Gamification Model for Virtual Team Collaborative Learning via Cloud Technology

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Abstract - **The objectives of the research study were: (1) to synthesize a gamification model for virtual team collaborative learning via cloud technology and (2) to assess the appropriateness of the model. The sample group consisted of five experts selected by purposive sampling. Each expert had experiences in instructional design, gamification of education or game activities in learning, virtual team, collaborative learning, and cloud technology. An evaluation questionnaire used in the study to assess the appropriateness of the model. The statistics used in the study were the arithmetic mean and standard deviation. The results showed that the designed gamification model was the combination of the gamified roles of two main stakeholders, the online and face-to-face learning strategies, and environments. The model composed of three main parts which were Part I: Learner as a Player, Part II: Instructor as a Coach, and Part III: Classroom as an Arena. The experts agreed on the appropriateness of the model at a very good level. Therefore, it is highly feasible for the educators to implement the model.**

Keywords - **Cloud Technology, Collaborative Learning, Gamification of Education, Teamwork Skills, Virtual Team**

I. INTRODUCTION

According to the globalization of lifestyle and workforce in the 21st century, high level of teamwork skills are commonly expected in all learners. Therefore, educators should provide education and learning environment that support learner to work collaboratively as a member of their team by using the ICT [1].

As an in-demand trend emerged in global business over the past few years [2], Gamification is the application of game design elements in a non-game context [3]. The benefits of Gamification have widely drawn the attention of educators in higher education [4]. Research concerning gamification of education have shown the evidence of its effectiveness involved with learners' enjoyment, motivation, engagement, behavioral changing and skill development [5, 6]. Therefore, Applying gamification to higher education, learners could be motivated to learn in enjoyable and engaged ways.

Recently, cloud technology has offered flexible solutions for higher education in developing countries [7]. The benefits of cloud technology have been used to eliminate limitations of educational resources by providing an on-demand network access to a shared pool of configurable computing resources [8]. Therefore, cloud technology potentially enables educators to create a virtual educational environment in a platform of Software as a Service (SaaS) application that

can be conveniently accessed by instructors and learners using any smart devices.

According to above mentioned key points, it's crucial that qualified gamification model for virtual team collaborative learning via cloud technology should be studied, created and used as a framework for improvement of learner enjoyment, engagement, and teamwork skills.

II. THE OBJECTIVES OF RESEARCH STUDY

The objectives of the research study were:

1. to synthesize a gamification model for virtual team collaborative learning via cloud technology.

2. to assess the appropriateness of a gamification model for virtual team collaborative learning via cloud technology.

III. METHODOLOGY

The research procedures were comprised of six steps as follows:

1. Firstly, the concepts, principles, theories, and research study concerning existing gamification of education, collaborative learning, virtual team, cloud technology, and teamwork skills were analyzed and synthesized by the researcher.

2. A conceptual framework for constructing a gamification model for virtual team collaborative learning via cloud technology was set based on the result of analyzed and synthesized data from the previous step.

3. Tools and evaluation questionnaire was created and used for assessing the appropriateness of the model.

4. The appropriateness of the model was reviewed and evaluated by five experts selected by purposive sampling. Each expert had experiences in instructional design, gamification of education or game activities in learning, virtual team, collaborative learning, and cloud technology. The questionnaire was used to assess the appropriateness of the model.

5. Data collected by the assessment of the model was analyzed by using the arithmetic mean and standard deviation.

6. Finally, the model was improved for further study based on suggestions and comments of the experts.

IV. CONCEPTUAL FRAMEWORK

The conceptual framework of this research is an integration of the concepts, principles, theories, and research study concerning existing gamification of education, collaborative learning, virtual team, cloud technology, learner engagement, learner enjoyment, and teamwork skills, as shown in Fig. 1.

