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Game “STATIC”: Is It Interesting for Students?

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Abstract. The study aimed to describe students' responses on the use of edutainment based mathematics instructional media with problem based learning model. The students' responses refers to students' interest. The instructional media used in this study is an educational game operated through smartphone that called STATIC (Statistics in the Arctic). It contains statistics material for 8th junior high school students. Thirteen junior high school students in Yogyakarta area were given a questionnaire about their response after using edutainment game as instructional media. The questionnaire contained 10 items with likert scale. Data in this study was analyzed using descriptive statistics with qualitative method. The results showed that the media had positive effect on students' interest in learning mathematics, most of the students suggested that learning using edutainment as instructional media was more fun and more challenging. Therefore, it could be one of alternative media to be use in mathematics classroom.

1. Introduction

Nowadays, technology have provided great advantages in the field of mathematics education. Therefore the example of many software applications and games that help and facilitate students in learn mathematics. A learning approach utilizing technology is needed to facilitate learning process in more fun way while simultaneously embedding a strong mathematical concept. Variations in the learning can help students to actively try something, then build a mathematical concept, with some interconnected components [1].

Furthermore, one important component in mathematics education is students' interest. Interest has long been regarded as an important motivational construct in learning mathematics [2]. Interest are important determinants of future study in mathematics and participation careers involving mathematics [3]. If students have interest in learning, the learning system and course material would support the students to master the material easily [4]. When a student is interested in a topic, he or she likely has both positive feelings towards that topic, and also value or find that topic important to his or her life or goals [5]. Therefore teachers should create an environment that help student to learn mathematics in a fun way.

One of the method that can be used to increases students' interest is edutainment. Edutainment is one of the learning bases that combine educational content into the entertainment context to facilitate learning [6]. Edutainment comes from the word education and entertainment. Edutainment refers to a type of teaching and learning process that is entertaining as well as learning. It is usually associated with video games for educational purposes [7]. Haddad argued that in contrast to formal education that uses a cognitive approach to convey information and problem-solving skills, multimedia edutainment relies on affective and sensory learning, based on experience and participatory methodologies that help



students reconnect knowledge and think about it in a concrete way [8]. Through the use of edutainment will make students interested and motivated to explore the topic more deeply.

One form of edutainment-based learning media is the game smartphone. Game is one of the media that students interest as an instructional media [9]. There are the reasons why digital mathematic games appeal to students and promote learning can be summarized as the following points: (1) combination of entertainment and education outside the classroom makes learning relatively attractive; (2) mathematic problems are embedded within storylines, allowing learners to accomplish tasks without focusing merely on mathematic formulas and equations; and (3) clearing of different stages in the game and challenges give learners satisfaction [10].

The smartphone device has properties like portability, connectivity and social interactivity that make it a platform of choice for learning. Therefore, the use of a smartphone or mobile device in learning can be use anytime and anywhere so that the learning environment is not restricted in the classroom [11]. Learn through mobile has many features such as flexibility of learning anytime and anywhere which have brought new changes in learning and education environment [12]. Potential use of games as a medium of learning can also be strengthened by seeing that Indonesia is the country with the largest number of downloaders of android-based games applications [7].

In addition to the learning media, the applied learning model is also an important component in the learning process. Problem based learning (PBL) model is one of the learning models where students learn through problems related to their daily lives. Duch, Groh, and Allen reveals that in the PBL, real-world problems are used to motivate students to identify and examine concepts they need to know to work through the problem [13]. PBL also provides a discovery structure that can help students learn to internalize and direct greater understanding [14]. By providing problems close to everyday life students are expected to increases interest of students to learn mathematics.

The PBL model uses a real problem as a representation. Learning by using representations of dynamically related mathematical concepts related to improving students' relational understanding of mathematical concepts [15]. In addition, to teach the concept requires the creation of problems or situations of questions in which students can learn something about the invention and categorization of patterns that lead to the creation of concepts in the first place [16]. Through discussion in the PBL model allows students to view mathematics as a collective construction, continuous student learning by involving them in the formulation and verification of concepts, and helping students conceptualize mathematical activities [17].

