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Design Gamification of Discovery-based Learning Models in Elementary School

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Abstract.
The purpose of this study is to develop learning designs that are suitable for elementary school students. This design connects the theory of gamification with discovery learning into a new model. Furthermore, the model will be combined with appropriate learning media so that learning becomes more effective and interesting when applied in various types of courses. Data analysis shows the average score of learning design evaluations achieved in the excellent category. This indicates that the design of the development of learning gamification of discovery-based learning in the form of theory and practice has the value of effectiveness and interest of students, and it has shown significant results to be applied in learning in primary schools.

Keywords: Gamification, Learning Models, Elementary School, Student.

1. Introduction

Learning and multimedia research has focused on the effectiveness of learning methods and design only. This study analyzes and discusses the determinants of motivation in the effectiveness of learning with gamification from a socio-cognitive perspective. First, consider the problem of motivation in the learning process. Second, the relevance of motivation theory to the learning process that can be applied to multimedia learning [1], teaching, and developing teaching materials. Lee and Hammer [2], shows that games can provide 3 psychological benefits, namely; cognitive, emotional, and social, and it can increase the motivation of players in learning a game [3].

The underlying assumption that students have the opportunity to use multimedia resources must be highly motivated. Based on the literature, it was found that multimedia technology does not cause motivation in superior learning [4]. Students are not doing the job for a long time, but there is plenty of time to play games. This raised the idea to combine learning and games that motivate students to learn. Wrap learning in a game.

In fact, many previous studies have focused on ways to improve student achievement through a pleasant learning environment. Research in increasing student motivation is still limited to simple or traditional games [5]. Digital games, for example, games have never been found in an effort to increase student activity in learning. Games like additives for children.

Since 2011, articles with this theme have risen sharply. The opinions of the researchers indicated that gamification had a positive effect [6]. However, the effectiveness in question depends on how large the context of gamification is applied. There is an increase in research in various fields, a combination of technology and game design has been explored as a means to motivate people in various aspects of their lives. Zichermann & Cunningham [7] has designed a system adopted from the game mechanism to increase employee productivity [8].

O'Donovan, et al. [9] tested learning design through gamification in higher education through Vula online games to increase lecturer attendance, material understanding, student skills in problem-solving, and enthusiasm. Using experience points (XP) are applied based on the achievement of the course (10 to 70-79%; 20 to 80-89%; and 30 to 90-100%), the enthusiasm of the students can be achieved. Plus, leaderboards are provided to display the rows of the 20 top-ranked student names. In fact, 10 of the best students win T-shirts bearing the game. These trials prove that activity has increased. Gamification has become an effective approach in the classroom environment. The technique used in instructional design significantly improves comprehension and in particular on the enthusiasm of the students [10].

2. Reseach Method

This study is the adaptation of research methodology for the development and validation of a practical and theoretical perspective. In theory, based on the literature related to the model to be developed, while the practical perspective is based on relevance to reality. Furthermore, the model is validated to fit the components and purpose of model development. This is completing the completeness of the empirical data analysis process and the practical function of the initial model. The model is measured by the level of internal validity carried out by experts, and external validity is based on the quality of the product design. This requires the designer to analyze each variable from planning to evaluation.

This study applies the discovery learning design which is divided into 5 stages, namely: stimulation, problem statements, data collection, data processing, verification, and generalizations. The design of gamification of discovery-based learning is carried out in science courses at Primary Schools in Paiton and around Probolinggo, Indonesia. Procedures for designing gamification of discovery-based learning as shown in Figure 1;