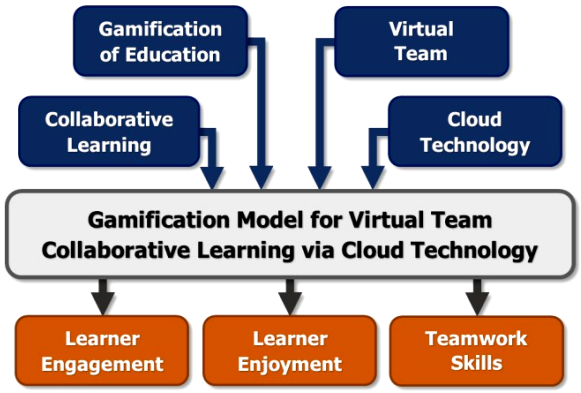

Fig 1. The Conceptual Framework of Gamification Model for Virtual Team Collaborative Learning via Cloud Technology

V. RESULTS

According to the objectives of the research study, the results comprise of two parts which can be shown as follows:

A. The Synthesized Model

The results showed that the synthesized gamification model for virtual team collaborative learning via cloud technology is the combination of the gamified roles of two main stakeholders, the online and face- to-face

learning strategies, and environments. The fundamental concepts of the model are based on the MDA framework: Mechanics, Dynamics, and Aesthetics [9]. The model consists of three main parts which are Part I: Learner as a Player, Part II: Instructor as a Coach, and Part III: Classroom as an Arena. The model was shortly named LIC gamification model, as shown in Fig. 2.

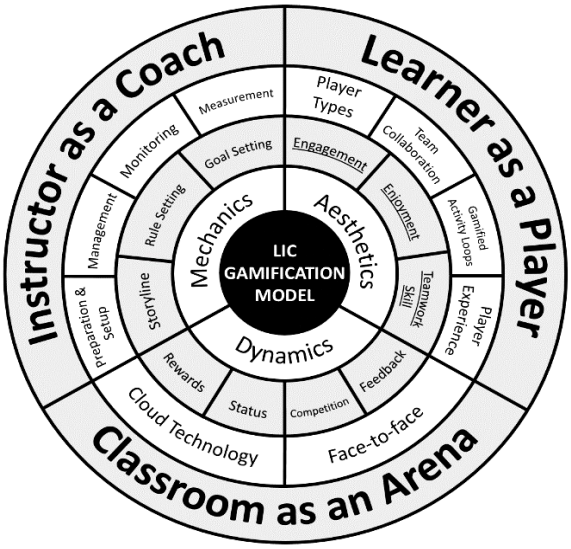

Fig 2. The Gamification Model for Virtual Team Collaborative Learning via Cloud Technology (LIC Gamification Model)

Part I: Learner as a Player

In the traditional learning approach, learner listens to the instructor for details and concepts in order to gain his or her knowledge. Sometimes, they need to improve knowledge of a field by working in it under the instruction of an instructor. In the collaborative learning approach, learner works on projects and assignments on behalf of a team to learn collaboratively [10]. This approach may not be playful, engaged and enjoyable for learners who have different personality types. In the LIC gamification model, a learner in the gamified classroom undertakes a new role as a player who work collaboratively with their learning team. Instructor as a coach need to gamify learning processes and environments of the classroom. The Learner as a Player should be considered the following issues.

1. **Player Types:** Bartles's work on MUDs was the starting concept of player types. Players play for the different reasons or ways [11]. Four types of players are Socializers, Achievers, Explorers and Killers, each with different motivations, in behaviors and play styles [12]. Another player model called BrainHex, which was based on neurobiological findings. The model presents seven types of players: Seeker, Survivor, Daredevil, Mastermind, Conqueror, Socializer, and Achiever. The model explains how each of these player types relates to older player typologies, and how each type characterizes a specific playing style. Therefore, it is more appropriate to classify player types in gamification [13]. In the LIC gamification model, instructor as a coach gets started to gamify classroom by identifying player types, selecting, and applying the best-fit game mechanics and dynamics.

