

# Students' Perceptions Towards Educational Games Learning Media in Mathematics

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**Abstract**—Educational game is one of the media that can be used to support students' learning in mathematics. Several previous studies have shown that educational games can improve students' competencies. However, educational games are under-utilized in schools. The purpose of this survey study was to describe students' perceptions toward educational games in mathematics learning. The participants in this study were 101 students in 7th and 8th grades junior high school in Mataram, Indonesia. The participants were selected using voluntary and random sampling techniques. Data were collected using questionnaires that contain two parts, i.e. closed and opened statements. The data were analyzed using descriptive statistics with qualitative methods. The study found that students gave positive and negative responses towards application of games in learning. Students agreed that games enhance their motivation and activity in learning. On the other hand, some students complained that games tend to distract their focus. It contributes to the students' difficulty in mastering the mathematical concepts. The results of this study provide a useful insight for future research in learning media development.

**Keywords**—education, game, mathematics, perception, educational game

## I. INTRODUCTION

The development of various digital technology products and global competitions significantly increased in the Industrial Revolution 4.0 [1]. The society is demanded to flexibly adapt and properly prepare to face the disruption era. Various ways have been done to accommodate future generations, one of them with innovation in education.

Educational innovation is expected to facilitate students to learn in a modern way including the integration of technology in learning. Traditional approach in learning which merely focus on knowledge transmission and tend to neglect the students need should be improved. The students should have more opportunities to optimize their learning process and outcome. Hence, teacher plays essential role in preparing creative and meaningful classroom activities [2]. For instance, by selecting an appropriate technology application in the learning process.

One of the technology-based media that able to support learning activities is a game. Even though the name is game, it actually has a function to serve in serious application, as in formal classroom [3]. The game for learning purposes, generally called as educational game. It is an instructional media that enhance students' motivation, participation and engagement in learning [4].

Educational games can be played on mobile devices such as smartphones, tablets and laptops. The use of mobile

application makes the game become flexible, easy to access and familiar with students' routines as it is a part of daily activities [5]. Furthermore, according to data (see Fig.1.), majority of people in Indonesia use mobile devices to play games. The study also found that the number of gamers in Indonesia continues to increase from year to year [6].

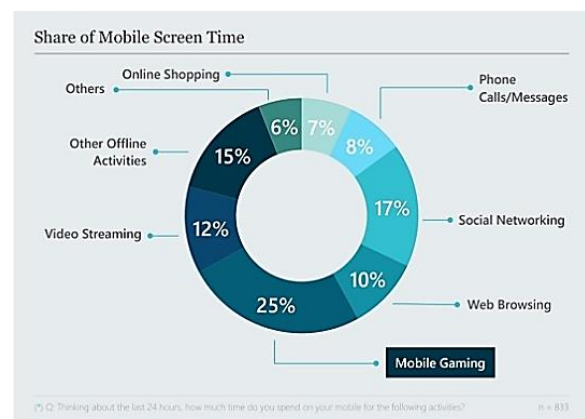


Fig. 1. Percentage of society activity on mobile applications

A high percentage of people who are interested in playing game in mobile devices makes it possible to use it as a medium for learning. Games are needed in mathematics. Through games students will be enthusiastic and motivated to take lessons, improve students' attitudes towards mathematics, and even help students to develop problem solving and higher-order thinking skills [7]. Educational games can motivate students to achieve conceptual knowledge of mathematics through the games presented [1]. Some commercially produced games also have the opportunity to be used as learning tools for mathematics.

Previous studies have shown that games can be used as instructional media. Mathematics education games can improve a variety of mathematical abilities, from the cognitive and affective aspects of students. Video games can also improve students' abilities and cognitive abilities [8]. Kiili, Moeller, & Ninaus [9] in their research found that educational games also develop students' understanding of mathematical concepts in number material. The level of the game allows students to gradually understand concepts.

There are a number of studies that support the use of games in learning. Nonetheless, there are some obstacles in implementing the use of games in the classroom. Barriers and challenges that occur could be lack of resources (teacher

resources, facilities, and infrastructure), education policies that are less effective in mobile learning, and parents' negative perceptions about the use of games [5]. Well preparation is needed to facilitate students learning through games.