Furthermore, several research results show that edutainment-based instructional media influences students' interest in learning mathematics. Pareto et al. find that game is considered an effective tool because it is action-based; motivation; accommodate multiple learning styles and skills; strengthening skills of mastery; and provide an interactive context and decision making [18]. The results of Abdullah research show that PBL is effectively used as a learning model [19]. Students showed positive results on interest in learning mathematics. There is an increase in student interest and pleasure in the subject and develop their professional development. So the purpose of this study is to describe the response of students about the use of edutainment (game smartphone) with problem based learning as mathematics instructional media.

2. Method

The participants of the study are thirteen 8th junior high school students in Yogyakarta area. The school are located in the rural area of Yogyakarta. The method of choosing the participants is voluntary and random sampling. Participants were given a questionnaire about their response after using instructional media developed. Instructional media that is used in this study is an educational game with PBL model operated through smartphone to increase students' interest in learning mathematics. The questionnaire contained 10 items with likert scale: 1) totally agree; 2) agree; 3) neutral; 4) disagree; and 5) totally disagree. Data from the questionnaire was analyzed using descriptive statistics with qualitative method. Table 1 shows the statements used in the questionnaire.

Table 1. Sample questions of students’ response after using edutainment game as instructional media.

No.	Questions
1	Game instructional media increases interest in learning mathematics.
2	Game instructional media presents an interesting storyline.
3	Game instructional media can be used anytime.
4	Game instructional media increases curiosity about mathematics.
5	Game instructional media challenge me to complete the missions.

3. Results and Discussion

The aims of this study are to describe students’ responses on the use of edutainment based mathematics instructional media with PBL in terms of students’ interest. The instructional media is a game smartphone titled "STATIC (Statistics in the Arctic)". Through this game students learn statistics material with problem based learning model. This game consists of 4 levels, each level representing 4 sub-material in statistics material. Here is the scene of Game Static (see figure 1 (a) (b) (c)).

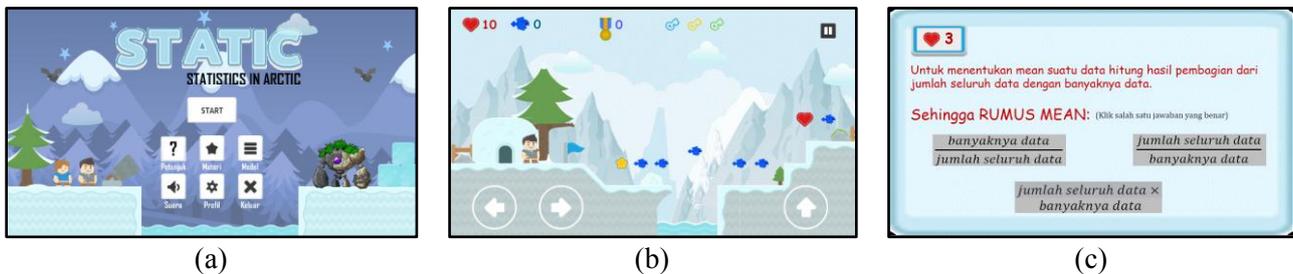


Figure 1. (a) (b) (c) The Scene of Game Static.

The questionnaire of students' response for the game as instructional media showed positive results as discussed in the following section.

3.1. Game Instructional Media Increases Interest and Motivation in Learning Mathematics

For the first statement on the questionnaire ‘game instructional media increased interest’ 39% of students stated totally agree with this statement. Then 46% of students agreed that games increased interest and 15% of students felt neutral. For the second statement, game instructional media improves motivation, 38% of students totally agree, 54% of students agree, and 8% of students are neutral on the statement. This shows that most students agree that games can increase students' interest and motivation in learning mathematics. The results of this question can be seen in figure 2 (a) (b).