2. **Team Collaboration:** The process where two or more people work in harmony to do a task and to achieve shared goals is called a team collaboration. [14]. This process helps promote social skill, player engagement, and achievement [15]. Virtual team collaboration follows the same process as physical team collaboration, but the virtual team members do not physically interact and communicate exclusively through technological channels [16]. In the LIC gamification model, Learner as a player participates in gamified collaborative processes and activities as a part of their physical and virtual teams.

3. **Gamified Activity Loops**: Games usually consist of loop activities. Although, players play the same task, the results may be different. Activity loops can be seen as micro and macro level. The micro level is about what and why the player takes their actions and what the system does in response, called the engagement loop. The macro level on the other side describes the player journey, also named as progression stairs [17]. In the LIC gamification model, learner as a player individually and collaboratively involves in gamified activity loops. The player will get meaningful feedback from the instructor as a coach, gain motivation and keep going on to the next level of the activities. Player keeps

climbing from the beginner to the mastery level. To gain a higher level, the player should master some challenges after each level, called "Boss Fights". Then, the player gets some rest, wait until they feel stable, and then get ready for next challenges. Teacher design gamified activity loops which have to be done in the physical and virtual learning environments.

4. **Player Experience**: User experience (UX) are person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service [18]. The concepts are familiar to the player experience because they based on the same concepts of HCL [19]. The Playful experience model was proposed and intended to help UX designers build games that will be more successful, engaging, and enjoyable. The model is divided into five planes: Motivation, Meaningful Choices, Balance Usability and Aesthetics, each of which is further divided into short- and long-term effects. [20]. In the LIC gamification model, player experience is designed by the teacher as a coach following the UX playful design standards and focusing on the expected aesthetics of the player.

5. **Player Engagement:** In education, student engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education [21]. In game design, engagement is an essential element of the player experience, and the concept is described in various ways [22]. There are a few ways in which player engagement may be discussed or addressed in playful design: Intellectual, Emotional, Behavioral, Physical, Social, and Cultural Engagements [21]. Gamified system designer should understand what aspects can be used to evaluate engaging gameplay and to design engaging player experiences. In the LIC gamification model. Questionnaires and methodologies are proposed in order to empirically evaluate the level of players' general engagement.

6. **Player Enjoyment:** Psychological research has been studied to clarify what is fun in a game and what engages people playing computer games. Theoretical approaches include Malone's principles of intrinsic qualitative factors for engaging gameplay [23], namely Challenge, Curiosity and Fantasy as well as the well-known concepts of the theory of flow [24] incorporated in computer games as a model for evaluating player enjoyment, called GameFlow [25]. A qualitative approach for player enjoyment evaluation demonstrates a tendency to overlap with Malone's and Csikszentmihalyi's foundation concepts. These approaches are based on Lazzaro's fun clustering which uses four entertainment factors based on facial expressions and data obtained from game surveys of players [26]. According to Lazzaro, the four types of fun are Hard Fun, Easy Fun, Serious Fun and People fun. Moreover, Koster's theory of fun, which is primarily inspired by Lazzaro's four types of fun, defines "fun" as the act of mastering the game mentally [27]. An alternative approach to fun measure is composed of three dimensions: Endurability, Engagement, and Expectations [28]. In the LIC gamification model, Questionnaires and methodologies are proposed in order to empirically capture and evaluate the level of players' general enjoyment.

7. **Teamwork Skills:** According to the P21 Framework for 21st Century Learning, students need teamwork skills to succeed in the 21st century work and life. Students who have teamwork skills are able to work effectively and respectfully with diverse teams, to accomplish a common goal, and assume shared responsibility for collaborative work, and to value the individual contributions made by each team member [1]. In the LIC gamification model, Questionnaires and methodologies are proposed in order to empirically evaluate the level of player teamwork skills.