The study aims to describe students' responses to mathematics education games. In the future, game technology can be used as a instructional media. Certainly, the technology learning environment is not only beneficial for students, but also teachers.

## II. METHODS

To achieve the goal, a survey had been conducted with 101 students of grade 7<sup>th</sup> and 8<sup>th</sup> junior high school in Mataram were enrolled as the participants. In general, there were 51 females and 50 males with range of age from 12 to 14 years old. They were selected using voluntary and random sampling techniques.

Quantitative and qualitative data in this study were collected using a questionnaire regarding students' perceptions toward the use of educational games in mathematics teaching and learning. The questionnaire consists of two parts, that is closed statement for the first part and opened statement for the second part. The statements in first part consists of 4 points Likert scale (totally agree, agree, disagree, and totally disagree), while the second part consists of questions about what they like and dislike about the use of the games in learning mathematics.

Besides using student response questionnaires, we also obtained data from interviews. Unstructured interviews were conducted with mathematics class teachers from where the participated students come. The data from interview were employed to confirm the results from questionnaire. The data obtained from the questionnaire were processed by applying Microsoft Excel and SPSS. Then the data were analyzed further qualitatively using descriptive methods.

## III. RESULT AND DISCUSSION

This study aims at describing students' perceptions about educational media games in mathematics learning. The data obtained in the form of quantitative and qualitative data. Below will be shown and discussed about the data obtained from the questionnaire.

The questionnaire contained questions about students' interest in using educational games in mathematics classroom. A positive response was obtained from the results of this question as can be seen in Fig. 2.

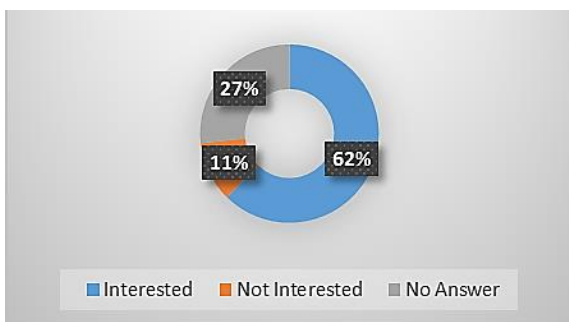


Fig. 2. Percentage of student interest in educational game media

Fig. 2. shows the percentage of students who were interested in educational game media as a medium for learning mathematics since more than half of the participants expressed their interest. The result shows that the educational games in mathematics are not only attractive to male students but also female students. This is in line with the previous study that games are popular in both genders [6]. Hence, it can be stated that the use of game as educational media is applicable for male and female students.

There are some reasons revealed as interest factors of the games. The students mentioned that they enjoy the learning process with the support of the game. According to them, the class become exciting and challenging. They do not see mathematics as rigid subject when playing with the educational games.

On the other hand, according to the students who were not interested in using game, mathematics is easier if it is directly explained by the teachers. Also, they encountered difficulty in concentrating with the materials presented on the game as they more focused on the game itself.

In addition, the students' questionnaire also contained several closed statements. The closed statements should be reflected in 4 points Likert scale. The students were asked to assign the point that most reflecting their perception toward the statement. The following discussion elaborates the students' responses in the closed statements questionnaire.

### A. Learning Becomes Fun When Using Mathematics Educational Games

In this statement I, most students agreed that educational games make learning mathematics enjoyable. The percentages of each category in statement I can be seen in Fig. 3.

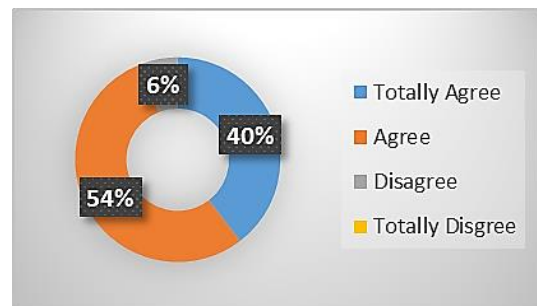


Fig. 3. Percentage Result of Statement I

Based on these results, it can be said that through educational games students not only learn, but also play in a fun way. Here, the students' responses are mostly between agree and totally agree. The use of various learning tools, i.e. mobile devices can enhance the students' interest in learning mathematics and personal skills in genera [2] & [5]. The development of students' interest were influenced by the various challenge and level of difficulties provided in the media [7].