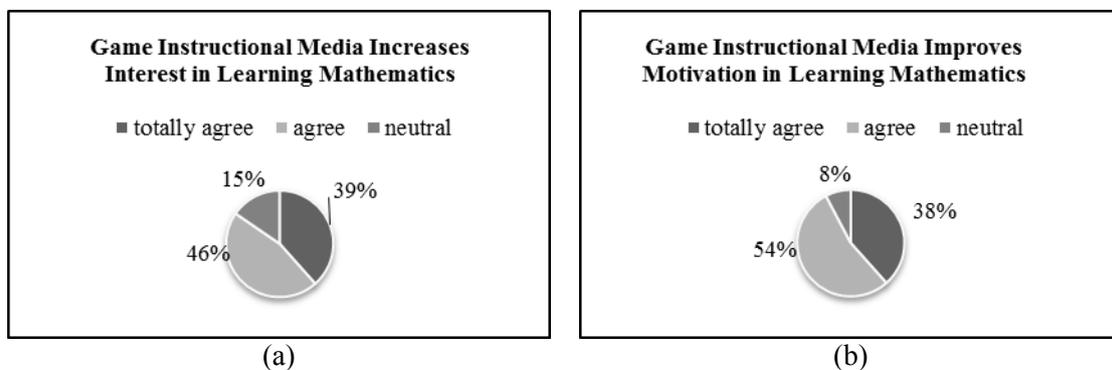


Figure 2. (a) Students’ response about game instructional media increases interest, (b) Students’ response about game instructional media improves motivation in learning mathematics.

The result match with the research Prince that found the effect of game based (edutainment) learning techniques on student achievement and interest in algebra at the primary education level [20]. The research showed that the use of game-based learning techniques in teaching influenced student achievement and interest in algebra. This is also reinforced by Chen and Rhen research results games can serve as an effective educational tool to motivate learners and elicit learning performance [10].

Edutainment makes learning fun so students can easily grasp the material concepts. Novikova also revealed that edutainment is effective to improve students' learning motivation [21]. In addition, the learning models used in the game also affect student interest. In regards to PBL, real world problems in PBL will engage students' interest in learning [13]. Abdullah stated PBL model in mathematics motivate students to seek answers from initial problems they do not yet understand [19].

3.2. Game Instructional Media Makes Me Bored to Learning Mathematics

The third statement on the questionnaire is 'game instructional media makes me bored to learning mathematics'. The data showed that 15% students agree, 31% neutral, and 23% disagree, and 31% students totally disagree (see figure 3). It can be said more than half participants disagree that game instructional media makes bored to learning mathematics. This result support the first and second statement results discussed previously.

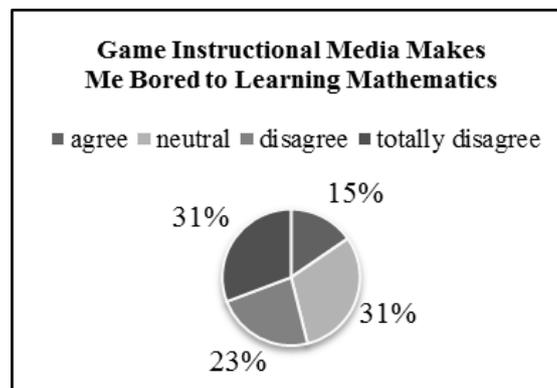
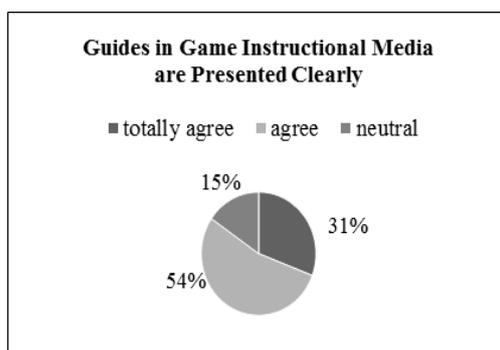


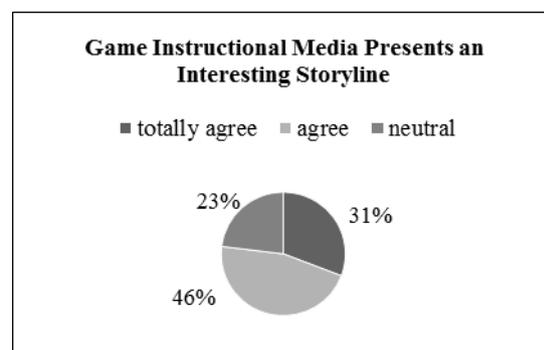
Figure 3. Students' response about media bored to learning mathematics.