Part II: Instructor as a Coach

The instructors are expected to carry out various functions or roles within and outside the classroom [29]. An instructor who makes

extensive use of gamification for learning undertakes new roles as an intellectual and playful coach. The gamified roles of instructor are to provide playful learning that increase engagement, enjoyment and improved skills such as teamwork skills. To gamify learning is to apply the appropriated game mechanics and dynamics into the class that results in the expected aesthetics, behavior changes, and improved skills. The Instructor as a Coach should be considered the following issues.

1. **Preparation & Setup:** The first important issue is the gamified classroom preparation and setup. Getting and keeping learner as a player engaged and enjoyed while they are learning competitively and collaboratively with their peer or team is the most important step in creating a successful playful learning outcome [30]. The instructors need to observe critical classroom factors carefully and objectively. They should select and evaluate materials, organization, and methods in light of the objectives of their class and the learners being taught. Moreover, they should be aware of alternative methods and techniques with which to approach teaching situations [31]. Classroom preparation and setup can dramatically influence students' attitudes and behaviors. Students need an environment that is organized, stimulating, and comfortable in order to learn effectively, competitively and collaboratively. Creating such an environment entails arranging a practical layout, supplying diverse materials and supplies, and encouraging students to have a sense of belonging and ownership [32]. In the LIC gamification model, instructor as a coach undertake the roles, preparing and setting up gamified classroom using appropriated game mechanics and dynamics that give playful experience to the learner as a player on physical and virtual environments.

2. **Classroom Management:** After gamified classroom is set up and get started, instructor as a coach needs to manage the classroom. The classroom management is the methods and strategies an educator uses to maintain a classroom environment that is conducive to student success and learning [33]. Classroom management refers to the wide variety of skills and techniques that instructors aim to keep students organized, orderly, focused, attentive, on task, and academically productive during a class. When classroom management strategies are executed effectively, instructors minimize the behaviors that impede learning for both individual students and groups of students, while maximizing the behaviors that facilitate or enhance learning [34]. In the LIC gamification model, the instructor undertakes a role as a coach or game manager (GM), controlling, assisting, monitoring, and assessing all kinds of activities occur in the classroom as an arena in physical and virtual environments.

3. **Player Progress Monitoring:** While the classroom is managing, it is very important that instructor needs to keep an eye on learners' progression. Learner progress monitoring is a practice that helps instructors use learner performance data to continually evaluate the effectiveness of their teaching, make more informed instructional decisions, and ensure that all learners engage, enjoy their learning and reach expected outcome and skills [35]. Learner progress monitoring can be implemented with individual learners, groups or an entire class. The learner's current levels of performance are determined and goals are identified for learning that will take place over time. The learner's academic performance is measured on a regular basis (daily, weekly, or monthly). Progress toward meeting the learner's goals is measured by comparing expected and actual rates of learning [36]. In the LIC gamification model, the instructor monitors and assist individual learners and their team performances in physical and virtual environments by using selected game mechanics and dynamics.

4. **Outcome Measurement:** Without assessments, instructors cannot know whether their learners' learning outcomes meet the expected standard or not. The term assessment refers to all those activities undertaken by instructors, and by their learners in assessing themselves, which provide information to be used as feedback to modify the teaching and

learning activities [37]. The diagnostic use of assessment which provides feedback to instructors and learners over the class is called formative assessment. It stands in contrast to summative assessment, which generally occur after a period of instruction and requires making a judgment about the learning that has occurred [38]. In the LIC gamification model, the instructor empirically measures the level of learner engagement, enjoyment and teamwork skills in physical and virtual environments using questionnaires and methodologies. The empirical result of the measurements is represented in the classroom as an arena by using selected game elements such as points, badges, and leaderboards.

