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A GUIDELINE OF DESIGNING GAMIFICATION IN THE CLASSROOM AND ITS CASE STUDY

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Abstract. *This paper indicates some common mistakes in designing gamification in the classroom which some gamification designers fall to. The paper takes a step back and observes the actual purposes of gamification in the classroom. Some game design techniques are raised for proper designing process instead of just identifying game elements that can be included into the classroom. A guideline of designing classroom gamification is proposed which includes 1) identify the pillar roles of the classroom, 2) identify expected pain points in the classroom, 3) identify expected overall aesthetics and the purposes of including gamification into the classroom, 4) design mechanics in the class, 5) pick the right elements and tools for the classroom, and 6) iterative monitoring and adjustments. A case study of actual gamification implementation in classroom of undergraduate level is provided which has been conducted in four semesters. It received increasing assignment turn-in rate from 82.86 percent in the first semester to 92.86 percent in the latest semester. On the other hand, the satisfactory rate of students is steady with 8.80 out of ten in the first semester to 8.96 out of ten in the latest semester. These designing guideline and case study are expected to help understand the gamification design process for a classroom.*

Keywords: Gamification, Education, Game design elements, Pain points in classroom, Game aesthetics

1. **Introduction.** Gamification is a word which has been widely discussed in past years. It has been applied in many contexts such as business, marketing, healthcare, and education. Normally, gamification refers to the application of game design elements in non-game activity settings [1] to increase and maintain the motivation and engagement of participants. In education, there are several researches and case studies of implementing gamification principles within classrooms in various educational levels, i.e., primary education [2], secondary education [3], and postsecondary education [4].

Gamification is reported to be a potentially effective set of tools which can enhance the experience of students in the classrooms if used correctly. However, educators often struggle with how to implement gamification into their classes. This might due to the educators' several factors including unfamiliarity of game design principles. Several studies suggested elements of gamification which could be added to the classroom. However, these are actually not main points of designing gamification but instead only components. Some studies included these elements without considering the purposes and characteristics of the classroom. This could lead the result of the designed gamifications to be as not successful as they should be.

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In this paper, an overview of gamification in education will be given and some common mistakes of designing gamification in the classroom will be identified in Section 2. A guideline of implementing good gamification in education context will be contributed in Section 3. A case study of actual gamification implementation in classes of Department of Computer Science, King Mongkut's Institute of Technology Ladkrabang, Thailand, from 2017 to 2020 will then be described in Section 4. Finally, the conclusion is provided in Section 5.

2. Literature Review.

2.1. Gamification definition. Gamification is generally defined as the concept of using game design elements in other non-game contexts in order to motivate and engage activity participants [1]. This can be explained using Maslow's hierarchy of needs [5] (see Figure 1) that games can fulfil psychological (belongingness and love, self-esteem) and self-fulfilment needs. Therefore, implementing game elements into non-game activities is considered to increase motivation of participants in the same manner as how playing games does, even though there are many times that no actual games are implemented.

