

# Gamification Strategy for e-Learning Using SMART Model Approach: An Indonesian Case Study

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**Abstract**—Lately, e-learning is the most used learning method applied worldwide, especially after the Covid-19 pandemic. With the use of e-learning, teaching and learning activities can continue during this pandemic. However, in the world of education, the application of e-learning has several obstacles faced, including boredom, lack of interaction, and a relatively long time in the implementation of learning. These obstacles can be minimized by applying a gamification strategy in e-learning. However, most times, the application of gamification tends to focus on game and reward schemes to ignore the essence of learning itself. A SMART gamification model ensures the usage of gamification strategies in e-learning can be implemented according to the essence of the desired online learning and can increase learning effectiveness to support teaching and learning activities with an e-learning platform.

**Keywords**—SMART gamification, e-learning, Covid-19 pandemic

## I. INTRODUCTION

Education is a major milestone in the development of Human Resources (HR). According to UNICEF, the Covid-19 pandemic affected more than 91% of the world's student population, which was affected by school closures due to the pandemic. The solution to keeping learning activities going is to adopt distance learning, where every educational institution is starting to compete to carry out developments to ensure that distance learning activities can take place in a quality manner by using technology in the form of e-learning.

E-Learning is a form of learning that is structured to use an electronic or computer system so that it can

support the learning process [1]. With the use of E-learning, it is hoped that it can avoid face-to-face meetings between teachers and students, especially during the pandemic [2]. In its application, the replacement of the learning system from conventional methods to online learning has several obstacles arise, such as the lack of attractiveness of the material provided by the teacher, the lack of variety of learning materials, to the low level of student participation in online teaching and learning activities [3]. In addition, the change in the physical environment into a visual environment is also suspected to be the cause of the ineffectiveness of online learning to be carried out [4].

Some of the obstacles that arise have proposed a solution by implementing the Gamification strategy in e-learning. Gamification can generally be defined as the use of some game design elements in a non-game context [5]. Or it can also be said that the concept of Gamification refers to the application of game mechanics and dynamics that are used to increase user motivation, enthusiasm, and engagement [6]. Gamification applies concepts from lessons on using the game domain to change user behavior in non-game situations [7], Which with these behavioral changes, in particular, is expected to be more motivated, more enthusiastic, and have more involvement in taking online classes. The concept of gamification can be described in Figure 1.

The purpose of implementing gamification is to make teaching and learning activities more attractive, interactive, and have a rewarding system so that students become more enthusiastic in online learning

activities. However, the use of gamification in e-learning does not all go according to plan. Many cases result in students becoming more oriented to getting rewards from e-learning than getting an understanding of the learning content itself. [8]. This certainly results in the ineffectiveness of e-learning with gamification strategies.

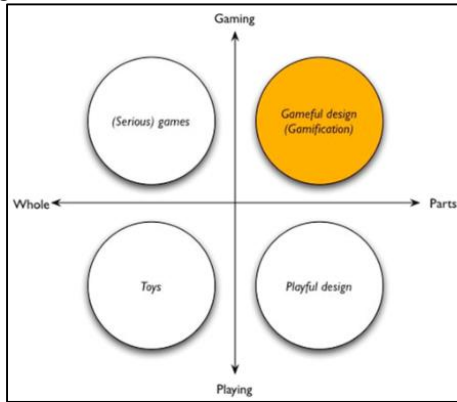


Fig.1. Definition of gamification [5]

To answer these challenges, it is necessary to apply a "SMART" model in compiling gamification for e-learning so that the essence of online learning through e-learning can be ensured to be maintained without forgetting the essence of learning itself and teaching and learning activities can run effectively according to with the aim of education itself. SMART guarantees that gamification in e-learning remains in its share as an attractor of student learning interest and not as a system that gives a level of addiction to the game in it without any knowledge gained.

II. RELATED WORKS

Gamification and its relationship with e-Learning have begun to be widely applied in the education sector, especially during the COVID-19 pandemic. This can be seen from the existence of several previous studies on the sector. The following is presented with several previous studies on e-learning and gamification in Table 1.