5. **Storyline Design:** Narrative and story elements in computer game integrate different forms of interactivity and use different strategies for combining interaction with the non-interactive story and narrative elements [39]. Player engagement activities involve players experiencing the story. The anticipation of what will happen and being curious about how the story evolves is a great trigger for player engagement. However, it depends on the different types of player, some keep playing because of the story and that they want to see what happens next as some do not want to keep playing when there is too much story, if the story is boring or bad or if there is no story at all [22]. The storyline has been included in the most engaging games, drawing the player into the game. The importance of a good story cannot be overemphasized. Human beings have an inherent predisposition for learning in this way [40]. In traditional learning approach, students learn the whole subject by breaking the larger topic into smaller lessons. In the LIC gamification model, the instructor as a coach may take the whole subject as a storyline of a gamified class and each lesson as the levels of the gamified class. Learners role play as a character and a member of guilds or tribes involved in the story based on their difference player types. The teacher may roleplay as an intellectual savant, coaching the learners to climb the levels up from the beginning through the end of storyline [41, 22]. The storyline occurs in the real world and simulates in the virtual environment.

6. **Goal Setting:** A goal is the desired result that a person or a system envisions, plans and commits to achieve. Goal setting involves the development of an action plan designed to motivate and guide a person or group toward a personal or organizational goal [42]. Goals have a pervasive influence on personal behavior and performance in organizations and management practice [43]. According to Locke and Latham, there are five principles that improve chances of success: Clear Goals, Challenging Goals, Securing Commitment to Goals, Gaining Feedback and Considering Task Complexity [44]. Goals can be long-term, intermediate, or short-term. The primary difference is the time required to achieve them [45]. The most games share four defining attributes are Goals, Rules, a Feedback System, and Voluntary Participation [6]. In the LIC gamification model, the instructor as a coach undertakes personal and team learning goal settings in the real world and virtual class based on the goal setting theory.

7. **Rule Setting:** To manage a classroom effectively, teacher need rules to control the students in the class. The function of a rule is to prevent or encourage behavior by clearly stating student expectations [46]. Rules are what guide a player through the game. It tells them what they can and cannot do in order to win. The rules not only describe how to play the game but also help shape the player experience [47]. In the LIC gamification model, the instructor as a coach undertakes positive gamified classroom management that they should be focused on problem solving and not on punishment. Rules in the gamified classroom are set and reinforced in order to ensure the accomplishment of the personal and team learning goals.

Part III: Classroom as an Arena

A classroom is a place in which classes are held. Classrooms are found in an educational institution of all kinds. Classroom aims to provide a place where teaching and learning

can occur uninterrupted by outside distractions [48]. According to the ICT evolution, the classroom may not be only held in a place but also in a virtual environment. Learner in the traditional classroom works on individual assignments or projects on behalf of a team to learn collaboratively and, likewise, the player in the gamified classroom or learning arena plays on individual quests or tasks or challenges on behalf of a guild or tribe. Learner in the real world environment do some physical activities and as a player in the virtual environment, they do some virtual activities as well. The learning arena should be created by playful design using the game mechanic and be driven by the game dynamics. The learning arena can be held in the physical or virtual environment which support player to play for their learning anywhere and anytime. The Classroom as an Arena should be considered the following issues.

1. **Face-to-face Classroom:** Traditional face-to-face classes are the cause formats which instructors and students meet in the classroom or another in-person setting. The face-to-face class facilitates building relationships and community of the classroom. However, some limited conditions such as the pace, impediments to learner engagement, large-class and the schedule affected the efficiency of the face-to-face classes [49]. According to Lowry's research, there were effects of the face-to-face classes with a team-based learning approach [50]. In the LIC gamification model, the face-to-face approaches are the primary part of the classroom as an arena especially with some gamified activities which required physical actions and reactions. The instructor as a coach undertakes a role as a gamified classroom designer.