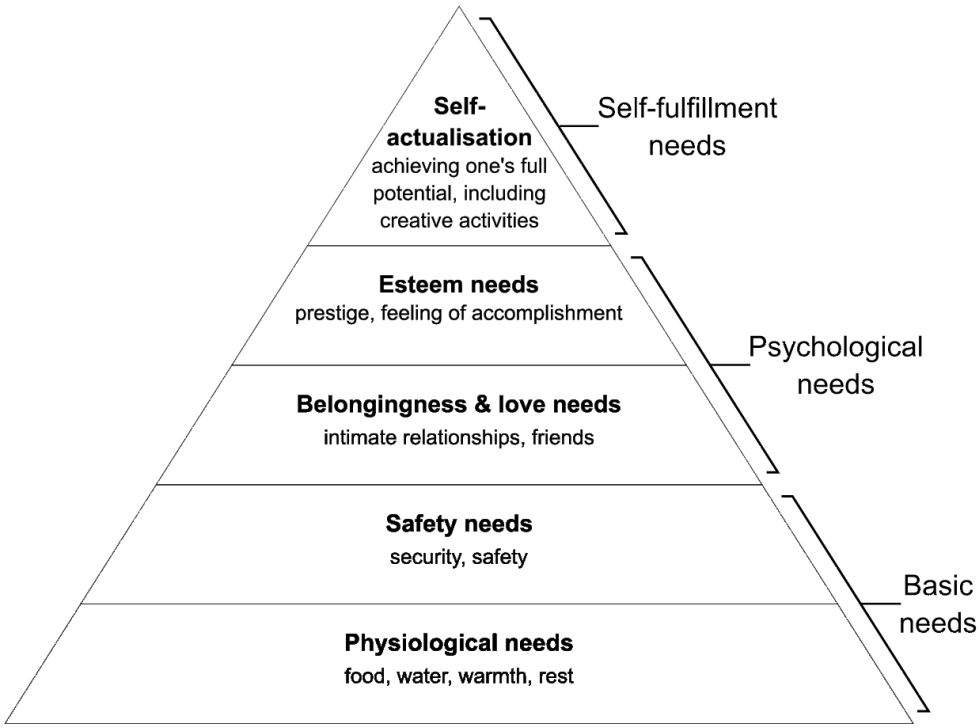


FIGURE 1. Maslow's hierarchy of needs

Gamification is often described consisting of 7 elements as follows [6]: Goals, Rule, Conflict/Competition/Cooperation, Times, Reward, Feedback, and Levels. However, this definition is slightly oversimplified. Some studies also reflect a confusion that these elements are mandatory and the design is limited to the list [7]. At many points, gamification is discussed by focusing on how to include badges, feedback, levels, and reward to the activity rather than how to actually design and implement game elements to the context which is how gamification originated. In game design, there are more underlying details than jumping right into the game elements.

2.2. Games and game design elements. Games are playful activities which have been in the history of humankind for a long time. There are many definitions of game, for example, Suits [8] defined that 'playing a game is a voluntary effort to overcome

unnecessary obstacles'. On the other hand, Rogers [9] defined that 'a game is an activity that 1) requires at least one player, 2) has rules, and 3) has a win and/or lose condition'. None of them, as well as many other definitions of game are right or wrong. Game definition can be varied and alternated from time to time.

Although definitions of game are various, there are elements that always present which is called 'game atoms' [10].

1) Players. The word 'game' is generally paired with the word 'play' [11]. Hence, there must be at least one 'player' to play the game.

2) Mechanics. Game mechanics are the rules of the game and the core of game progression.

3) Goals. Goals are missions in games which can be small or ultimate. Goals in game are normally achievable under game mechanics and not necessary are win/lose conditions.

4) Dynamics. Game dynamics are the patterns of play style of players which are influenced, but not entirely enforced by game mechanics. Players might create their play style to assist their goal achievement or exhance their gameplay experience.

5) Theme. Themes of game can be their stories, appearance, or atmosphere which is typically not necessary for the gameplay but is necessary for player's experience.

These elements are core of game design which are used in several game design frameworks. One of well-received frameworks is MDA framework which stands for mechanics, dynamics, and aesthetics [12] (see Figure 2). The game designer focuses on how to create game mechanics, and anticipates the game dynamics, to build the emotions of players via game aesthetics. On the other hand, players consider their aesthetics, then build and adjust their dynamics in which the mechanics allow. Hence, the game designer and players are viewing the same elements in different perspectives.