Based on the results of the above findings, it can be concluded that the application of gamification is indeed proven to be able to increase student learning interest in e-learning, but this does not guarantee the essence of gamification in e-learning, namely learning that is conveyed effectively. This is found in the absence of continuity between the level of student interest in participating in gamification-based e-learning with their level of understanding or value acquisition.

III. METHOD

To answer the challenges of these studies, this study uses the SMART approach in developing a gamification-based e-learning platform. The use of gamification strategies generally applies a form of a

game in e-learning with the aim that students become more motivated and engaged in e-learning by implementing a badge system, rewards, and so on in e-learning. However, this approach makes students more oriented to getting rewards from the learning rather than getting to understand the content from the learning itself. This results in less effective e-learning learning with the application of gamification.

TABLE 1. PREVIOUS RESEARCH

Research Title	Findings
Gamification in e-learning: the effect on student performance Saran et al. (2018) [9]	There was a higher attendance rate, the amount of homework submitted, and an increase in the scores in the post-test scores obtained by the students in the experimental group. The gamification feature has the power to improve student achievement in the learning process.
Student's Perspectives of Online Language Learning During Corona Pandemic: Benefits and Challenges Zhoun et al. (2021) [10]	According to a survey of 82 students, the results show that students are dissatisfied with online classes. They prefer and recommend traditional classes more because they participate, interact, and are motivated more in them. They assume that online classes have more negatives than positives.
Exploring E-learning Challenges During the Global COVID-19 Pandemic: A Review Aini et al. (2020) [11]	One of the biggest problems is Operational problems in delivering e-learning materials, such as lack of training, maintain student involvement in online classes through e-learning.
The Challenges and Prospects of Using E-learning among EFL Students in Bisha University (Ja'ashan, 2020) [12]	The advantage of E-learning for students is that e-learning can adapt learning to suit their learning needs and time requirements, which makes it interesting and motivating for them.
Gamification as a tool for engaging student learning: A field experiment with a gamified app (Welbers et al., 2018) [13]	The application of game mechanisms in the form of quizzes on e-learning is proven to be able to increase student interest in learning.
The impact of opt-in gamification on students' grades in a software design course Fernandez et al. (2018) [14]	Gamification was applied to an online course, and it was found that students tended to be motivated and enjoy the games applied to e-learning. However, there was no significant relationship between the elements of enjoyment in e-learning and the level of student score acquisition.



Fig. 2. Gamified e-learning goal

Figure 2 above explains that the use of gamification strategies in e-learning is the creation of more intense involvement by students in learning by using several game elements [15]. This approach based on previous studies is considered quite promising, but there is a major problem, namely that students in e-learning learning with gamification tend to enjoy the flow of the game that is applied rather than getting the essence of the learning itself. Therefore, this study offers a framework called SMART to overcome these problems.

SMART is a gamification strategy that can be applied to e-learning to ensure that gamification in e-learning is not only to increase user engagement but also to increase the effectiveness of training programs in e-learning. SMART itself is an acronym formed from the words Measurable, Achievable, Relevant, and Time-bound goals.

**A. Specific**

Each gamification element should contain elements that are easy for the players to understand, in this case, the students. With the aim that students can study e-learning learning content harder, not more confusing so that the formulation of gamification specifically is needed so as not to confuse students. The use of commonly applied gamification elements should still be applied, such as badges, points, and levels. They are simple but very effective. It has been proven that the simple gamification element that it ranks as the highest motivator (even when compared to real-life rewards and real-life punishments).

