Differences of Students' Responses on using Card-Board Game and Mobile Game of Membrane Transport

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Abstract. Interactive learning requires media that can make students interested and active in following the learning process. Game media that can be played online and offline is one of the learning alternatives that need to be studied for its use. This study aims to distinguish students' responses to the use of Card-Board Game Membrane Transport which is played offline and mobile on membrane transport material. This study used a quasi-experimental design one group post-test design, with participants of class XI MIPA SMA Negeri 1 Boyolali (N = 20 people), who had studied membrane transport. Data in the form of student responses were measured using a respone questionnaire of 17 items with a Likert Scale of 1-4. Data analysis was carried out with the Independent Samples t Test. The test results showed a p value of 0.005. There are significant differences in student responses in the printed and mobile versions of the media. The result showed that student gave a positive responses to the learning media in the mobile form.

Keywords: Card-Board game, mobile game, membrane transport, students' responses

1 Introduction

Biology is one of the branches of science in the field of science that studied the organism of living beings and the environment. Organism is composed of organs, and organs are composed of tissues. The network is composed of cells. Each part of the organism has a structure that forms a unity to coordinate a system. The dynamics of cell structures and functions are an important basic topic to understand the phenomenon of complex living organisms. Study in the biological class suggests several learning strategies, namely the use of images, computer simulations, and models of tactical games (Cavalho, Beltramini & Bossolan, 2019). Topic cell structure and its function aims to inspire students about cellular processes such as protein synthesis, cell division, and mobile respiration depends on the knowledge of the molecule involved, such as structure, function, and its interaction.

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In the grade XI SMA there is a cell membrane transpor material that is included in the biologically observing cell material at a mobile level that can not be seen directly due to the microscopic cell properties. This causes students difficulties in understanding cell membrane transpor mechanism (Setiawati, Retnoningsih & Irsadi, 2017). The use of the media in the learning process can improve the understanding of the concept of students, besides it can also create interactive learning that involves students directly in the learning process. Interactive and fun learning is expected to improve the understanding of students on transport membrane materials.

Game is one of the learning media that can help or facilitate teachers in conveying lesson materials to be easily digested by educators (Rao, 2014). Syandri (2015), added that the use of media aims to make more effective and efficient learning as well as can improve quality. In order to use the media to be maximum, Benzies (2015), explains that the selection of strategies and learning media should be able to attract the attention of educators to engage learning in a pleasant context. Chitravelu affirms that children who type congregation (concrete learner) screaming learning strategies utilizing games, pictures, films, casettes, videos, and others (Chitravelu, Sithamparam & Choon, 2005).

Media board games are designed through learning that provides play activities to do every individual, so that students are raced to become winners. With learning media related to learning activities while playing, students will be interested and growing interest to follow learning. In fact, one of the functions of the learning media, giving a pleasant, unpressed, relaxing, and interesting learning goals (Sanaky, 2013). It is also supported by Ratminingsih (2018), who stated that the verbalization is solely in learning causes students is less able to understand the lessons, because the child is physically always active that it requires activities that make them move. Therefore, the active role of students should be maximized through fun and challenging learning. In addition, the dominance of teachers in learning should be minimized.

Naz and Akbar classifies board games as one of the types of media simulations and games (Naz & Akbar, 2008), and according to Berlnad and Lee, (2012), board games is a game that provides activity that its rekreative properties, played grouply, and can direct them to play competitively, cooperative, and collaborative. In line with it, (Zagal, Rick & His (2006), stated that board games have a unique potential that can make a collaborative educators.

Chiarello (2016), declared board games created as supporting equipment to understand complex materials and abstract scientific concepts. The research conducted by using a board game as a tool that is able to give example, analogy and metaphora, so it encourages his players to understand the important aspects. Board games in science that can bring his players to the world that is difficult to reach by human vision has been used to teach biomolecular concepts such as metabolic processes (Rose, 2011), immune system on medical education (Bochennek, Konrad, Boris, Stefanie & Thomas, 2007), quantum mechanics (Chiarello, 2016) and protein synthesis (Cavalho et al., 2018).

Media Card-Board Game Membrane Transportation is a media developed by the National University of the RG Biology Education team (Qonita Majid, Murni Ramli, Maridi) in 2020 that has been tested its validity and can be applied to the learning process. There are two versions,

namely the print version and mobile version. The use of game media in the learning process needs to be measured for effectiveness, one of which is in terms of student response. Through measuring student responses, teachers can evaluate the learning that has been carried out. The student responses measured include students' interest and feelings in playing the media as well as students' opinions about the form and benefits of the learning media used. When students feel interested in the learning process, the process of understanding the material can be easier to do (Uliyandari, Latipah & Handayani, 2021). This study aims to resolve differences in students' responses to card-board game learning media used in print and mobile versions.