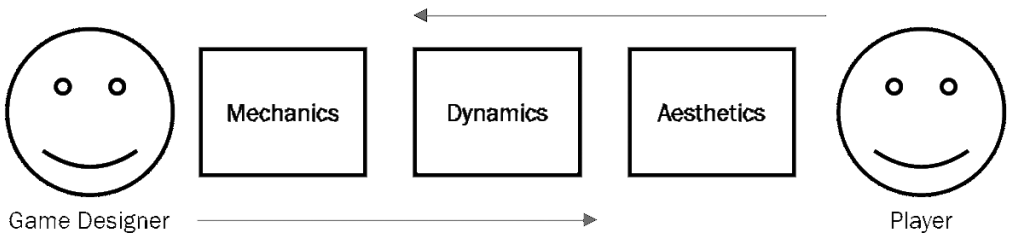


Figure 2. MDA framework

Gamification derives great amount of elements from game design. As the original concept of gamification is to implement game elements into non-game contexts in order to achieve the similar experiences and circumstances as in games, the designer of gamification setting should step back and acknowledge how games are actually created. The gamification designer should take similar responsbilities as a game designer, although the gamification is not necessary to be a game. This will be discussed further in Section 3.

2.3. **Gamification in education.** Education is one of non-game contexts which gamification is normally discussed. The interest in gamification in education has recently been escalated. This can be measured by the number of published research papers, which are related to this topic, significantly increased from year 2013 onwards [13]. The reason that gamification is in interest within education field is owing to some pain points in education system. Huang and Soman [14] stated that there are six common pain points in education as follows.

1) Focus. Some learners especially younger students tend to be easily distracted from the class.

2) Motivation. Adolescent learners tend to lose motivation as the class processes.

3) Skills. There are many times that learners lack the skills or knowledge that are required to complete the given tasks in the class which they might give up before trying.

4) Pride. The learners that believe they know enough knowledge in the class tend to refuse to learn from the class. This often happens when the learners are older than the instructor.

5) Physical, mental, and emotional factors. The factors might be basic conditions such as hunger or fatigue, or more serious conditions such as depression or learning disabilities.

6) Learning environment and nature of the course. These might be the size of the class, time of the class, location, and any other factors that involve the class.

Gamification is expected to relieve these six common pain points in education. As can be seen in the reports from [7] and [13], several game elements such as rapid feedback, reward, and conflict/cooperation play were included in several classrooms which intended to motivate the learners in the classroom. Some reports also focused on the tools being used such as LMS or online avatar. They reported that the results were satisfying and claimed as the best practices. However, none of these studies included one of the most important elements in game design – **players**.

It is not wrong that the elements of game such as reward, goals, multiplayer gameplay, and storytelling, are discussed in terms of gamification in education. As stated in the previous section, these elements are confused to be essential and sometimes instructors do not understand the purposes of including these elements to their class. A recent report from Jung and Wang [15] presented the influence of virality which elementary school students want to share information with their peers. This shows the importance of considering the perspective of the gamification participants – or players in terms of game design. Robson et al. [16] used MDA framework as the core of designing gamification. This is one practice to design gamification in the classroom. As gamification is originated from the game design principles, the instructors should embrace the techniques of game design in designing gamification even though there are no actual games in the classroom.

3. A Guideline of Designing Gamification in the Classroom.

As stated in the previous section, a gamification designer should take similar responsibilities as a game designer, Hiwiller [17] stated that the responsibilities of game designer are 1) establish design goals and plan, 2) think in systems, 3) see with player's eyes, 4) embrace being wrong, 5) communicate with players, 6) fill the gaps, 7) facilitate play, and 8) do not be an auteur. In this section, a guideline of designing a gamification in the classroom based on these responsbilities is being proposed. This is the result of combining game design process with the educational nature, intending to relieve common pain points in education. Figure 3 overviews the guideline process of designing gamification in the classroom.

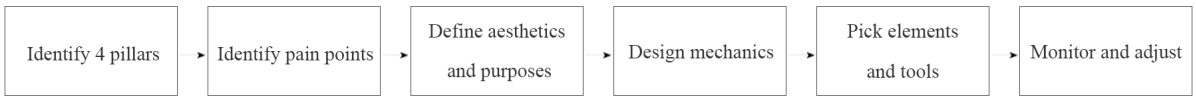


Figure 3. Guideline process of designing gamification in the classroom

3.1. Identifying pillars of the classroom.

Before designing a gamification in a classroom, the design should be aware of the main components in a classroom. There are four pillars that should be considered in designing gamification in a classroom. These pillars must be fully identified and understood before executing the design process because every pillar can affect the contents and process of classroom gamification.