3.3. Guides in Game Instructional Media are Presented Clearly and Game Instructional Media Presents an Interesting Storyline

In the terms of the quality of the interface, 31% students totally agree and 54% agree that the guides of the media are clearly stated. Meanwhile 15% students stay neutral for this aspect. It can be said that students can easily understand the instructions that are presented in the game. According the study, game instructional media presents an interesting storyline because 31% of students totally agree and 46% agree with this statement. And then 23% neutral on the statement. The results of this question can be seen in figure 4 (a) (b).



(a)



(b)

Figure 4. (a) Students' response about guides in game instructional media are presented clearly, (b) Students' response about game instructional media presents an interesting storyline.

The results show that the instructional media has presented interesting storyline that can increase students' interest in learning mathematics. Storyline on the game is an important component for teaching mathematics through games [22]. Visual on the game also need to be considered whether it has match with mathematics. The game also has mission to stimulate the students' interest and motivate them to play the mathematics game [23].

3.4. Game Instructional Media Can Be Accessed Easily and Used Anytime

Sixth statement on the questionnaire is 'game instructional media can be accessed easily' 8% students totally agree with the statement, 69% agree, and 15% neutral, and 8% students disagree. For next statement 'game instructional media can be used anytime' showed that 31% of students totally agree, 46% agree, and 23% students neutral. We can finding that most of students agree game instructional media can be accessed easily and can be used anytime. The results of this question can be seen in figure 5.

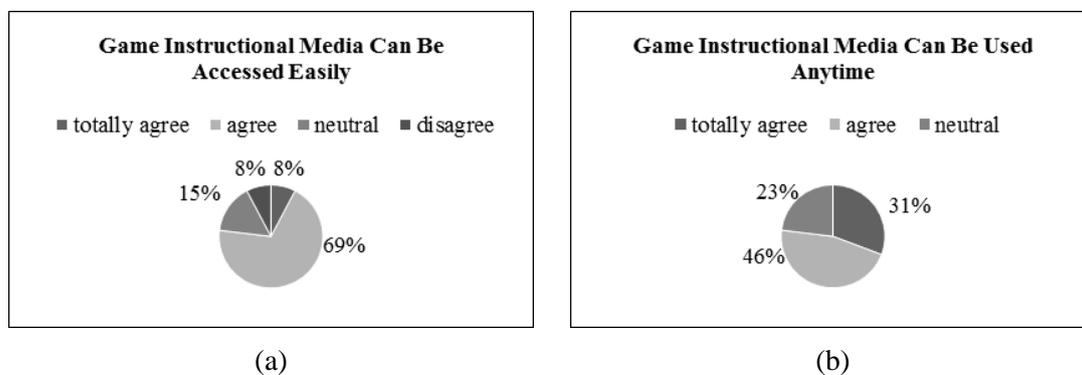
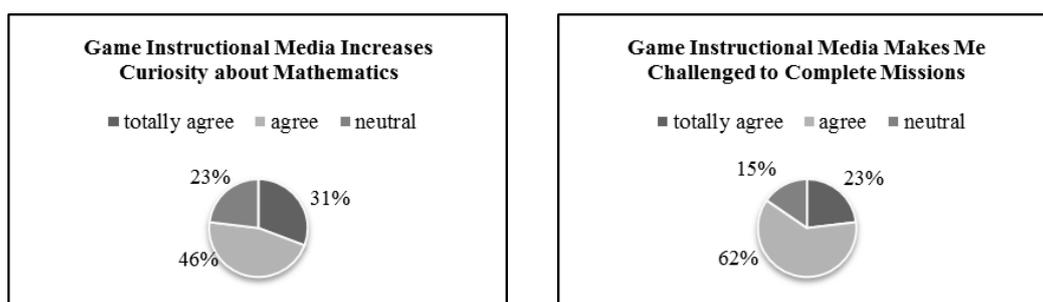