2 Method

2.1 Research Time and Place

Research was conducted in June 2022 with research place in State SMA N 1 Boyolali. Kates Street No.8, Madumulyo, Pulisen, Boyolali District, Boyolali District, Central Java, Post Code 57311.

2.2 Research Design

The research method applied in this research is the Experiment Quasi with one group posttest design. Research is carried out only in a group of students given treatment and seen responses provided by students after treatment.

2.3 Population and Sample

The population in this research is a grade student of XI Mipa SMA Negeri 1 Boyolali. Sample on this research amounts to 20 students. The technique of sampling used is purposive random sampling, which is a sample determination technique with certain considerations (Sugiyono, 2012). Consideration used in sample determination is a student who has got the material of the membrane transport.

2.4 Data Collection Technique

Data collection is carried out by providing quizzers to students after playing games. The first stage of the student implements learning by using the Card-Board Game Membrane Transport print media, then the student fills the given quiz. The second stage, students implement learning by using the Mobile Game Membrane Transport media, then students refill the given questionnaire.

Student response quiz consists of 17 items with 12 positive items and 5 negative items. Questionnaire indicators include interest, comfort, feeling, complexity, saturation, and game competitiveness, game duration, addiction, motivation, and play benefits, as well as game design..

2.5 Data Analysis Techniques

Students' response quiz data after playing the game is analyzed by checking and calculating the score of each answer selected by the student on the pre-built questionnaire. Then they narrowed the scores earned each student. In this research, earnings for each answer using suchrt scale is as follows..

a. Positive item assessment score

Strongly Agree = 4

Agree = 3

Disagree = 2

Strongly Disagree = 1

b. Negative item assessment score

Strongly Agree = 1

Agree = 2

Disagree = 3

Strongly Disagree = 4

Once they're bound to score the student's answer, then calculate the interpretation of scores per item of statements by using the following equations:

Interval = score item question/(the highest record item x students) x 100%

The following criteria for interpretation of scores based on intervals:

- Number 0% - 25% = Strongly Disagree
- Figure 26% - 50% = Disagree
- Figure 51% - 75% = Agree
- Figure 76% - 100% = Strongly Agree

(Rusnah, Yeni & Marlina, 2021)

3 Research And Discussion Results

Research was conducted in June 2022 in the State SMA 1 Boyolali with the aim to know the difference of student response to the use of the game media card-board games in the print form and mobile version. Research is conducted by dividing students into small groups consisting of 3-4 people. Researchers provide explanations about game procedures, types, uses and content on cards as well as how to play and rules of print version games. While for mobile versions, researchers guide students to the game first then request one of the representatives of the student to read the rules of the game on the menu available, other students are responsible for associating the explanations submitted.

The process of playing media learning by students is either a print or mobile version accompanied by researchers to ensure the truth of the game procedure. After the student finished playing media print version, the student is asked to fill the quizioner response to the use of the learning media. As soon as the student finished playing mobile version media, the student is asked to recharge the response quiz to the use of the learning media. Researchers provide instructions for students to answer honestly and in accordance with what they feel when playing the game.

To find out the student's response to the Card-Board Game and Mobile Game Membranete Transportation learning media used research instruments in the form of response sockets. The used socket consists of 4 answer options namely SS (Sangat Setuju), S (Sell), TS (Unsappeared), and STS (Not Agree). Students' responses are said to agree if the results of a response ticket range from 76% - 100%, agreeing to range between 51% - 75%, tidal agrees to range from 26% - 50%, and strongly does not agree to range from 0% - 25% (Rusnah et al., 2021). The average student's response jacket on card-board game learning media and mobile game membrane transport can be seen on the following Table 1.

Table 1. Student Call Analysis Result Against Media Card-Board Game and Mobile Game Membrane

Indicator	Result (%)		Criteria
	Mobile	Printed	
Interest	90,00	85,63	Strongly agree
Convenience	90,00	84,67	Strongly agree
Competitive spirit	91,25	86,50	Strongly agree
Game duration	86,88	77,38	Strongly agree
Addicted	83,75	76,25	Strongly agree
Motivation and benefits of playing	84,38	80,75	Strongly agree
Game design	87,71	80,42	Strongly agree

Table 1 shows that the percentage of responses of SMA Negeri 1 Boyolali students to the membrane transport mobile game learning media is more than the print version. The level of interest in mobile game media was 90.00% while the print version was 85.63%. Based on the response criteria, the results of the student responses in the two versions were stated to be very agreeable. The student's comfort level when playing mobile games is 90.00% and the print version is 84.67% with very agreed criteria. The indicator of the competitive spirit of students in the mobile game version was 91.25% and in the print version it was 86.50% with strongly agreed criteria. The game duration indicator in the mobile game version is 86.88% and in the print version it is 77.38% with very agreed criteria. The student's addiction rate to the mobile version of the card-board game was 83.75% and the print version was 76.25% with strongly agreed criteria. Students feel happy and interested because learning using interactive media and in accordance with the current digital era, especially with a cheerful atmosphere, students feel comfortable, supported by competition in the game makes students become active. So that students do not feel bored when learning takes place. This is in accordance with the opinion of Nugraha, Binadja & Supartono (2013), most of the students' attention will be focused on learning because of students' interest in teaching materials or learning media so that students will not quickly feel bored.