1) Instructors. Instructors are the role which make the classroom progress as it is intended to be. This role is equivalent to the game master or system in games. Although

it is not necessary that they are the designer of the gamification of the classroom, they should fully understand the purposes of gamification along with the learning programme and materials.

2) Learners. Learners are the role which is equivalent to the players in games. They might be different in terms of past experience but the designers are expected to conduct the intended aesthetics to them using the game elements. There are normally multi-learners in one class; hence the social interactions are expected to occur during the class progression.

3) Learning program and materials. These are the main contents of the class to be conveyed to the learners. There are also expected learning outcomes that instructors need to assess at the end of the class.

4) Classroom environment. This reflects the size of the class, the time, how the class is normally conducted, the devices in the class, etc.

3.2. **Identifying expected pain points in the classroom.** In every classroom, there should be pain points which the gamification designer expects to overcome or relieve as the objectives. Therefore, these pain points must be fully identified and understood in terms of each pillar. The example pain points are:

Instructors

- Each instructor does not agree in using gamification on the classroom, or not fully understand the purposes of implementing gamification.
- Each instructor has different styles of teaching.
- Some instructors do not have any experiences in playing playful activities or games which could lead to unenjoyable experience in overall.

Learners

- Learners might lose focus or motivation when the class progresses.
- Learners might refuse to attend the activities in the class.
- Learners might have or have not intimating relationships with each other which could affect the interactions within the class.
- Learners might not have any experiences in playing playful activities or games which could lead to unenjoyable experience in overall.
- Some learners might have conditions or disabilities that require special attentions.

Learning program and materials

- The materials and program might not be suitable for gamification.
- The assessment might not be suitable for gamification.

Classroom environment

- Learners might lose focus according to the time and place of the classroom.
- The size of the classroom might not be suitable to conduct any activities.
- There might be devices which are specially required and not available in the classroom.

3.3. **Identifying expected overall aesthetics and the purposes of including gamification into the classroom.** Aesthetics are one of important game elements. They can help motivate and engage the participants of the classroom. This does not mean only the aesthetics of the learners, but also the aesthetics of the instructors. The aesthetics should be considered according to the expected pain points combining with the natures of the classroom pillars. For example, in a classroom where the learners do not personally have intimating relationships with each other, the social interaction should be collaboration or cooperation because this might build a good atmosphere in overall. On the other

hand, in a classroom where learners know each other well, some conflicts and competition such as leaderboard or other competitive activities might be included to increase the tension which could motivate learners in overall.

3.4. **Designing mechanics in the class.** Mechanics are rules of gamification in the class. This step might be the most difficult one for the designer. However, at this point, some of important elements have been stated already such as purposes of the gamification in the classroom, learners, and expected aesthetics. Some game design frameworks that were introduced in previous section such as MDA framework (see Figure 2) or any others can be implemented.

3.5. **Picking the right elements and tools for the classroom.** This is the process where some designers jump straight into in many previous gamification studies. However, since the designer should understand the targets and purposes of gamification in the classroom at this point, picking right game elements should not be a problem. Common game elements such as leaderboard can be used to create competition within the classroom, level system can be used to create the empowerment aesthetics which is good for younger learners and/or learners with some experiences in games, reward can be used to when learners successfully achieve some goals to motivate them furthermore, and some randonnesses to increase some uncertainties in the progression. These can be included under some rules and mechanics to help the classroom progress smoothly, while tools help instructors to track and inform learners some necessary information.

3.6. **Iterative monitoring and adjustments.** There are only small chances that the game elements succeed at the first time. There might be some unforeseen events and conditions occurring that affect overall progression. Some adjustments might be required as the classroom progresses. Instructor must monitor the classroom and modify some elements to smooth the development. After the course finishes and if the classroom will reoccur in the future, any information during the past classrooms can be used to adjust or redevelop the coming classroom as well.