Introduction .....	1	
<b>Book 1: Getting Started with Python</b> .....	5	<b>Level 1</b>
CHAPTER 1: Starting with Python .....	7	
CHAPTER 2: Interactive Mode, Getting Help, Writing Apps .....	27	
CHAPTER 3: Python Elements and Syntax .....	49	
CHAPTER 4: Building Your First Python Application .....	61	
<b>Book 2: Understanding Python Building Blocks</b> .....	83	<b>Level 2</b>
CHAPTER 1: Working with Numbers, Text, and Dates .....	85	
CHAPTER 2: Controlling the Action .....	125	
CHAPTER 3: Speeding Along with Lists and Tuples .....	147	
CHAPTER 4: Cruising Massive Data with Dictionaries .....	169	
CHAPTER 5: Wrangling Bigger Chunks of Code .....	193	
CHAPTER 6: Doing Python with Class .....	213	
CHAPTER 7: Sidestepping Errors .....	247	
<b>Book 3: Working with Python Libraries</b> .....	265	<b>Level 3</b>
CHAPTER 1: Working with External Files .....	267	
CHAPTER 2: Juggling JSON Data .....	303	
CHAPTER 3: Interacting with the Internet .....	323	
CHAPTER 4: Libraries, Packages, and Modules .....	339	
<b>Book 4: Using Artificial Intelligence in Python</b> .....	353	<b>Level 4</b>
CHAPTER 1: Exploring Artificial Intelligence .....	355	
CHAPTER 2: Building a Neural Network in Python .....	365	
CHAPTER 3: Doing Machine Learning in Python .....	393	
CHAPTER 4: Exploring More AI in Python .....	415	
<b>Book 5: Doing Data Science with Python</b> .....	427	<b>Level 5</b>
CHAPTER 1: The Five Areas of Data Science .....	429	
CHAPTER 2: Exploring Big Data with Python .....	437	
CHAPTER 3: Using Big Data from the Google Cloud .....	451	

Fig.3. The design of a specific element

Each chapter in Figure 3 is a lesson that should be applied according to the level of difficulty (leveling) according to the reference book. The book always explains from basic to advanced, each chapter is given a leveling/level of difficulty where every level increase is required to complete the previous chapter and get a

mark in the form of points/badges as a sign of measuring the success of a specific completion of e-learning material.

**B. Measurable**

Gamification elements work better if they can be measured directly. With measurement, students can measure their progress quickly and allow them to compare their achievements with others so that e-learning will create an element of competition in it. Measurement can be done in various ways, such as collecting badges. With badges in Figur 4, students will be able to get an idea of the size of their learning achievement and also understand the achievements of their competitors or classmates to maintain the level of competition.



Fig.4. The design of the measurable element

**C. Achievable**

To motivate students effectively, the goal of gamification must be attainable. Each gamification element should contain elements that are easy to understand by the players, in this case, the difficulty level of the questions or games should not be made too difficult and not too easy, give the right weight so that an award is logically able to be achieved following weights, e.g., leaderboards. The leaderboards scheme can be done by grouping several students who get the highest and lowest scores so that each student will be encouraged to be among the best that shown in Figure 5.



Fig.5. The design of the achievable element

**D. Relevant**

The gamification element must also be relevant to your student life. The main purpose of a gamification

strategy is to encourage learner engagement and not to turn the entire training into a game. Linking the rewards collected in e-learning with real-life rewards for learners will also increase their motivational potential that shown in Figure 6.



Fig.6. The design of the relevant element

In a small group survey, it was found that the results of 40 respondents in a closing statement about what reward they most want in school when winning a competition in their class that is relevant to teaching and learning activities (for example) is presented in the following Table 2.

TABLE 2. THE SURVEY

No	Reward	Number of Answers
1	Handwritten Note	6
2	Textbook	11
3	Online Game Voucher	8
4	Trophy	12
5	Stationery	3

From the table above, it is found that the majority of respondents want a trophy with 12 answers as a form of reward in e-learning games, followed by textbooks with 11 answers and online game vouchers considering that they (students) also need time to play apart from studying.

E. Time-Bound

The gamification strategy should be time-bound. The gamification element must be tied to the schedule and deadline of the training program on e-learning (e.g., students must be able to collect as many points as possible within one semester in a particular module). With the application of time-based gamification, students will be required to establish the level of discipline that must be followed in their studies. It will also motivate them to complete each unit of study on time while trying to beat other students in the same time frame.

Based on those requirements in Figure 7, an e-learning gamification development with the SMART model is proposed, which is described in the following Figure 8.