The use of card-board game learning media provides benefits, including related to motivation and learning materials. The percentage of benefits of the mobile version of the game is 84.38% and the print version is 80.75% with the criteria strongly agreed. This shows that CBGMT media makes students interested in membrane transport material and increases students' learning motivation on membrane transport material. As

stated by Maidiyah & Fonda (2013), that teachers can attract students' attention by using illustrations of pictures and in non-convoluted delivery so that students can more easily understand the material. In addition, according to Wahyuningsih, (2011), fun learning causes a growth of positive responses from students which directly has an impact on increasing interest in learning, activities following learning activities, which ultimately has an impact on improving learning outcomes.

The results of the percentage of game design indicators, both the mobile version and the print version, are on the criteria of strongly agreeing with the percentage of the mobile version of 87.71% and the print version of 80.42%. The mobile version gets a higher percentage, this is related to the color play and clearer animations than the print version. In addition, there is a zoom feature that can enlarge writingso that it makes it easier for students to read and understand it. According to Holiwarni (2012), the use of contrasting colors makes it easier to distinguish one side from the other side and the use of the type or size of letters and writing must match the appearance of the media. Furthermore, Alkhalim (2013), explained that the images displayed according to the subject will make the material presented can be easily understood and the results received by students will be the same.

Table 2. : Independent Samples t Test Results

Media	p value	Decision
Card-Board Game Membrane Transport	0,005	H_0 rejected

Based on the results of the Independent Samples t Test test, it is known that the p value of < 0.05, it can be concluded that there is a significant difference in the use of the mobilr version of the Card-Board Game Membrane Transport media compared to the print version. Mobile games are more in demand by students, this is in accordance with research conducted by Cobcroft, Rachel, Towers, Stephen, Judith, Burns & Axel (2006), which states that mobile media is more effective because mobile media can contribute to improving quality learning experiences, can play a role in increasing learning flexibility into more personal and student-centered activities, in addition, it can also support the development of social knowledge between students by improving critical, creative, collaborative and communicative.

Based on the results of the questionnaires that have been given to students after playing the game, all indicators show that mobile game play is more attractive and effective for students. This is indicated by a more targeted percentage than the printed version of each indicator. Mobile media is a process of transferring information and communication capacity that comes from the center and is given to each individual hand of the student. Mobile games have practical characteristics and can be carried anywhere (Dikkers, Martin & Coulter, 2011). In addition, the animation in mobile games also makes students feel more interested in playing. The ease of playing the mobile version of media that is practical and easy to carry anywhere and can be played anywhere and anytime is very suitable for today's digital era (Drolia, Sifaki, Papadakis & Kalogiannakis, 2020).

The print version of the card-board game membrane transport media also received a positive response from students, indicated by the same index as the mobile version. However, the print version of the media has several disadvantages, including that print media cannot visualize material in the form of a process (Jayawardana, 2017). Print media is also less practical to carry anywhere, writing and images on cards that will fade over time, many media components that can be lost at any time if they are not careful in packaging, cannot be played remotely which means that all players must be in one room in order to play the game. But this can also be an advantage of the print version of the media. Students can directly play and interact with each other which can improve the competitive spirit of students (da Silva Júnior, Uchoa, Sousa Lima & Monteiro, 2019).

4 Conclusion

The use of mobile media games on transport membrane materials is more demanded and received positive responses from students. Percentage of student response on mobile media games for a 90,00% interest indicator, a 90,00% comfort indicator, a competitive spirit indicator of 91.25%, an indicator of the duration of playing by 86.88%, an addiction indicator of 83.75%, motivational indicator and play benefits of 84.38%, and a game design indicator of 87.71%. The seven indicators index “Strongly agree” and have higher value than the print version. After conducting a different test regarding the percentage comparison between print and mobile card-board games, a p value of < 0.05 was obtained which showed that there was a significant difference between the two types of card-board games, so it can be concluded that the tested mobile card-board game can attract more enthusiasm from students in using learning media than the printed version of the card-board game. The print and mobile versions of card-board game membrane transport can be applied in learning cell membrane tanspor according to the student's ability and available facilities. The suggestion for subsequent research is to expand the application of media to diverse students and a larger sample of classes.

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