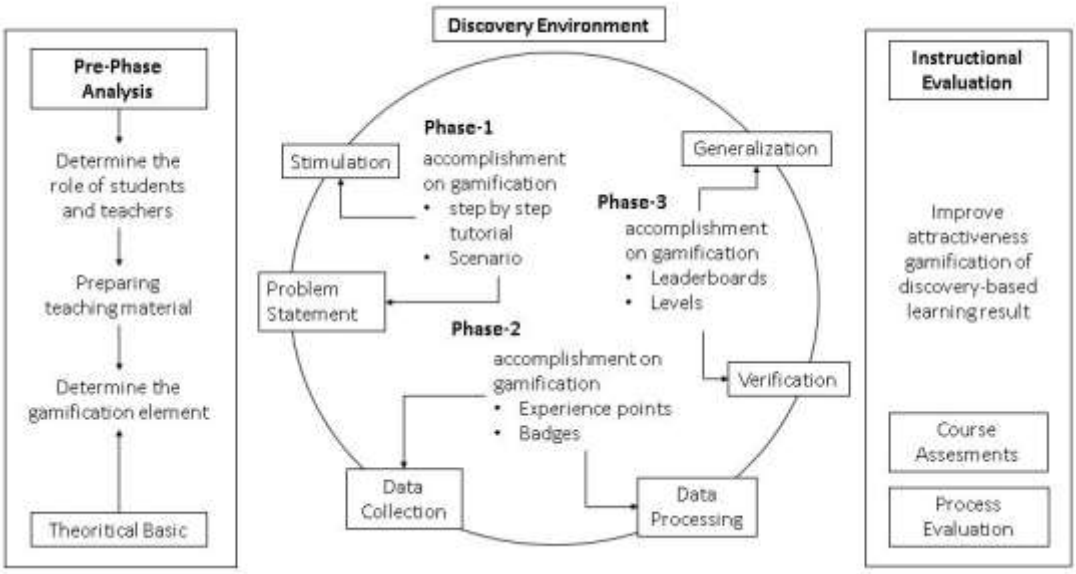

Figure 1. Gamified Discovery-based learning

3. Research Result

The product validators of this research are instructional technology experts by providing ratings, comments, and suggestions related to aspects of effectiveness, attractiveness, and the level of content coherence and message design. The results of the experts' validation are presented in the table below,

Table 1. Validation Results from Gamification of Discovery-based Learning Design

Question	Expert 1	Expert 2	Mean	Category
Excellence in terms of learning effectiveness	3	4	3,5	Good
Attract student interest as users to find out the contents of learning	4	4	4	Very Good
The Convenience of students as users in listening to the contents of learning	3	4	3,5	Good
The level of speed at which to reach the goal	3	4	3,5	Good
Enjoy the appearance of learning design	4	3	3,5	Good
Ease of access and operation of navigation on the design	4	4	4	Very Good
The level of content coherence and message design	4	4	4	Very Good
The effectiveness of design as teaching material in the formof theory and practice	3	4	3,5	Good
Total	28	31	29,5	

Based on the data in table 1 above, the average score of all aspects of learning design (3.6875), indicates that the design included in the category of "very good". This shows that the design of gamification of discovery-based learning is feasible to be applied in elementary school learning. Recommendations from instructional technology experts for general revision and improvement, 1) the basis of gamification is more highlighted, and 2) the design is continued with more variations of the course.

4. Discussion

De-Marcos, et al. [11] conducted an effectiveness study of learning approaches using social and games. The difference in this latest study is to compare the educational games, gamification, and social networking. In addition, a new type of approach is added, social gamification where the two existing approaches are combined for a new approach [12]. The aim is to measure differences in learning outcomes. Several previous studies stated that the three approaches have an impact on learning outcomes from behavioral and affective perspectives [13]. According to the experimental study, social gamification has better results when used in the evaluation and initial stages. This study emphasizes the difference between practical skills where new approaches have more appropriate results and conceptual knowledge, where blended learning has better results [14].

Glover [15] states that gamification can be implemented in a learning environment without electronic concepts. This study only discusses the concept of gamification based on three main parts of the game; goal-focused, reward mechanism, and trading progress. In this paper, the design adds elements that can build interest and student engagement.

Adopting information technology does not always lead to high motivation. Hoskins & Van Hooff [16] state that only highly motivated and educated students can benefit from multimedia. The advantages of using Gamification add to students' motivation in learning and because the system always provides positive feedback, students are encouraged to continue learning. Points on the gamified system are a must. This point will trigger other parts of the system [2].

Marko, Goran, Jereb, & Pintar [17] state that in the introduction to gamification as e-learning model, it has key elements such as e-learning management, important factors in e-learning, user experience, development phase (including analysis, planning, development, implementation and evaluation), game mechanisms, gamification factors in e-learning and their effects on students.

Gamification aims to increase user interest in a software [5]. Some gamification applications that have succeeded in increasing user interest, namely angry birds (physics courses), pokemon (language courses, art, science, maps), minecraf (architecture courses). Existing elements in a game (game mechanics and game dynamics) are always designed to make users always challenged and continuously play and achieve the highest achievements [18].

In terms of education, gamification allows students to receive direct feedback about their progress in the classroom and appreciation for the tasks completed. A study of the effectiveness of gamification on user engagement Seixas, Gomes, & Filho [19] shows that gamification has a positive effect on user engagement. Those with high engagement, indicated to have more badges of teachers. Gamification creation strategy should be in accordance with the purpose of education. Gamification applying game design concepts to learning [20]. The characteristics of the learning model are challenges, satisfaction, appreciation, and dependency.

Specific principles in learning strategy, which is interactive, inspiring, fun, challenging, motivating. It is a special principle used to build engagement for students to learn [21]. Many of the elements that can be used to build engagement in a game, this design uses a basic element in applying the concept of gamification in accordance with the specific principles of learning strategies.

5. Conclusion

The assessment of attracting student interests as users to find out the contents of learning, ease of access and operation of navigation on the design, and the level of content coherence and message design have shown very good categories, and excellence in terms of learning effectiveness, the convenience of students as users in listening to the contents of learning, the level of speed at which to reach the goal, enjoy the appearance of learning design, the effectiveness of design as teaching material in the form of theory and practice show good results, this is feasible to be applied in learning. Although some improvements are still needed, including the involvement of other subjects in Primary Schools

6. References

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