The use of mobile learning at SMP Negeri 3 Karawang Barat in improving students' mathematical representation ability

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Abstract. The mathematical representation ability is a mathematically visual image either in a person's image, symbol, or expression, which is a mental picture of himself in learning mathematics. Many concepts of abstract mathematics lessons sometimes make students do not understand what they are learning, therefore the ability of mathematical representation is needed when students learn math. In growing the ability of mathematical representation, it is necessary an appropriate learning so that students can visualize it, namely using mobile learning. Mobile learning is a teaching learning activity that utilizes information and communication technology that refers to mobile handheld devices through mobile devices such as mobile phones, smartphones, tablets, personal digital assistance (PDAs), notebooks and netbooks, with availability teaching materials that can be accessed at any time as well as interesting and interactive material visualization in it. The results show that students using mobile learning achievement of representational ability is better than students who use conventional learning.

1. Introduction
Current technological advances this is on various communities are very quickly felt everywhere [1]. If we look at the aspect of education, the beneficiaries of the progress of the development of these technologies are still not felt so great, most are more used as business media, or just entertainment [2]. It is not good if the use of this technology is not balanced with the positive side [3]. The progress of a nation cannot be separated from how the development of education in the country. Indonesian people put education is the main focus that must be considered, so that Indonesia requires 9 years of study [4].

Educational success cannot be separated from how students learn, and learning success can be done through various things, including the application of the model or the learning design [4]. Along with the development of technology, there are several concept learning that applying technology in the teaching learning process among other on line learning, electronic learning, and computer based learning and there are also mobile learning [5]. One interesting and medium learning developing now this is mobile learning, mobile learning is a teaching and learning activity that to take advantage of Information and communication technology that refers to mobile devices moving through mobile devices such as handphone, smartphone, tablet, personal digital assistance (PDA), notebook, and netbook, with the availability of teaching materials that can be accessed at any time and visualization of interesting and interactive material therein [5][6]. This learning makes it easy for students to learn, especially in learning mathematics.
Mathematics has a lot of abstraction material, something not tangible in concrete or real form, but can only be imagined in mind alone [7]. Therefore the use of mobile learning is good to apply because of the visualization [8], so that things this can helps in growing students' mathematical representation abilities in learning mathematics.

The ability of representation is very important, because it is a mental picture of a person in a mathematical visualization either through images, symbols, or mathematical expressions. From all of these discussions, then need researched in "Growing Mathematical Representation Ability Students use Mobile Learning in SMPN 3 Karawang Barat ".

2. Methods
This research is a quantitative study using quasi-experimental methods, that is research experiment that not allow random sampling of subjects from the population, because the subject (students) naturally have formed in one group (one class). This quantitative research using pretest-posttest control group design [9].

On research this there is two group student researched in mathematical representation ability (KRM). The first group using Mobile Learning (ML) as an experimental group, and the second group using Conventional Learning (CL) as a control group. The population in this study were all eight grade students of SMP N 3 Karawang Barat with 630 students. From each of these schools two classes were chosen individually random cluster sampling, as a sample in the study, and selected class VIII C as an experimental group of 42 students, and class VIII E as a control group of 43 students.

3. Results and discussion
Research this aim at for analyze the quantity of mathematical representation abilities student based on type learning, namely by using Mobile Learning (ML) and Conventional Learning (CL). Data on mathematical representation ability (KRM) is obtained through grades pretest, and posttest which then next testing statistics with compare between group basis whole. Before presenting a detailed data analysis, the following is presented an overall description of students’ mathematical representation abilities including average ($\bar{x}$) and standard deviation ($s$) from value data pretest, and posttest. A summary of the statistical description of students’ KRM score data is presented in table 1.

|                | ML         | CL         |
|----------------|------------|------------|
| N              | 42         | 43         |
| $\bar{x}$      | 3.38       | 3.40       |
| $s$            | 3.08       | 2.04       |
| Postest        | 15.50      | 11.53      |
| Pretest        | 3.40       | 3.08       |

Based on table 1 the student KRM score data generally shows the average mathematical representation ability student before being given the learning the two classes are the same, that is not greater than three, but after learning is given to the experimental class that uses Mobile Learning and class control that uses Conventional Learning the results are different. The achievement of the experimental class KRM from the data description of the data is on average better than the control class. More clearly, the percentage of student posttest results based on the whole can be seen in figure 1 as follows.
Based on figure 1, the percentage of KRM achievement of students who use Mobile Learning greater than students who use Conventional Learning. Furthermore, to ensure the accuracy of the data and answer the problem formulations and hypotheses in this study, namely "The achievement of mathematical representation abilities of students who use Mobile Learning better than student that use Conventional Learning ". Then analyzed in more depth with statistical testing and review so it looks clear how the results. To answer the problem formulation and this hypothesis, analyzed by comparing values pretest and posttest KRM. In detail, the comparative data on the average value is analyzed as follows:

3.1. Data pretest KRM

Data analysis pretest conducted to find out how the student KRM before given treatment, whether sample research has the same or different mathematical representation capabilities. The descriptive analysis of Table 1 can be seen as mean pretest mathematical representation abilities of experimental group students who use Mobile Learning and group control that uses Conventional Learning not too different, then proceed with the value statistical test pretest KRM students with normality test and homogeneity test, in order to get the accuracy of the data in order to know the test in parametric and non-parametric. Summary of normality value test results pretest KRM is presented in table 2.

| Design | N  | Sig. | Conclusion                  | Ket          |
|--------|----|------|-----------------------------|--------------|
| ML     | 42 | 0.003 | H₀ rejected                 | Not Normal   |
| CL     | 43 | 0.090 | H₀ rejected                 | Not Normal   |

H₀: Samples are normally distributed.

Based on the results of the normality test with Shapiro-Wilk presented in table 2, conclusions can be drawn, including values pretest KRM in class ML and class CL distributed not normal, so it is not continued to see its homogeneity, but directly to nonparametric statistical testing using the Man Whitney test. From the results of the average similarity test, it can be seen that the statement H₀ for value pretest overall KRM based on learning is accepted (sig. 0.828). In other words it can be said that the average KRM as a whole, does not different between the experimental groups that will use Mobile Learning with the control group that will use Conventional Learning.
3.2. Data Posttest KRM Achievement

Data analysis posttest conducted to find out how the KRM achievement of students after the treatment is given, whether the research sample has the ability of representation mathematically different students or test which one is better. The results of the analysis in the description can be seen that the mean posttest mathematical representation ability student experimental group that uses Mobile learning and the control group that uses Conventional the average KRM achievement is based on the whole. Learning looks different. Value data posttest Student KRM is data that can answer the formulated hypothesis, namely: Achievement of the mathematical representation ability of students who use Mobile Learning better than student that use Conventional Learning. In detail, the comparative data on the average value is analyzed as follows.

Data posttest overall the experimental and control groups first test for normality and homogeneity tests, so that testing can done parametric or non parametric. Summary of normality value test results posttest KRM is presented in table 3.

| Design | N   | Sig | Conclusion   | Ket  |
|--------|-----|-----|--------------|------|
| ML     | 42  | 0.018 | H_0 received | Not Normal |
| CL     | 43  | 0.064 | H_0 rejected | Normal  |

H_0 Samples are normally distributed.

Based on the results of the normality test with Shapiro-Wilk, the values are posttest the overall achievement of the KRM only in the CL class is entirely distributed normal, so not the homogeneity test continued and was tested non-parametrically directly with the Whitney Man test. From the results of the average difference test, it can be seen that the statement H0 for value posttest KRM achievement in a manner whole based on learning is rejected (sign. 0.001). In other words it can be said that Normality Test values Posttest KRM in a manner significant different among group experiments that use Mobile Learning with a control group that uses Conventional Learning. Based on data analysis the average achievement of students’ mathematical representation ability and the results of the analysis of differences in the data test posttest KRM, it can be concluded that "The achievement of mathematical representation abilities of students who use Mobile Learning better than students who use Conventional Learning”.

Figure 2. Socialization of Mobile Learning.

Achievement of these students is also seen from student activities during mobile learning, enthusiastic students at the beginning of learning show they are excited by paying attention to the learning process explained by the teacher in front of the class, as seen in figure 2.
In the process the use of mobile learning is a learning activity that utilizes learning technology information and communication that refers to the device handled moves through mobile devices like handphone, Smartphone, Tablet, digital personal assistance (PDA), notebook, and netbook, with the availability of teaching materials that can be accessed at any time and visualization of interesting and interactive material. So that, each student in the group digs information related to the material they will learn through the mobile device.

In the implementation of mobile learning uses a scientific approach through the process of observation, asking exploration, association and communication so they can better understand what they will learn. Mobile devices become a medium that can connect students’ misunderstanding through visual images of material that are visible from the applications that are in mobile devices, as shown in figure 3.

