The Effectiveness of Smart Bottle Caps Math Learning Media on Mathematics Learning Achievement of Multiplication Counting Operations Material

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Abstract. *This research is conducted due to some problems found in the conventional learning process. Moreover, many students have less interested in learning mathematics, which results in their low math achievement. The objectives of this study are: (1) to find out the increase of Mathematics learning achievement of multiplication counting operations material after being taught by using Smart bottle caps Math learning media (2) to find out the effectiveness of the use of Smart bottle caps Math learning media. The research used an experimental quantitative research method. The results showed an increase in the average value between the pretest of 60 and the posttest score of 90; the t-test is found that the p-value (sig) of the Levene's test was 0.31 or greater than the α (0.05). This means that the variants of the two groups are the same, so the t-test results in the first row show that the p-value (sig (2-tailed)) is 0.000. It proves that there is a significant difference between the pretest and posttest scores. The average posttest score is statistically higher than the pretest score, before being taught by using Smart bottle caps Math learning media. Therefore, it can be concluded that the learning media is very effective to improve students' achievement.*

Keywords: *Learning Media, Learning Achievement, Mathematics*

1. INTRODUCTION

One of the disciplines that can improve students' thinking skills is mathematics. Mathematics is considered as a scourge subject by students. Many students are pessimistic about this subject. In this case, the teacher as an educator is the spearhead who can create an attractive learning atmosphere and prepare learning facilities. Learning facility can be a learning media that can support the potential development of students. For elementary school students who are still in the concrete operational stage needs real media to construct the knowledge. Mathematics is an abstract subject matter, especially on multiplication material. Multiplication material is taught not only at the elementary school level but also the following levels. Thus, the multiplication material plays an important role as a basis for better understanding the next mathematical material.

According to the results of observations made by researchers on August 10, 2019, it was found that that the teaching and learning process was still conventional. In addition, there were still many students who were less interested in mathematics in which it caused their learning outcome was low. It was supported by students' scores data which did not reach the minimum completeness criteria (MCC) score. There were 18 students from 26 students who had score above MCC. Before the treatment was carried out, the researcher gave a pretest to know the students' achievement before getting treatment. From the pretest result, it was found that the average score of pretest was 60.

The learning activities carried out by the teacher in explaining the multiplication count operation material was by using the lecture method. The students were asked to write down the multiplication table in the book. When the students did the multiplication questions, they saw the answers in the multiplication table without calculating the questions by themselves. Consequently, many students were able to get good grades and many of them got perfect score, 100. However, if the students were asked to do questions without looking at the multiplication table, they still had difficulty to count or answer the questions correctly. Heruman (2008: 1-2) states that elementary school students need media to understand the presented material. Therefore, it needs a learning media to make the students understand the material easily, especially the multiplication material.

Based on previous research, there are many researches that contribute to increase student interest and motivation towards mathematics in the form of textbooks, methods, learning media that can improve mathematics learning achievement. Ummah (2014) states that teaching materials of teacher textbooks and PMRI-based student textbooks can improve mathematics learning achievement of fourth grade students. The difference between the present study and the research conducted by Ummah are the learning media used and the students' grade level. Ummah's research uses teacher and student textbooks as the learning media and it is applied for fourth graders. Meanwhile in this study, it uses Math Smart Bottle Caps as the learning media and it is applied to third graders.

Based on the problem analysis, the researchers are interested in conducting research on the effectiveness of Math Smart Bottle Caps as learning media toward multiplication counting operations achievement. The media is expected to be an attractive and effective learning media so that students will more easily understand the multiplication material given by the teacher and give inspiration for teachers to be more creative and innovative in the use of learning media.

2. LITERATURE REVIEW

2.1 Learning Media

The success of a learning process is determined by several factors. It includes teacher who is supposed to be creative and innovative in applying models, approaches, strategies, methods or approaches. Besides, teacher must also be required to be creative and innovative in using learning media in order to attract students' interest and motivation. According to Muhson (2010: 2), learning media is part of learning resources which is a combination of software (learning materials) and hardware (learning tools). In this research the software is lesson plan, materials and student worksheets. Meanwhile, the hardware is Smart Bottle Caps from bottle caps waste.

Jannah (2018: 15) states that waste is the unused thing of human daily activities or natural processes in solid form. The Smart Bottle Caps media used in this study is an innovative learning media adopted from the results of Jannah's (2018) research, which in her research she also used unused goods, rubber sandals as material to make 10 economical mathematics teaching aids.

Primasari (2014: 68) argues that the use of instructional media must be varied. It can attract attention, create more fun, and provide learning experiences. Thus, students can understand the material given easily. Prastiwi's research (2016) reveals that props based on the Montessori multiplication board are proven to be able to help the third grade students in understanding the multiplication count operation material with the result of three three-digit results. The difference between Prastiwi's research and this research is the type of teaching aids developed with the material specifications. Vincentia's research develops props in the form of a Montessori multiplication board with multiplication counting operations in three-digit results. Meanwhile in this study, it uses Smart Bottle Caps as learning media for multiplication counting operation of two-digit results.

2.2 Learning Achievement

In the process of teaching and learning, an assessment is needed to be carried out by educators to know the level of students' achievement in the learning. Assessment is carried out to know the achievement. Suhendri (2011: 32) explains that achievement is the culmination of learning activities that result in changes in the form of continuous and dynamic actions or knowledge that can be measured and observed.