Figure 5. (a) Students' response about game can be accessed easily and (b) used anytime

As suggested by Foti and Mendez, one advantage of learning through smartphones is that learning activities can happen anytime and anywhere [24]. This is might affect students' responses on the use of game. Learning is not limited to a particular location and time. Learn through mobile should be viewed as a way to augment the learner through the use of ubiquitous technology that can provide access to learning content and information, anytime and anywhere [25].

3.5. Game Instructional Media Increases Curiosity about Mathematics and Makes Me Challenged to Complete The Missions

Statement 'game instructional media increses curiosity about mathematics' on the questionnaire showed that 31% students totally agree, 46% agree, and 23% students neutral. Ninth statement, game instructional media makes me challenged to complete missions, 23% of students totally agree with this statement, 62% agree and 15% neutral. It can be said that the game instructional media can make students' curiosity increased and make students challenged to complete missions. The results of this question can be seen in figure 6 (a) (b).



(a)

(b)

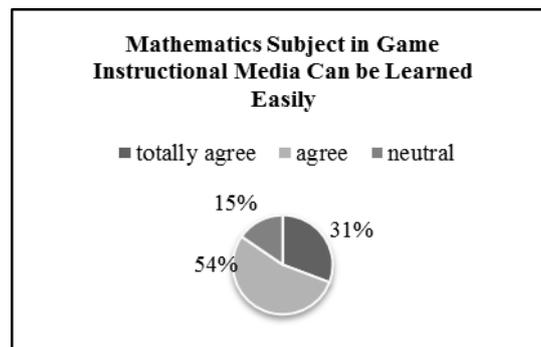
Figure 6. (a) Students' response about game increases curiosity and (b) challenged

The above results are consistent with Setyaningrum results suggesting that edutainment game media can help students learn mathematics to be interesting and arouse students' curiosity both of the mathematics subject and the game [26]. Additionally, Admiral also revealed that the mission in game can be used to challenge students [27]. Computer games as educational tools also have an intrinsic motivational factor that encourages curiosity [28]. Moreover, mission stages in the game and challenges give learners satisfaction [10].

Another aspect PBL model in game instructional media also affect students' curiosity, while also giving students a challenge. The PBL activity begins with the introduction of unstructured problem and can trigger students' curiosity [29]. Tan also suggests PBL in the curriculum has several characteristic, one of them is problem as a knowledge challenge [30].

3.6. Mathematical Subject in Game Instructional Media Can be Learned Easily

The last statement 'mathematical subject in game instructional media can be learned easily' on the questionnaire showed that 31% students totally agree, 54% agree, and 15% students neutral. The most students can learn math through game easily. Not only play in games, the material presented must also be understood by the students so that the learning goals are reached. The results of this question can be seen in figure 7.

**Figure 7.** Students' response about mathematics subject in game can be learned easily.

Through the game students can easily understand the mathematics subject. This is could affect students' interest. Game instructional media allows students to construct their mathematics concepts and make students more interest in learning mathematics [31]. There are various advantages through the PBL model so that students can develop their conceptual understanding. The PBL model provides greater opportunities for students to learn more in-depth math, thereby embedded in long-term memory [29]. Through PBL students will learn more easily and can increase student' interest [19].

4. Conclusion

Based on the result and discussion, most of students agree that game instructional media had positive effect on students' interest in learning mathematics. Learning mathematics using game edutainment as instructional media was more interesting and challenging. Students can play while learn mathematics in a fun way. Games that students can use wherever and whenever, can help them to learn mathematics easier. Furthermore, the teachers can use this edutainment instructional media as an alternative way to increases students' interest in learning mathematics. But this game needs to be tested to more students in order the game can be an effective instructional media.

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