

# Literature Review on Gamification for Educational Content

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**Abstract:** Education is one of many important things that we need as human being. The lessons given at class are repetitive and a bit boring, that is why we need something to be able to engage learners to learn more. To do that, educator can implement gamification for subject they teach, might be with a fun quiz, storytelling, or holding competition. Some other way to motivate learners to learn is by using digital game, an education game. Education game, if done correctly, will make learners even more motivated to learn and more active in class.

## 1 INTRODUCTION

Traditional learning used in school should be changed following the appearances of new technology. The coming of new technology like computer and smart-phone makes the way students learns need to be changed (Eleftheria et al., 2013) (Aleksić-Maslač et al., 2018) (Dicheva et al., 2018). This is caused because student actually prefer to use computer rather than books. But, just having the content moved from books to digital forms is not enough to increase the student interest in learning, the content need to be changed in a way which make them enjoyable and easier to learn, which can be achieved by gamifying them into a fun and engaging educational game (Cetin, 2012) (Cheng and Su, 2012) (Eleftheria et al., 2013) (Brayshaw and Gordon, 2016) (Hooshyar et al., 2015) (Aleksić-Maslač et al., 2018) (Dicheva et al., 2018).

Teachers are requested to be even more creative in presenting their subject in class. Traditional learning method used in class that rely on blackboard, oral lectures, books and written exercise are becoming less effective (Barata et al., 2013)(Aleksić-Maslač et al., 2018). Students can get bored easily compared to when they play games, people who play games can spend hours playing a game (Cheng and Su, 2012) (Brayshaw and Gordon, 2016) (Aleksić-Maslač et al., 2018). Knowing this, many researches have tried to implement game techniques into learning material, which can be called gamification (Ymran et al., 2017).

Gamification is a strategy to implement the principles of motivation and engagement based on game

element or gaming concept into ordinary tasks or activities (Good et al., 2012) (Ying et al., 2012) (Codish and Ravid, 2014) (Hamzah et al., 2014) Kaneko et al., 2016;(Wang et al., 2016) (Perryer et al., 2016) (Basten, 2017). Gamification for educational content is usually aims to increase the student motivation to learn the learning material. Gamifying learning materials will make the educational content to be presented to the student in a game form. In hope that the students will be interested and get motivated to play and learn the material (Tsukamoto et al., 2012) (Ongoro and Mwangoka, 2014) (Mistry and Al-Anan, 2015) (Ferianda et al., 2018) (Prabawa et al., 2017) (Wu et al., 2018). Students need to focus on their study, but they rather play game than study. By gamifying the learning material, students will be learning while playing a game which can help students to stay focused while learning through playing the gamified learning material.

There are a lot of game design which can help in gamifying the learning material, but not all of the design can be used as is, which is why we need to understand a design to help increase student motivation and engagement to learn the learning material which should be given from the class (Fathoni and Delima, 2016) (Tóth and Tóvölgyi, 2016) (Kuo et al., 2018). Teachers need to consider some things before gamifying learning material. This research focuses on reviewing several researches that discuss about using gamification for non-game content to motivate or engage users. Furthermore, the comparison of the system can then be measured later from each aspect i.e. the best model, framework, and other factors, and also

review previous researches related to the method used to produce a game or system that is suitable for educational content.

## 2 DATA COLLECTION

The reference used in this literacy were searched from lib.ugm.ac.id database (like IEEE and ScienceDirect). The data used are related to gamification, education game, technology, and motivational game. Search keywords which being used are “Gamification”, “Education Game”, and “Motivational Game”. The selected paper which getting referenced in this paper are filtered by publish date which ranged from 2010 to 2018. The focus in the analysis of a paper is in the parts of the method and discussion. An important point in every chapter of the paper then recorded to obtain information on the objectives and methods that being used. In total, 19 reference papers related to research on the field of gamification and gamification on educational content were obtained by filtering process. There are limitations found on this research. Previous researches did not explicitly detail about their methods and techniques used in developing and creating the system or game.