Performance on Grade Level Standards

1. Advanced Student is consistently working at or above grade-level standards. Teacher consistently scores at 80% and above on classroom work and assessments. (80-100%)

2. Proficient Student is consistently working at grade-level standards. Teacher averages classroom work and assessments on an average 60% and 80%. (60-80%)

3. Basic Student is consistently working at grade-level standards. Teacher averages classroom work and assessments on an average 40% and 60%. (40-60%)

4. Below Basic Student is consistently working at grade-level standards. Teacher averages classroom work and assessments on an average 20% and 40%. (20-40%)

5. Not assessed at this time.

Trimester 1 2014-2015 Report Card

Student Name:	Teacher:	Grade Level:
Language Arts	Mathematics	3
Reading Literature	Operations And Algebraic Thinking	3
Reading Informational	Number And Operations - Fractions	3
Writing	Measurement And Data	3
Speaking And Listening	Geometry	3
Language Acquisition	Statistics And Probability	3
Foreign Language	Science	3
Physical Education	Health	3
Art	Music	3
Career/Technical Education	Physical Education	3
Health	Art	3
Physical Education	Health	3
Art	Music	3
Career/Technical Education	Physical Education	3

Within the specified time period, an achievement that can be measured and used as a benchmark between students is needed

Fig.7. The design of the time-bound element

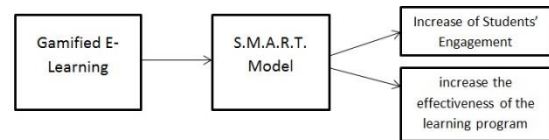


Fig.8. Gamified e-learning using SMART model

With the application of the SMART model, an e-learning platform with gamification will ensure the level of effectiveness of learning that does not only focus on student involvement in the game in e-learning itself but ensures that the content of the learning itself will be more accepted and understood by students.

IV. RESULT AND DISCUSSION

The gamification design approach to e-learning in this study uses the SMART model, where the offline learning application approach is also the basis for development obtained from the results of previous studies regarding students' perceptions of the shortcomings of online learning. Based on this model, there is an e-learning application design based on SMART gamification, which is described in the following Figure 9. Figure 9 shows that the specific dimension emphasizes that e-learning must have a level of material that can be adjusted to the target of the course itself, each lesson should be given a level of difficulty (leveling) so that each student can follow the course starting from the basic, advanced, to expert sections. The design developed is that each learning course has a student passing percentage rate seen from the post-test after the learning material. e.g., each course has a rule that to proceed to the next discussion, a student completion rate of > 80% is required.

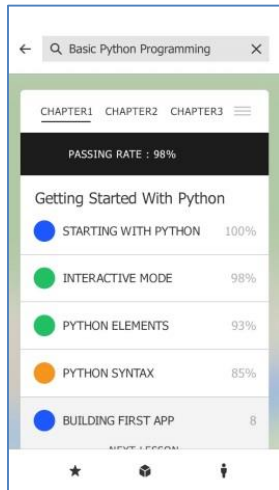


Fig.9. Specific learning

Figure 10 shows that SMART gamification also emphasizes how the application of gamification in e-learning must have achievable and measurable dimensions. The design above shows that the measurement in e-learning with the SMART model is applied in the form of points obtained by each individual and can be compared between one individual and another to maintain the level of competition in the form of leaderboards. The leaderboards also display achievements in each subject, where they must work together to complete a "level" in a subject matter so that they can move on to the next "level".



Fig.10. Leaderboards

Figure 11 shows the design of "Top Students Of The Week," which is needed to maintain the level of competition. The purpose of the live leaderboards is to motivate students not only to focus on the gamification

side but also to focus on completing several pre-tests and post-tests in the future to get good grades and be able to be at the top of the leaderboards. This refers to the existence of a desire for self-actualization that is owned by each student.

Figure 12 shows the design of the "individual learning report" in e-learning with the usage of Relevant and Time-bound dimensions. Individual reports in gamified e-learning do not only focus on students' final grades but also the form of points earned by students over a certain time (time-bound). If at a certain time, for example, one semester, the final grade of the course and the points earned, these points can be used as conversion units to get rewards, for example, textbooks, so that student learning motivation can be maintained.



Fig.11. Top students of the week



Fig.12. Individual report and achievements

## V. CONCLUSION

This study resulted in an e-learning design with the application of the SMART gamification model. Where this research is making a prototype using the android studio application, with this research, it is hoped that in the future, the implementation of gamification strategies in e-learning can be done by maintaining the essence of e-learning itself, namely the achievement of

understanding the material by students and not just providing interesting experiences or engagements for e-learning users in the hope of increasing effectiveness of e-learning can also be improved.

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