4. **Case Study of Designing Gamification in Classrooms.** In this section, a case study of a classroom that has implemented some gamification into is going to be presented. This classroom has been conducted during acadamic year 2017-2020 in the Department of Computer Science, King Mongkut's Institute of Technology Ladkrabang, Thailand. This class is a selective subject in the B.Sc. Computer Science programme called **Mixed Reality** teaching the principles of mixed reality including virtual reality, augmented reality, ubiquitous computing, and locative media. Normally, there are around 20-40 students each semester.

Four pillars of the class

- Instructors – 1 teacher
- Learners – 20-30 students in the major of B.Sc. Computer Science, mixed gender, 18-22 years old, all students are familiar with digital technologies.
- Learning program and materials – Three-hour lecture, mid-term exam, and projects.
- Classroom environment – Lecture room.

The expected pain points

1) This subject requires a lot of further researches after the class.
2) All students are required to apply the theories to several contexts and think further.

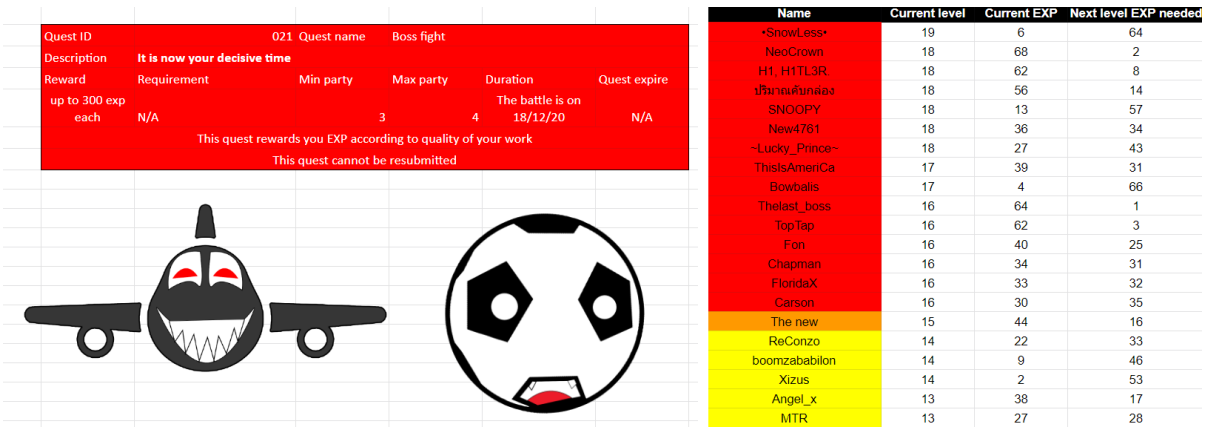
Purposes of gamification

1) To motivate students to do further researches.
2) To motivate students to analyze and apply mixed reality theories to each context.

The design of gamification

In this class, the most important aesthetics are **submission** (game as past time) and **immersion** (expands the boundary of experience in spatial, temporal, and social perspectives) which are the common aesthetics of mixed reality applications, since they are learning about designing mixed reality experiences. The whole class is transformed into a big adventure. The common classroom words such as slides, assignments, students, teacher, and examination are forbidden. Instead, students must use the words journey manuals, quests, adventurers, game master, and boss fight. They are changed from a student to an adventurer who wants to maximize their level. The max level is 20 which is equivalent to grade A in reality. They have their right to name their own avatar whatever they want as long as the name is appropriate which gives an **expression** aesthetic.