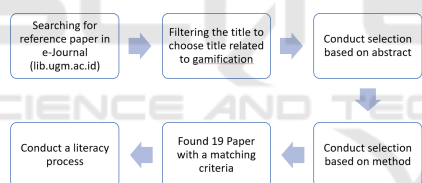


Figure 1: Literature Process

## 3 RESULT

### 3.1 Literature Review

(Aleksić-Maslač et al., 2018) impart a gamification into technology and law course to learn about gamification effect on their satisfaction and motivation when learning through the game given. From the result, most of the student are motivated to learn through the help of gamification.

(Eleftheria et al., 2013) used Flow Theory to implement the gamification into an AR learning book. There are eight elements in Flow Theory:

1. Clear goals or immediate feedback
2. Equilibrium between challenge and personal skill
3. Merging of action and awareness

4. Focused attention
5. Control
6. Loss of self-consciousness.
7. Time distortion.
8. Self-rewarding.

By using Flow Theory, the researcher learned that in gamification efficient feedback and fast assessment during learning process is a must, as well as the ability for learner to learn at their own pace without losing the element of interactivity and personalized education.

Gamifying educational content can be beneficial for both learners and teachers. By adding game elements, such as badges, rewards, leader boards, etc. into learning material, learning process can become a more joyful experience, making a material that looks unattractive or difficult become easier to learn. Learners become actively participating in the learning process, not just passively learning by reading or listening in the class.

By being active, educator will be receiving constant feedback from their learners, these feedbacks can help educator to keep track of the learner progress which can be used to tailor a more efficient course to meet the specific needs of each individual learner and all of the learners.

(Cetin, 2012)) implement gamification using tutoring model.

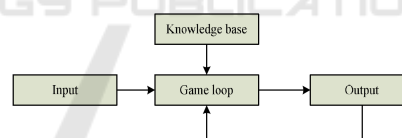


Figure 2: Tutoring Model

As for the element in tutoring model:

1. Input, game characteristics with instructional content
2. Game loop, consist of four sequences, playing, thinking, knowing and debriefing
3. Knowledge base, theoretical supporting materials and activities
4. Output, learning objectives of the module

The tutoring model emphasizes educational content delivery compared to game elements, each challenge will produce results explicit output. So, at every level is required to have educational content with outputs that can documented directly. The learners in this research are college student in computer and electrical engineering major, and by the end of the tests, it gave a promising and positive result, which means

that gamification can help them in learning an educational material.

Some researches being done are using ARCS game model to impart gamification, especially to increase the user motivation (Cheng and Su, 2012) (Tsukamoto et al., 2012) (Ying et al., 2012) (Hamzah et al., 2014) (Wang et al., 2016). Elements of ARCS model are:

- Attention, aims to maintain the level of players' attention in the game played, this can be done by giving a response to the player when doing something in the game or when completing an instruction in the game
- Relevance, aims to help players connect the lessons learned inside the game to the real world, this can be done by giving an instruction, background or story about the game, and can be shown by giving players some problems in the real world that are similar to the circumstances given in the played game.
- Confidence, aims to increase the players' confidence by learning the lessons in games they play, this can be seen when players are given feedback like graphics of their status, or by separating some material and give them in a step-by-step stage.
- Satisfaction, aims to give players satisfaction when completing the game, this can be done by giving the players some prizes and rewards when finishing their tasks in game, or by using a leader board.

(Cheng and Su, 2012) (Ying et al., 2012) (Hamzah et al., 2014) stated that gamification have a positive result, which make the learners become more motivated to learn compared to traditional learning method.