### B. Educational Game Media Increases Motivation to Learn Mathematics

Besides making learning joyful, educational games can also increase student motivation. Fig. 4. displays the percentage results for each category in statement II.

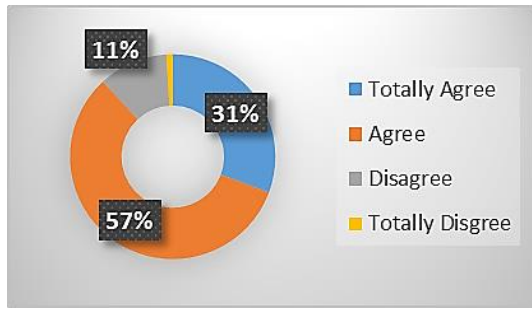


Fig. 4. Percentage Result of Statement II

The results showed that educational games can increase the majority of students' motivation to learn mathematics. This is confirmed the result of previous study about the impact of game and students' motivation in learning [10]. It is happened because the students were motivated to obtain high score in the game which influence the learning outcome in the intended mathematical concepts [9].

Students' motivation also related to students' interest in learning. If learning in the classroom is fun, then student motivation will increase [11]. It can also be said that the results in statement II are in line with the results of statement I. Most students agreed that learning becomes fun and increases motivation when educational games were used. The results in this study is also consistent with the previous study which found that most students agree that games as instructional media can increase students' interest and motivation in learning mathematics [12].

C. The Display of the Educational Game Attracts Attention

In statement III, most students agreed that the user interface and design of the game is attractive. The percentage of each category in statement III can be seen in Fig. 5.

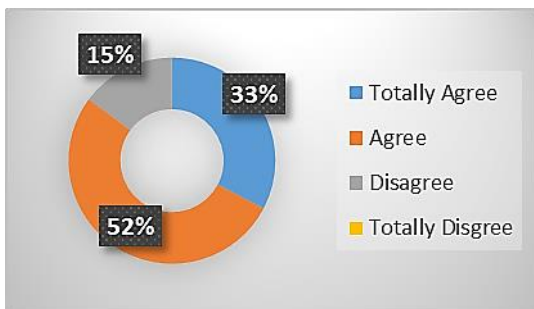


Fig. 5. Percentage Result of Statement III

Games can attract students' attention and therefore the students will pay attention to learn and try to understand the material presented in the game. Educational games in a mobile devices supports the students to imagine the context in real life [5].

D. Learning with Educational Game Media Makes It Difficult to Understand Mathematics Topic

On the other hand, students encountered some difficulties in learning mathematics materials. Fig.6. presents the percentage results for each category in statement IV.

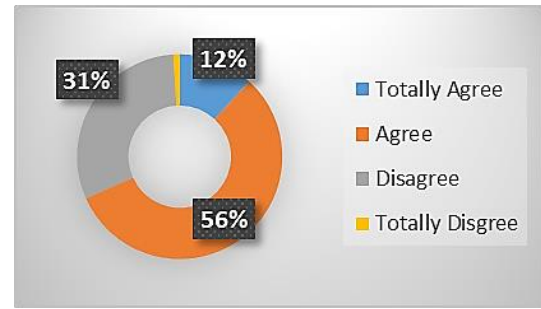


Fig. 6. Percentage Result of Statement IV

The findings about the difficulty to understand the mathematical concepts contrary with the previous study that stated mathematical concepts can be easily learnt through the game and therefore it improves the students' mathematical knowledge [12] & [13]. Also, it is revealed that the technology-assisted learning can be used to enhance students' self-regulated learning [14]. However, in the present study, majority of students reported their difficulties in understanding the concepts.

