Teachers’ ability in using math learning media

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Abstract. The studies aim to enhance teachers’ knowledge and skill in making math instructional media, develop math instructional media, train and assist the use of instructional media in learning math in the classroom. The method used in the activities adopted the pattern of preventive implementation, planning stage, program implementation, observation and evaluation and reflection. The research results show that the evaluation of teachers’ ability is still in average category. The result required more intensive training.

1. Introduction

The development thinking of primary school students is still in a concrete operational stage [1, 2]. It is because the logical thinking process is even based on the physical manipulation of the objects [3]. Students can learn math based on clear and visible facts when using teaching aids [4, 5]. The subject that students learn will be easier to learn and understand when the learning process seems real to them [6, 7]. Therefore, students need learning media in the form of actual objects (teaching aids) during the learning process.

Cope [8] says that the review of the research on the effectiveness of using math manipulative supported by the use of concrete, pictorial, and virtual manipulative. Furthermore, primary school teachers who use manipulative to help teach math can positively affect student learning manipulative objects in learning mathematics have a positive impact on the students' learning process [2, 7, 9]. So, the teacher who can design the learning of mathematics that is abstract to change learning to be concrete with teaching aids would be able to improve student learning outcomes.

Several studies have documented the results of their research regarding the use of learning media that is manipulative [2, 10, 11]. Indonesian traditional games could be used in teaching mathematics like learning multiplication [2] and measuring time [10]. On the other hands, Haris and Putri [11] teach measuring area using one of Indonesian context namely anyaman. Furthermore, several contexts can be used as starting point in learning mathematics.

In reality, the government has made efforts to assist Math Learning Media (MLM) tools in primary schools in Indonesia especially in the Pariaman city for the mathematics learning process becomes more meaningful for students. Observations made by the researcher shows that teachers rarely use
MLM that has been given by the government. Teachers do not use the visible tool in MLM during the learning process. Though the teaching materials taught can be taught by using MLM. The condition of MLM is quite a lot and well maintained, but only display in the warehouse storage. It makes the big question for the researchers why it can happen.

Based on the interviews, the researchers found that teachers strongly agreed in the use of MLM tools. The tool of MLM is essential for the learning process, but they are sometimes confused in matching learning materials with MLM used. Also, the problems faced by teachers are the teacher’s ignorance in using the available tools so that teachers hesitate in the utilization of the MLM. Even some teachers feel bothered when it comes to explaining learning materials using MLM.

Yanti et al. [12] stated that the utilization of MLM has been implemented by teachers in schools but not yet optimal. Teachers’ preparation is limited to checking the availability of MLM alone not considering the completeness of MLM or testing. More implementation of the Standards Competence wakes up, and some wake up only while other competencies do not take advantage of existing MLM. The ability of teachers in utilizing the MLM still needs to be improved. MLM storage requires attention to be more organized and well maintained. Support from school principals and supervisors should be done to motivate teachers to utilize MLM at school.

It proves that the use of MLM is still not optimal. Continuous use of aids in mathematics learning in primary schools can provide satisfactory results on student learning outcomes. It is following the results of a study conducted by Nurhanif [13] which states that the use of MLM could support learning in free materials and build a flat area in class IIIA Primary School 16 Banda Aceh. In line with research conducted by Manurung, et al. [14] state that the use of MLM can improve student learning outcomes. Based on the explanation above, researchers interested to see the ability of teachers in using the MLM. Furthermore, researchers provide treatment to teachers to maximize any existing learning media.

2. Method
Learning implementation phase is divided into three major stages. First, the researcher explained to the teacher basic theoretical training and working principle of various kinds MLM. Furthermore, the researcher gives an opportunity to the teachers to try using MLM. Finally, the researcher motivates the trainees to develop or modify the MLM so that it can add a collection of teaching aids in their school.

The form of learning evaluation conducted consists of three major stages. First, the researchers did an initial assessment that was used to measure the first ability of the prospective teachers. Furthermore, the researcher evaluates the process used to measure the knowledge of research subjects at each stage of learning using MLM. Process evaluation is used to refine the next activity. Finally, the researcher conducts a final useful assessment to measure learning achievement with success indicator is a component of the learning outcome.

3. Results and discussion
The implementation of mathematics learning using MLM divided into two major sections. Each section is held in the form of a workshop meeting, described as follows.

The first session was held on August 19, 2017. Workshop and training activities on developing the ability to make and using media for these teachers focused on doing media contextual and IT-based media training. It aims to improve the quality of mathematics learning of primary school students through teachers who have mastered MLM. This activity was held in one classroom at SD Negeri 11
Koto Marapak. The material that has been delivered during the learning process is the definition of instructional media, the function of instructional media, the study of the making and utilization of mathematics learning media in primary school, the making of contextual media, training of ICT-based media development, and learning simulation using media. Teachers must be able to select and use media in accordance with the material presented. Teachers are expected to be ready to try to use the media accessible to handle students.

Furthermore, teachers need to take advantage of learning media because it can improve student responsiveness and improve the quality of education [15]. Learning process using only lecture method will cause boredom for students so that the laziness of students in receiving learning. The quality and student learning outcomes would be reduced if we could no using MLM.

The second session was held on September 9, 2017. The teacher's ability in using MLM was done by one teacher from SD 11 Koto. She presented the results of KPK and FPB teaching aids which can be used for grade 4 of primary school as shown in Figure 1. Media made of cardboard and used plastic bottles are used to find Lowest Common Multiple (LCM) and Greatest Common Divisor (GCD) from a number. The number used is represented by using candy. Next, how to use the teaching aids by placing a candy that represents the multiples of each number that the KPK and FPB want to find out. Each bag on the media is filled with some sweets by the multiples of numbers. Then look at the most candy bags.