(Hamzah et al., 2014) stated that to use gamification in learning context, it is important to pay attention to the game dynamics and mechanics used to encourage learners' participation and engagement. The main aim for using gamification is to help the learners especially the unmotivated one to be involved in the process of learning and to interact with other learners, and these can be done by adding simple game features in learning process. This research used ARCS model and develop the game using MDA framework (Codish and Ravid, 2014) (Hamzah et al., 2014) (Basten, 2017):

#### 1. Mechanics

Mechanics consist of the input or functioning components of game e.g. points, levels, and badges

#### 2. Dynamics

Dynamics consist of the output given by the game e.g. rewards and achievements

#### 3. Aesthetics

Aesthetics consist of emotional response desired by the learners e.g. satisfaction, pleasure and envy

(Wang et al., 2016) use ARCS model as a foundation to gamify the learning material. But, the result given from using ARCS model is mixed, because there is not any significant difference in learning performance between the group using the game developed and the class e-learning system. (Tsukamoto et al., 2012) learned that when developing a game, it is important to manage the challenge, it should be challenging enough for the learners, if it is too challenging or not challenging enough, the attention of the learners will diminish which will also affect their motivation.

(Codish and Ravid, 2014) get a positive result by implementing gamification by using MDA and adaptive gamification framework. By using adaptive gamification framework, the game will be able to optimize each individual, each individual will have a different applied rule accordingly without creating a sense of un-fairness.

(Brayshaw and Gordon, 2016) list four aspects of game-based motivation:

1. The game player's perception
2. The game designers' model of how to motivate
3. Team aspects and social interaction as a motivating force
4. Psychological models of motivation

A gamification is not a game that used solely for teaching, gamification is a way to give the learners an increase of motivation in education interaction design. Essentially a game teaches a specific material e.g. math. The advantage of using game compared to traditional method is the notion of play and fun. The challenge of the need of engagement and success in learning can potentially be achieved through gamification.

This paper researched about human as a social being who loves to use social media and learned that they want to learn on the move. People want gratification and feedback instantly, and for the learning material, as a game, it should be delivered in a social activity that the learners desire to engage in.

(Hooshyar et al., 2015) argue that people are different and that makes learners has different way of learning. Because of this difference, integrating gamification into educational content which aims to improve learner's learning performance while maintaining the entertaining and engaging aspect of the games

is a bit difficult, and this is shown from games with educational purposes usually rigid and not equally suitable to each learner. So, gamification need to create a game that enjoyable and effective besides suggesting only the learning goals or giving learners appropriate reading sequences.

(Barata et al., 2013) create a system to increase learners' motivation specifically in attending classes. This research has already researched that games have a great potential to improve learning experiences and learning outcomes. A successful game is the one designed to be challenging enough to prevent learners to become bored or frustrated, but also not too challenging to allow the learners to experience the flow of the game. With this information, the researcher tried to implement a gamification into the system, which gave a very encouraging result. The learners show a notable increase in their motivation, especially in their attendance and participation in the course, and material download prepared.

(Ymran et al., 2017) implement gamification design driven motivation using Octalysis as the framework.



Figure 3: Octalysis Framework

This framework is used to measure the level of gamification, it's based on eight core elements that related to motivation factors:

1. Epic meaning and calling
2. Accomplishment
3. Empowerment
4. Ownership
5. Social influence
6. Scarcity and impatience
7. Unpredictability
8. Avoidance

The researcher argue that game and gamification main function is not to teach, but to keep the learners motivated trough the learning process. Gamification is meant to borrow a game mechanic and use

them in a non-game context to make the experience become more exciting and fun, however, using a game mechanic without a proper consideration to the learners' emotions during their interaction with the game, would lead to a bad gameplay and can make the learners' feel bored. So, the researcher uses the Octalysis framework, in hope to create a game that mainly focuses on motivation factors. And the result of the research shows that the resulted game is able to increase the learners' motivation.

(Perryer et al., 2016) use the gamified system which is aimed at employee of a workplace. The researchers argue that there are a variety of game elements that already implemented into a non-game context aiming to motivate the employee to achieve an objective. But, implementing game elements into a non-game context will not always motivate the employee, there are even some researches which resulted in demotivation of the learners. So, implementing gamification is not only adding game elements into a non-game context, but the researchers also need to satisfy the learners psychological needs, which means, an appropriate game design and game mechanics are needed.

(Ongoro and Mwangoka, 2014) is using point game mechanic to gamify a language material. Targeting the young audience who are children aged below seven, the researchers stated that for young children there is a gap in understanding digital multimedia. Which is why the researchers doing a bit research about game design and tried to develop the game according with the current technology development and society needs. As for the result, the children are giving a positive feedback to the game developed and become motivated to learn more.