Similar to other typical role-playing games, students can level up by obtaining EXP points. There are two parts of EXP points provided. First, there will be quests given each week in order to let students research further than in the class. The quests are available for two weeks and they are free to start the quest whenever they want within this timespan. Once they start, the quests will have different time limits (might be 3, 5, or 7 days in general depending on the difficulty of the quest). If the quest's timespan is not expired, they still can request to receive the same quest again if they are not satisfied with the result. This is one of game design elements called **free to fails**. They can also choose to team up with the others to ease their work but the EXP point will be divided among their group which is another game design elements called **player's weighted choice**. The weekly quests are provided to the students using simple tools like Google Classroom and Google Sheets (see Figure 4). During the entire process of weekly quests, the students' names are put in the leaderboard and they can find the log of the game progression within the dashboard to create competitive feeling which could motivate the students using **social esteem** feelings.



Name	Current level	Current EXP	Next level EXP needed
•SnowLess•	19	6	64
NeoCrown	18	68	2
H1, H1TL3R	18	62	8
ปริมาณต้บกล่อง	18	56	14
SNOOPY	18	13	57
New4761	18	36	34
~Lucky_Prince~	18	27	43
ThisIsAmeriCa	17	39	31
Bowbalis	17	4	66
Thelast_boss	16	64	1
TopTap	16	62	3
Fon	16	40	25
Chapman	16	34	31
FloridaX	16	33	32
Carson	16	30	35
The new	15	44	16
ReConzo	14	22	33
boomzababilon	14	9	46
Xizus	14	2	53
Angel_x	13	38	17
MTR	13	27	28

FIGURE 4. (Left) The quest board with bosses appearing, and (Right) the leaderboard of Mixed Reality class

The second part of EXP is from the examination. In the examination, they are free to form a group (called 'party') which two-third of the full EXP point is individual performance while the one-third will be averaged in the party. Therefore, they must teach each other within the party before examination to understand the theories and maximize their overall EXP points. The examination is also in a form of small adventure which they must escape from a game world and fight the final boss. This creates **immersive** feeling to the students.

The result and discussion

The whole activities in the class are very well-received. This class has been finished four times, with 120 students in total. The turn-in rate of the assignments is more than 80

percent in every semester. There were some critics in the first semester that the number of quests was too high (32 quests). The number of quests has been reduced to 20 quests in the following year with some modifications in the quest instruction. The assignment turn-in rates have been increasing from the first semester to the latest one by 10 percent, while the satisfactory rating has been maintained within the same range. This shows that the adjustments are satisfying. The result of this class in the past is shown below in Table 1.

Table 1. Result of gamification in all mixed reality classes

Semester	**Number of students**	**Number of assignments**	**Assignment turn-in rate**	**Average ratings (out of 10)**	**Standard deviation**
Semester 2 2017/18	40	32	82.86%	8.80	0.82
Semester 1 2018/19	21	23	84.21%	8.81	0.81
Semester 1 2019/20	17	20	86.36%	8.61	1.29
Semester 1 2020/21	42	20	92.86%	8.96	0.87

5. **Conclusion.** Gamification is widely used in education now. Many results have been reported that gamification can motivate the learners into the class. The possibilities of designing the gamification in a classroom are endless. However, it is essential that the designer must understand the purposes of gamification rather than just including game elements into the class.

The goal of this paper was to indicate the actual purposes of gamification, as well as a guideline of designing process. The designer must identify the identities of classroom's pillars, expected pain points that might occur, and implement game elements to relieve those pain points. This process must be monitored and adjusted as the class progresses, and after the class finishes.

There was a case study included in this paper to help explain how the designing process is conducted. However, the case study is not the best practices. Actually, there are no best practices in designing gamification in the classroom. The designer should observe their own classroom conditions, purposes, and pain points to implement the game elements into. Sometimes, the gamification in the classroom must go through trial and error processes and adjustments in order to achieve the best possible outcome.

The game design processes and frameworks stated in this paper are only a few examples of game designing methods. There are still many more methods and patterns of game design which depends on the type of game, desired mechanics, and different types of players. There are also a number of techniques involving in game design such as storytelling, game balance, and difficulty curve. These frameworks and techniques are highly recommended for gamification designer to explore further.

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