![Figure 1](image.png)

Figure 1. Teacher present the teaching aids of LCM and GCD

Based on the evaluation form provided, the learning activities are implemented successfully, although there are still some obstacles. The success of the learning process, seen from most of the targets can be achieved, that teachers can make one or several mathematical learning tools from the cheap tools and materials provided, but the tools and functions are quite functional. Next, teachers can understand various accurate elements or concepts in primary schools. Lastly, the teacher can design the learning activities for the implementation of the MLM that is produced as outlined in the form of student worksheets. The response of the research subjects to the learning process is positive, indicating that although many participants have enough experience related to MLM, they still need the empowerment to broaden their insights and experiences in developing the media of mathematics model.

Furthermore, the researcher explained that the innovation of learning the mathematics of primary school oriented to the learning objectives in the curriculum [16]. Then the characteristics of learning mathematics must also be adjusted with the level of thinking the development of elementary students, as well as the most critical point, is the process of student-centered learning, so that students are expected to be active and creative.
During the presentation, the teachers were involved in providing other ideas and suggestions on the performance of their colleagues. The assessment process is using Macromedia Flash 8 software. Teachers are guided in installing Macromedia Flash according to the guide seen in Figure 2.

![Figure 2](image2.jpg)

**Figure 2.** All participants install Macromedia Flash 8 according to the guide

The presenters explained that to understand the creation of flash animation media, student-assisted participants first install the software to each participant's laptop (Figure 3).

![Figure 3](image3.jpg)

**Figure 3.** Installing process of Macromedia Flash 8

Finally, the evaluation of the implementation of learning activities divided into four things. First, attendance and participation rate of participants through presence attendance is 90% because some participants cannot attend. Furthermore, based on the implementation schedule, as well as the timeliness of the implementation, this devotion activity has been done well, as planned. Third, the participants gain new insights about the media of mathematics learning at the end of the event. Mathematical tools in the form of games and real concept make media and positive chip teaching aids in understanding the concept of integers, as well as interactive learning media which is the development of IT-based learning media [15-17]. Lastly, the speaker explained that to follow the creation of flash animation media, student-assisted participants first install the software to the laptop.
4. Conclusion
Teachers can create and use MLM, especially various kinds of visuals such as volume and flat builds and numbers and so on. Besides, teachers have been able to maximize the use of learning media that can be used in the development of the concept of learning mathematics. Furthermore, the teacher has been able to choose teaching media in mathematics learning that can be used in the cultivation of the idea of learning math. Finally, teachers can develop and create mathematics learning media associated with abstract concepts using IT-based learning media, so that learning becomes interactive.

References
[1] Tall D 2002 The psychology of advanced mathematical thinking In Advanced mathematical thinking (Netherlands: Springer) pp 3-21
[2] Prahmana R C I, Zulkardi and Hartono Y 2012 Learning multiplication using Indonesian traditional game in third grade Journal on Mathematics Education 3 115
[3] Reiner M and Gilbert J 2000 Epistemological resources for thought experimentation in science learning International Journal of Science Education 22 489
[4] Biggs J B 2011 Teaching for quality learning at university: What the student does (London: McGraw-Hill Education)
[5] Loewenber Ball D, Thames M H and Phelps G 2008 Content knowledge for teaching: What makes it special? Journal of Teacher Education 59 389
[6] Entwistle N and Ramsden P 2015 Understanding Student Learning (Abingdon: Routledge)
[7] Tanujaya B, Prahmana R C I, and Mumu J 2017 Mathematics instruction, problems, challenges, and opportunities: A case study in Manokwari regency, Indonesia World Transactions on Engineering and Technology Education 15 287
[8] Cope L 2015 Math manipulative: Making the abstract tangible Delta Journal of Education 5 10
[9] Boggan M, Harper S and Whitmire A 2010 Using manipulatives to teach elementary mathematics Journal of Instructional Pedagogies 3 1
[10] Jaelani A, Putri R I I and Hartono Y 2013 Students’ strategies of measuring time using traditional Gasing game in third grade of primary school Journal on Mathematics Education 4 29
[11] Haris D and Putri R I I 2011 The role of context in third graders’ learning of area measurement Journal on Mathematics Education 2 55
[12] Yanti S, Rif'at M and Suratman D 2015 Pemanfaatan media kit dalam proses pembelajaran matematika di SMP Negeri Kota Pontianak Jurnal Pendidikan dan Pembelajaran 4 5
[13] Nurhanif 2015 Pembelajaran keliling dan luas bangun datar menggunakan media KIT matematika di Klas III A Sekolah Dasar Negeri 16 Banda Aceh Undergraduate Thesis (Aceh: Universitas Syiah Kuala)
[14] Manuring E, Sugiatno and Yani A 2013 Pengembangan aktivitas belajar matematika berbantuan alat peraga kartu KIT di Kelas IV SD Jurnal Pendidikan dan Pembelajaran 2 24
[15] Young J R 2017 Technology integration in mathematics education: Examining the quality of meta-analytic research International Journal on Emerging Mathematics Education 1 71
[16] Fathurrohman M, Porter A L and Worthy A L 2017 Teachers’ real and perceived of ICT supported-situation for mathematics teaching and learning International Journal on Emerging Mathematics Education 1 11
[17] Khomsiatun S and Retnawati H 2015 Pengembangan perangkat pembelajaran dengan penemuan terbimbing untuk meningkatkan kemampuan pemecahan masalah Jurnal Riset Pendidikan Matematika 2 92