(Mistry and Al-Anan, 2015) tried to approach the use of gamification to increase learners' attention. The purpose of gamification is not only to increase learners' motivation but also to attract and grab the attention of the learners. Gamification should promote the learning process, improve learners' achievement and attract learners to maximize their learning potential and progress. To make this happen, the researchers are using educational game framework. This framework considers factors like 'Challenge', 'Feedback', 'Social', and 'Identity'.

These four factors are having a connection with "fun", this is because a game is supposed to be fun, even though the one created is an education game.

- Fun, every game needs a fun factor, it is called a game because the user can have fun when playing the game. As for creating an education game, it is true that education content is a must for the game to be called education game, but fun is also

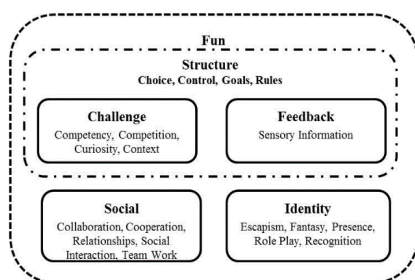


Figure 4: Educational Game Framework

an important factor which needed in creating an education game.

- **Social**, a game is created with the purpose to be played by many users not only one. Social factor is aimed to create and increase the chance for the user to communicate with other user, each user is different from one another, so they can discuss, compete, help, and compare their thinking and result. This factor is also needed to decrease the stress level of the user, because an educational content in the game can be absorbed easier in a team.
- **Identity**, an education game which aimed for learning will need an identity factor to identify the user. The identity of the user can be used by the teacher or admin to track the progress and performance of each user, while they are playing the game. The identity of the user also can be used to show the rank and leaderboard of the user in the game.
- **Challenge**, a challenge is also an important factor for an education game. Challenge in game can be given with a gradual increase of difficulty following the user progress in-game. With the different difficulty or subject, the game can help the user to find out their strengths and weaknesses.
- **Structure**, structure in an education game is a collection of choice, control, goals, and rules of the game. The structure of the game has to be clear, so the user can easily understand how to play the game, and what they need to do to win.
- **Feedback**, feedback from playing an educational game is a must, not only to give in-game reward and prize, but also how playing the game can actually help them in their class. The feedback can usually be seen from how they get better in their exam or homework.

Using educational game framework, makes the gamification being done by the researchers to give a positive result, that can be seen in the learners' attendance and test performance.

(Wu et al., 2018) is utilizing gamification to help learners to learn about chemistry material. The researchers design a model to implement gamification, that is Card-game, Slides and Learning Sheet (CSLS gamification model). CSLS model is mainly focused on collaborating and cooperation learning to increase the learners' motivation. The researchers got a positive result from the learners, the learners become more hooked to play the game and can understand the material easier than learning through traditional model.

(Ferianda et al., 2018) tried to implement gamification using Technology Acceptance Model (TAM):

1. Understanding the target audiences and the context
2. Defining learning objectives
3. Structuring the experiences
4. Identifying resources
5. Applying gamification elements

TAM is a model which focused first on the problem and objectives before adding gamification elements into the context. TAM is used to identify especially whether the developed game or system can be accepted by the learners or not. (Ferianda et al., 2018) created a system using TAM and got a positive feedback from the learners.

(Prabawa et al., 2017) tries to apply gamification by observing some game elements in gamification, using concept of attainment model:

1. Game-based
2. Game mechanic
3. Game aesthetics
4. Game thinking
5. Engagement
6. People
7. Motivate action
8. Promote learning
9. Problem solving

The resulted system is giving a mixed feedback from the learners, concept of attainment model is requiring the active participation of the learners, while not all learners can participate actively.