In use mobile learning material mathematics pictured clearly so that the meaning can be understood by students. In line with this, Burton [10] said that representation relates to re-presentation, not an original idea but a version built from it. With mobile learning, students get new ideas from what they see and understand. They learn from pay attention to the impressions presented in the material presentations in mobile learning, as shown in figure 4 student observation activities. Figure 4 shows how the process Representation the took place, because as said Danesi mentions [11] that representation is a process record ideas, knowledge, or messages in a number of physical ways. The ability of mathematical representation is very important because it helps students gain new knowledge and ideas from existing ones.
Barker [12] argues that representation is the main study cultural studies which focuses on how the process of meaning of representation itself, so representation is cultural studies that is meaning that has a material nature, embedded in spoken (spoken) or written language. Language becomes an intermediary in interpreting something (symbols, pictures, graphics or writing) that can express thoughts, concepts, or ideas.

Result from representation either in the form of writing, pictures, graphics, or symbols that have meaning. The statement is in line with that delivered by Hall [13] in the book Representation: Cultural Representation and Signifying Practices, “Representation connects meaning and language to culture... Representation is an essential part of the process by which meaning is produced and exchanged between members of culture”.

In learning mathematics sometimes students often find errors in the meaning of an existing representation, so that in the process of use mobile learning This provides an opportunity for students to be able to discuss ideas with one another to get the same understanding, this is shown in figure 5 exploration and association activities student in finishing problems given by the teacher.

Activity mobile learning this when viewed from the process could grow mathematical representation ability of students through devices mobile which is provided by presenting the material well through the application mobile, so it can be connecting ignorance of students in the material learned. With the help of a device mobile. These, each student can learn anytime and anywhere and also can discuss with anyone. Sometimes many students are reluctant to ask questions directly with the teacher, but with this mobile device students are shy even though they can dialogue with that uses mobile learning is better than teacher without being seen, and also students whose good representation
ability will be accurate in solving mathematical problems, Hakim [14] Argue in contrast to those with low representation ability, will answer quickly without thinking visually.

The achievement of KRM cannot be separated from the support of information obtained student through network Internet, which can access any information they don't know about. So that their abilities are not only limited to information obtained from the display of material in applications, teachers and books, even their abilities more developing again different from conventional learning which is more dominated by teachers and students, students listen more and do what the teacher conveys. By using student mobile learning no longer limited by classroom walls to explore their knowledge, because with this mobile learning KRM students are achieved as a result of the clarity of the material displayed in a mobile device, as well as the accuracy and context that is described about what they are learning.

4. Conclusions

Based on analysis data and discussion that had been put forward previously it can be concluded that the achievement of students' mathematical representation ability in SMPN 3 Karawang Barat student that use conventional learning, so with mobile learning this can foster students' mathematical representation ability even better. In using mobile learning should prepare and check in advance all mobile device that will be used, so that at the time of implementation it can run smoothly and as expected.

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References
[1] Maceli M and Burke J J 2016 Inf. Technol. Libraries 35 35-63
[2] Coad A, Nightingale P, Stilgoe J and Vezzani A 2020 Industry and Innov. 27 1-11
[3] Mayer C H and Oosthuizen R M 2020 Int. Rev. Psychiatry 32 1-14
[4] Nuryana Z, Nurcahyati I, Rahman A, Setiawan F and Fadillah D 2020 Univers. J. Educ. Res. 8 583-90
[5] Bernacki M L, Greene J A and Crompton H 2020 Contemporary Educ. Psychology 60 101827
[6] Al-nassar B A Y 2020 Int. J. Mobile Lear. Organisation 14 277-306
[7] Bleeker M 2020 Philosophy Today 63 845-58
[8] Yang H Y 2020 Int. J. Human–Computer Interaction 36 669-84
[9] Ruseffendi, E T 2010 Dasar-Dasar Penelitian Pendidikan dan Bidang Non-Eksakta Lainnya. Bandung: Tasito.
[10] Burton G 2007 J. Educ. Teaching 33 5-17
[11] Danesi M 1994 Cool: the signs and meanings of adolescence (Ontario, Canada: University of Toronto Press)
[12] Barker C 2009 Cultural Studies: Theory and Practice (Yogyakarta: Banteng Reader)
[13] Hall S 2003 Representation: Cultural Representation and Signifying Practices Ed. Stuart Hall (London: Sage publication)
[14] Hakim D L 2017 Penerapan Mobile Learning Dalam Mengembangkan Kemampuan Komunikasi Matematis, Representasi Matematis, dan Kemandirian Belajar Matematika Siswa Thesis Universitas Pendidikan Indonesia