2. **Virtual Classroom on Cloud Technology:** The virtual classroom is a course format which instructors and students meet exclusively in the online environment through technological channels. In the virtual classroom, the instructor is able to organized learners into groups and roles. The instructor is allowed to present resources, activities, and interactions within a course structure [51]. The virtual classroom has been adopted by almost all higher education institutions [52]. Cloud computing enables an on demand network access to a shared pool of configurable computing resources [8]. In the LIC gamification model, the virtual classroom approaches are the supplementary part of the classroom as an arena especially with some gamified activities which occur outside of the face-to-face classroom. The virtual classroom approximately takes 20 to 30% of total course time. The virtual classroom is designed, developed and deployed using platforms of Software as a Service (SaaS) application.

3. **Rewards:** There are two types of rewards. Extrinsic Reward is an incentive that is tangible or physically given to someone for accomplishing something. The examples of rewards are money, coupons, points, trophies, medals, badges. It stands in contrast to the intrinsic rewards, which is an intangible incentive of recognition, a sense of achievement, or a conscious satisfaction usually arise from within the person who is doing the activity or behavior. The examples of intrinsic rewards are love, fun, purpose, belonging, passion, mastery [53]. In the game, the rewards are crucial to player motivation and engagement. The SAPS (Status, Access, Power, and Stuff) lists each potential of reward in game design [41]. In terms of the structure of the reward, there are six types of rewards that can be implemented into a playful design: Fixed Action Rewards, Sudden Rewards, Random Rewards, Rolling Rewards, Social Treasure and Reward Pacing [54]. In the LIC gamification model, a reward system should provide the physical and virtual extrinsic rewards which motivate and engage the different types of players.

4. **Status:** In games, players are often motivated by trying to reach a higher level or status. The status is the rank or level of a player. The extrinsic rewards such as points, badges, progress bars and leaderboards are often used to elevate status by showcasing the talents, expertise, and accomplishments of

players [55]. Status is the relative position of an individual in relation to others, especially in a social group. Status benefits and rewards give players the ability to move ahead of others [41]. In the LIC gamification model, the status of the individual player and teams are ranked and represented by using real world and virtual rewards.

5. **Competitions:** The most of games intentionally leverage player's natural desires of socializing and competition. Competition is a contest between two or more individuals or groups [56]. Competition is manifest by players accumulating rewards and showcasing of their status [57]. In the LIC gamification model, two types of competitions are arranged: Player vs. Player and Team vs. Team. The competitions are held in physical and virtual environments.

6. **Feedback:** Essential parts of all games are feedback. Feedback is returning information to players and informing them of where they are at the present time [41]. Feedback is the key that keep the player in the engagement loops [17]. From an instructional perspective, games give continual corrective feedback and that helps learner keep on the right direction [57]. In the LIC gamification model, instructor as a coach consistently delivers positive and negative feedback to individual players and teams.

B. The Appropriateness of the Model

The LIC gamification model was reviewed and evaluated by five experts. It was found that the experts agreed on the appropriateness of the model at a very good level ($\bar{x}$ = 4.65, S.D. = 0.50). The results indicated that the model was feasible for further implementation. The assessments of the model are shown in Table I.

TABLE I
THE APPROPRIATENESS ASSESSMENTS OF THE LIC GAMIFICATION MODEL

Parts of the Model	Results of Appropriateness		
	$\bar{x}$	S.D.	Level
Part I: Learner as a Player	**4.80**	**0.45**	**Very Good**
1.1 Player Types	4.60	0.55	Very Good
1.2 Team Collaboration	4.80	0.45	Very Good
1.3 Gamified Activity Loops	4.62	0.52	Very Good
1.4 Player Experience	4.40	0.55	Good
1.5 Player Engagement	4.40	0.55	Good
1.6 Player Enjoyment	4.80	0.45	Very Good
1.7 Teamwork Skills	4.80	0.45	Very Good
Part II: Instructor as a Coach	**4.75**	**0.50**	**Very Good**
2.1 Preparation & Setup	4.40	0.55	Good
2.2 Classroom Management	4.75	0.50	Very Good
2.3 Monitoring	4.75	0.50	Very Good
2.4 Measurement	4.40	0.55	Good
2.5 Storyline Design	4.40	0.55	Good
2.6 Rule Setting	4.80	0.45	Very Good
2.7 Goal Setting	4.80	0.45	Very Good
Part III: Classroom as an Arena	**4.62**	**0.52**	**Very Good**
3.1 Face-to-face Classroom	4.40	0.55	Good
3.2 Virtual Classroom on Cloud Technology	4.80	0.45	Very Good
3.3 Rewards	4.80	0.45	Very Good
3.4 Status	4.75	0.50	Very Good
3.5 Competitions	4.62	0.52	Very Good
3.6 Feedback	4.80	0.45	Very Good
Average Score	**4.65**	**0.50**	**Very Good**