Firmansyah (2015: 37) explains that achievement is the final result that students have or get after they experience the learning process which is marked by a value scale in the form of letters or symbols or numbers. And this is usually used as a measure of whether the student is successful or not in the learning process. The statement above is in line with Egok (2015: 187) which states that achievement is not something that stands alone. It means that it is the accumulation of various factors that affect students. This influence can come from the students themselves (internal factors) and can come from outside (external factors). Factors from the students include: intelligence, critical thinking skills, motivation, health and learning methods as well as independent learning. Meanwhile, external factors include family environment, school environment and community environment.

Meanwhile, Muslich (2011: 38) states that achievement is the abilities that students have after receiving a learning experience. Thus, it can be concluded that the assessment is a process to assess the students to know the students' achievement with certain criteria. In this study, the assessment was carried out in mathematics, 1-10 multiplication material.

In an effort to improve the students' achievement, this research uses a Smart Bottle Caps Math learning media. Reflecting on the results of observations, it is found that elementary school teachers in SD 01 Menganti need solutions to improve Mathematics achievement of third graders. Therefore, this study focuses on improving the students' achievement.

3. RESEARCH METHODS/ METHODOLOGY

This research used experimental quantitative research with the One-Group Pretest-Posttest-Design with the data analysis technique of the Independent Sample T Test. The prerequisites test carried out in this study were the validity test and the homogeneity test.

4. RESULTS AND DISCUSSION

The results of this study were as follows: (1) the average score of the post-test after being taught by using Smart Bottle Caps Math learning media was 90. It proved that the use of the learning media can improve the students' mathematics achievement. Furthermore, the percentage result of the student questionnaire assessment after participating in the learning showed 100%. In accordance with the conversion table of the scale of the validity/ feasibility level, the percentage of the achievement level of 100% was at a very valid qualification. Thus, the developed-media did not need to revise. This shows that Smart Bottle Caps Math learning media in the multiplication material of the third graders was very good and suitable for use in the learning process. (2) From the results of calculations using SPSS, it was found that the p-value (sig) of Levene's test was 0.31 or greater than the α (0.05) value. It means that the variants of the two groups are the same. Therefore, the t-test results in the first row showed that the p-value (sig (2-tailed)) was 0.000. It indicates that there is a significant difference between the pretest and posttest scores. The average posttest score was statistically higher than the pretest value. So, it can be concluded that the use of Smart Bottle Caps Math learning media is very effective in improving students' achievement for multiplication counting operation of third graders.

First, Smart Bottle Caps Math learning media can improve students' achievement because it can motivate students to learn. The implementation of Smart Bottle Caps Math learning media contains material on multiplication which is presented practically to motivate students in learning. This media can also make the students understand the learning material. The learning process taught by using this media was about

multiplication counting operation in two-digit result. The learning process was carried out by playing so that students did not realize that they were actually learning. This learning media are able to be used to solve multiplication learning problems. Students usually only learn through writing books, but by this media students became more motivated in learning. Research conducted by Fauziddin (2015) states that the game tools used are objects used in teaching and learning activities that make teaching and learning run smoothly, regularly, effectively and efficiently. Therefore, educational goals can be achieved and it can provide fun for learners.

Second, Smart Bottle Caps Math learning media can improve students' achievement because the attractive media display increases students' enthusiasm for learning. The application of the learning model is not perfect without using interesting media. Thus, Smart Bottle Caps is selected as learning media in the teaching and learning process in delivering the material. Consequently, students can easily understand and master the learning material (Irwandi, 2020; Nida, Parmiti, & Sukmana, 2020). Smart Bottle Caps Math learning media was using bottle caps containing mathematical multiplication as media for the students to learn multiplication. Since it used caps of bottle, the appearance of this media could attract students to learn. Research conducted by Pramana, Jampel, & Pudjawan (2018) states that learning media that has an attractive appearance will increase student interest in learning. Through this learning media students were also invited to appreciate used goods by processing them into innovative learning media. This learning media can help students in learning so it can improve the students' achievement.

Research conducted by Prastiwi (2016) states that props based on the Montessori multiplication board are proven to be able to help third graders in understanding the multiplication counting operation material in three-digit number result. Research conducted by Astutik (2018) also states that the use of learning media "Kalingga" in mathematics learning can improve students' achievement for multiplication and division material. This study has similar research focus, multiplication and students' achievement. The difference is in the type of learning media used. Research conducted by (Anam, 2015; Ningtyas & Wuryani, 2017; Tegeh, Simamora, & Dwipa Dwipayana, 2019) also states that an innovative learning media can help students in learning so that it can improve students' achievement. Based on this research, it can be concluded that learning media can improve students' understanding in learning.

CONCLUSION

Based on the results of the study, it can be concluded that Smart Bottle Caps Math learning media can improve students' achievement in mathematics. It is because the results of the study indicate an increase in the average score between the pretest of 60 and the posttest score of 90. To prove that there is a significant difference between the pretest and posttest, researchers find out the difference between the students' achievement before and after being taught by using Smart Bottle Caps Math learning media by using t-test.

From the calculation results using SPSS (attached). It is found that the p-value (sig) of Levene's test is 0.31 or greater than the α value (0.05). It means that the variants of the two groups are the same, so the t-test results in the first row show that the p-value (sig (2-tailed)) is 0.000. This proves that there is a significant difference between the pretest and posttest scores or statistically the average posttest score is higher than the pretest score before being treated using Smart Bottle Caps Math learning media. Therefore, it can be concluded that the use of Smart Bottle Caps Math learning media is very effective in improving students' mathematics achievement.

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