## 4 FINDING

From the literacy process described in result section, there are some finding about gamification which

can be described. Gamification can be used for educational content, but each reviewed paper has a different way to implement gamification into non-game context. This also caused because the difference in purpose, some of the researches focused to learn about the increase of learning process, but some others are focused to learn about the increase of the learners' motivation in learning and playing the game given, there are also some researches that tries to understand the increase of the learners' attention in class. The most used method in the reviewed papers is MDA which the three main point of gamification, and ARCS model which help researchers to develop the game with learners' motivation in mind. Adding gamification will need a case-by-case situation, though the same model or framework will also work in a similar case. Researchers should first understand the learners' age range, teaching material and environment before trying to add gamification. After understanding who are the learners and what teaching material to give, then the educator or teacher should determine their purpose in gamifying the teaching material, the common purposes are:

1. Increase the learners' motivation

Gamifying educational content is supposed to motivate the learners to learn more. So, it is recommended to use ARCS model because ARCS model focuses on increasing the learners' motivation (Cheng and Su, 2012) (Tsukamoto et al., 2012) (Ying et al., 2012) (Hamzah et al., 2014) (Wang et al., 2016). As for the framework, it is recommended to choose MDA that can be used to implement ARCS model (Codish and Ravid, 2014) (Hamzah et al., 2014) (Basten, 2017), or octalysis framework that focuses mainly on motivation factor (Ymran et al., 2017). For how to design the game, the four aspect which stated in research by (Brayshaw and Gordon, 2016) can be used to outline the game design that focuses in motivating the learner, as 3 of 4 aspects are focuses about motivation model.

2. Help the learners' to understand the teaching material

Each learners are unique, so educator actually need to first understand who are the learners, before provide the learners with a material, so it is recommended to use TAM, as TAM is a model that focus first on learning the problem and objective before imparting gamification into the educational content (Ferienda et al., 2018). There are also other models that can be used to outline how to gamify educational content depending on the main purposes, TAM as stated in research by (Ferienda et al., 2018) is recommended if educator

still have a broad purpose, tutoring model which being used in research by (Cetin, 2012) is recommended if educator want to focuses more on delivering educational content, and CSLS model which used in research by (Wu et al., 2018) in their research is recommended if educator want the learners to learn through collaboration and cooperation learning. As for the framework, it is recommended to use MDA or adaptive gamification framework that can give a different rule for each learner (Codish and Ravid, 2014). Some elements in gamification that need to be noticed are the learners' satisfaction (Perryer et al., 2016) (Aleksić-Maslač et al., 2018), efficient feedback that can be outlined using flow theory (Eleftheria et al., 2013), and a design according to the learners' needs (Ongoro and Mwangoka, 2014).

3. Increase the learners' attendance or attention in class

Gamification can also help to increase learners' learning performance, but to do that, educator needs to create an enjoyable and effective game as stated by (Hooshyar et al., 2015) so it is recommended to use attainment model, that needs learners' active participation (Prabawa et al., 2017). As for the framework, it is recommended to use MDA framework as stated in research by (Tsukamoto et al., 2012), or educational game framework that can help to maximize learners' learning potential and progress as stated in research by (Mistry and Al-Anan, 2015). The main element to be careful with is the difficulty of the game, it should not too difficult or too easy, it have to be challenging just enough, so the game can hooked the learners' attention as stated in research by (Barata et al., 2013).

## 5 CONCLUSION

This literacy research contains several references which are related with gamification and education and the findings were presented. From the research which has been done, it can be concluded that there is no common approach in adding gamification into a non-game context. But, all the gamification should be inline with MDA framework or an upgraded version of MDA framework. Even though the game mechanic, model or framework can be different, imparting gamification into a non-game context is possible, and the result of doing that will vary according with the situation and the target of the material. Different results mainly caused by the difference in the learners' psychology and environment which also need to be

researched beforehand to make sure the gamification can work and give a positive feedback.

In the future, it is expected that there will be an increasing number of researches related to the gamification especially in the field of education. Gamification has been researched for quite some time, and most of them are researching about using gamification to motivate or engage the user, so they can learn even faster or easier, but research about a negative effect of gamification and how to counter that negativity is rarely discussed about, thus this topic is interesting to discuss.

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