VI. DISCUSSION

According to the results, the LIC gamification model would be an in-demand and appropriate learning strategy for higher education in the 21st century. The results show that the model was synthesized and created by the integration of the well-known and successful fundamentals in the fields of gamification.

The model was accordingly created based on the MDA framework [9] focusing on the Mechanics, Dynamics, and Aesthetics. The fundamental concepts of gamification were studied and integrated into the model. The model aims to gamify learning that improved learners' fun, engagement, skills in accordance with the S. O'Donovan's [58], S. Sheth's [59] and G. Barata's [60] research findings indicating that gamification in classroom improve engagement and encourage targeted behaviors among learners in the university level. Particularly, the model was focused on the collaborative and teamwork approaches in according with N. Vegt's research that gamification was proposed to improve collaborative behaviors in teamwork [61].

The results suggested that the roles of Instructor as a Coach may require the in-depth understandings and practical approaches of gamification in higher education. The instructor may overwhelm on top layers of tasks gamifying their class because it may take some class time.

However, the results suggested that instructor should devote themselves and focus on learners' enjoyment and engagement affecting the classroom climate and overall outcome of learning. It is worth investing in mental factors of learning and get the better tangible results in return.

In term of Learner as a Player, the result suggests that player types should be precisely classified by the class get started. The game mechanics, dynamics, and aesthetics should be carefully selected and used according to the player types. The gamified activities should be designed, not too difficult or easy, take an appropriate period of time. Learners should be allowed and assisted in working collaboratively with their team. The most important is the balance of positive and negative feedback that learners consistently and immediately get from the activities because they help to encourage and to keep learner on the right track.

Still, some suggest that the Classroom as an Arena should be clearly defined. For examples, the activities should be considered in which environment that they should be done between face-to-face and/or virtual the environments. In addition, the Team vs. Team competition should be arranged and judged according to the goals and rules of the class. Each team should be equally built by various player types. The results concerning cheating of learner in classroom suggest that instructor should carefully manage this problem with no excuses in accordance to the institutional rules.

Finally, the results suggest that the assessment of learners' enjoyment, engagement and teamwork skills may need more customization in order to precisely assess learners' outcome. Further studies should investigate more specifically different factors that are effective for individual learners.

VII. CONCLUSION

In summary, the research study was conducted in order to create an appropriate framework for learner's enjoyable, engaging learning and improving teamwork skills using gamification. The developed model is comprised of three part: Learner as a Player, Instructor as a Coach and Classroom as an Arena. Each part of the model describes the crucial issues concerning the gamification of learning for higher education. The appropriateness of the model was evaluated by experts in the relevant fields. The experts agreed on the appropriateness of the model at a very good level. It is found from the results that it is highly feasible for the educators to implement the model.

VIII. ACKNOWLEDGMENTS

This research was partially funded by the Graduate Collage of King Mongkut's University of Technology North Bangkok, Bangkok, Thailand. The researcher would like to express special thanks to all experts for their valuable evaluations and comments. The research would not be successfully conducted without mental supports from my family and friends.

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(Arranged in the order of citation in the same fashion as the case of Footnotes.)

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