E. Learning with Mathematics Educational Games Causes Disturbed Concentration of Learning

The majority of the students though educational games disturbed concentration of learning. The summary of the results can be observed in Fig. 7.

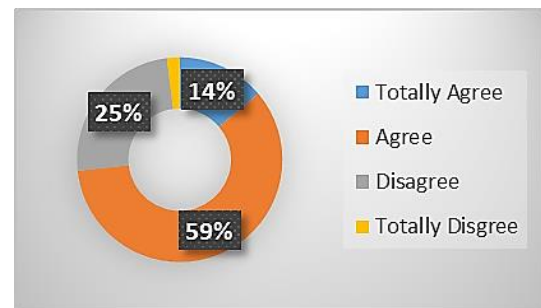


Fig. 7. Percentage Result Statement V

Most students agreed that learning with educational games can disturb learning concentration. In the same time, teachers believed that students cannot focus on learning using educational games [15]. Therefore, in some schools, mobile devices are prohibited to use. However, in fact a well-designed education games supports the students' mathematical learning and abilities [9].

Based on the results in statements I, II and III, most students agree that educational game is playful, interesting, motivating and attractive. These results are considered as the positive responses obtained from the study. Meanwhile the statements IV and V showed how students felt disturbed by the use of the game. Digging deeply, more female students confirmed this case.

Some students agreed that the educational games brought several advantages to their learning process. They provided 12 reasons as follows: (1) interesting, (2) fun, (3) exciting, (4) practical, (5) goals' achieved, (6) relax, (7) increase motivation, (8) increase enthusiasm, (9) attract attention, (10) easy to understand material, (11) not boring, and (12) keep them awake. In accordance with those factors, the previous study revealed that educational game can be highly support

the lesson since the students were able to effectively learn the concept [2]. It happened since the learning from the game setting presented in various ways and styles [16].

However, there were also disadvantage or the reasons of disliking the use of the game in the learning of mathematics that is formulated as follows: (1) hard to maintain focus on learning, (2) disturbs concentration, (3) difficult to understand the material, (4) get addicted to playing the games, (5) lazy to learn from other sources, i.e. books, and (6) smartphone radiation. The last reason is confirmed by the study of Repolsuk [17] as the eyes work harder when people look at the screens instead of the printed books. In addition, students' parents aware to the health issues of the use of the games to learn as well as the possibility of phone addiction [5].

All positive and negative responses obtained in this study can be matrix for future research and also as a teacher reference when using educational game media in the classroom. Not only to conceptual construction matters, in fact, educational games can also be developed as an evaluation tool for students' abilities in learning mathematics [9]. Even though currently there are some obstacles in its implementation, teachers have a positive perception related to the use of mathematics educational games [18].

Varying the techniques in teaching and learning is an important factor. Teacher should consider the content embodied in the games that will enable students in learning meaningfully. It can be useful as well if the educational games be used to show the intertwinement between mathematical concepts. Some studies showed how for instance, geometry and algebra or STEM can work hand in hand to enable students grasp in the intended concept [19], [20] and [21].

The use of interesting context, especially one that come from culture or social activities should also be considered [22], [23] & [24]. It will enhance students' curiosity to figure out what does the context really looks like in the real life and they will learn further using various medias and not get addicted only in playing the game using the mobile devices. Therefore, the use of educational games can be useful, meaningful, cheerful and playful.

#### IV. CONCLUSION

Reflecting to the results, the students' perception toward the use of educational games learning media can be distinguished into two major groups: positive and negative. On the positive sides, the students felt motivated when learning trough game. It attracted their attention and boosted their activities in learning. However, they also felt uneasy to keep their focus during learning process. It makes them encountered some difficulties in understanding the concepts.

Above all, educational games support students in learning mathematics. Some points need to be considered in order to use effective educational games, one of which is the presentation of material. Further research is needed to see how games can affect students' cognitive and affective mathematical processes. All of these responses can be used as a reference in the development of educational games in the future studies.

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