THE EFFECT OF USING ANDROID-BASED MATHEMATICS DICTIONARY MEDIA TOWARD STUDENTS LEARNING OUTCOMES

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Abstract

During learning, math teachers focus on teaching the use of existing formulas without explaining the meaning of each symbol and term in mathematical formulas. In addition, teachers still rarely use learning media which impacts students' low math learning outcomes. Therefore, researchers developed an android-based math language dictionary media to know the effect of using this learning media. With a quantitative approach, researchers used quasi-experiment research with a one-group pretest-posttest design. The population used included all XII grade students of MAN Batu Bara as many as 247 students with a sample of 34 from class XII IPA 3 which was selected by a random group. From the analyzed data, the study's results using the t-test showed a significance value (Sig 2-tailed) of 0.00 < α = 0.05, which means that there is a difference in learning outcomes between before and after using the mathematics language dictionary media. Thus, it can be concluded that there is an effect of using Android-based math language dictionary media on student learning outcomes.

Keywords:*Learning media, Dictionary, Math language, Learning outcomes, Android-based*

Abstract

During the lesson, the mathematics teacher focuses on teaching the use of existing formulas without explaining the meaning of each symbol and term in the mathematical formula. In addition, teachers still rarely use instructional media which has an impact on student mathematics learning outcomes which are still low. Therefore, researchers developed an Android-based math language dictionary with the aim of knowing the effect of using the learning media. With a quantitative approach, researchers used a quasi-experimental research type with a one group pretest-posttest design. The population used included all students of class XII MAN Batu Bara as many as 247 students with a sample of 34 from class XII IPA 3 who were selected randomly in groups. From the data analyzed, the research results were obtained using the t-test which showed a significant value (Sig 2-tailed), which was 0.00 <value a = 0.05, meaning that there were differences in learning outcomes between before and after using the media of a mathematical language dictionary. Thus, it can be concluded that water can influence the use of Android-based mathematical language dictionary media on student learning outcomes.

Keywords:*Learning Media, Dictionary, Mathematical Language, Learning Outcomes, Android-based*

Introduction

In the world of education, mathematics is a subject that students must pass from basic education to university. With such circumstances it is hoped that mathematics can have a positive impact on students' mindsets that are beneficial for analytical, critical, systematic and logical thinking skills. This explains that the importance of learning mathematics is used as the initial human capital to live life. Mathematics is generally known as an abstract science because in principle, mathematical work is done deductively which requires proof of a mathematical theorem. (Kasman et al., 2022)The abstract nature of mathematics is also due to the existence of mathematical language terms. Where the term is formed from a collection of symbols or symbols, and foreign words that seek to eliminate

the ambiguity of a problem(Rahman, 2013). In learning, the language of mathematics which includes terms and symbols is the basic ability that must be possessed by students because by understanding the meaning of each term and mathematical symbol students can solve existing mathematical problems. Based on this, it is not surprising that students' mindsets emerge that mathematics is very difficult to solve because it comes from students' initial perceptions that are not good and result in decreased mathematics learning outcomes. (Aprilia & Fitriana, 2022).

In the learning process, the importance of learning outcomes for teachers is to review how far students' ability to understand learning, especially mathematics (Kosilah & Septian, 2020). So that mathematics teachers should behave professionally to try their best so that student learning outcomes can increase. Purnamasari et al., (2017)argues that one of the benchmarks for determining the level of success of students in understanding and solving a mathematical problem from the learning experience is the results of learning mathematics. However, the field shows the fact that about 75% of students have mathematics learning outcomes that do not achieve completeness. Furthermore, based on the results of observations made by researchers towards one of the mathematics teachers who taught at MAN Batubara, it was shown that almost 80% of all students had mathematics learning outcomes below the set KKM average score of 83.

Factors causing low student mathematics learning outcomes based on the results of observations of researchers in the field, namely the learning process applied by teachers where most teachers only explain the application of the formulas provided without explaining the meaning of the symbols and terms of the formulas given. According to Sujalmo & Budiarto (2013) revealed that students can solve every problem in mathematics by visualizing with symbols or terms, so students must understand every meaning of symbols or terms in mathematics. In addition, other causal factors that affect student learning outcomes are the lack of use of media that utilizes technology. This is supported Wangge (2020)that teachers need to adapt the learning process to technological sophistication in order to provide new experiences and influence on students' mathematics learning outcomes. This opinion is also supported by Winda & Dafit (2021)that the use of technology-based learning media in learning mathematics is still rarely used due to the teacher's lack of insight into technology so that in the learning process only teaches in a monotonous manner.

Based on the problems above, one form of effort that can be made to deal with the problems above is that the teacher can explain each meaning of a mathematical symbol or term in learning with the help of android-based learning media. Siregar & Hasanah (2022)explained that the use of android application-based learning media can facilitate students in understanding learning and can also solve problems given by the teacher. In this study, the researchers provided a new alternative in the form of using an android-based mathematical language dictionary media during learning in the hope that there would be a positive impact so that it could improve students' mathematics learning outcomes. The Mathematical Language Dictionary is one of the Android-based learning media developed to make it easier for students to understand the meaning of mathematical terms and symbols accompanied by examples of questions and answers.

Some supporting research related to the math dictionary has been carried out by Salamah (2022)which shows that the use of a 3-language math mini-dictionary has an effect on the mathematics learning outcomes of students with moderate criteria. Research result Hamdani et al., (2021)showed that the development of an android-based math dictionary proved effective in improving students' mathematics learning outcomes. Almost all of the research conducted focuses on dictionaries which only contain formulas and examples of questions, but no one has yet discussed the effect of the media of mathematical dictionaries on student learning outcomes. In addition, this Android-based mathematical dictionary contains terms, symbols along with mathematical formulas and is equipped with examples of questions and an Android-based dictionary which can be accessed via a mobile phone. Therefore, researchers are interested in knowing the effect of using an android-based mathematical language dictionary media on student learning outcomes in class XII IPA 3 MAN Batubara. With the research hypothesis, namely that there is a significant influence between before and after the use of the android-based mathematical language dictionary media on student learning outcomes.

Method

Types of research

This study used a quantitative approach with a quasi-experimental research type where the research design was carried out in the form of a One Group Pretest-Posttest design which aimed to determine the effect resulting from the use of the media in a mathematical language dictionary on student learning outcomes. Pseudo-experimental research is an experiment that cannot choose a random sample from the existing population but is selected randomly in groups so that the clarity of the group's condition is not known before being given treatment(Abraham & Supriyati, 2022). The design to be used can be seen in Figure 1.

O1	X	O2

Picture1. Research Design Used

Information: O1 :*Pre-test*student mathematics learning outcomes
X : Treatment using the medium of a mathematical language dictionary
O2 :*Post-test*student mathematics learning outcomes

Time and Place of Research

This research was conducted in the even semester of the 2022/2023 academic year from January to February 2023 at the Batu Bara State Aliyah Madrasah located in Lima Puluh District, Batu Bara Regency, North Sumatra.

Population and Sample

The population in this study included all 247 students of class XII MAN. For sample determination, the researcher used randomly selected groups as the basis for determining the sample and obtained samples from class XII IPA 3 as many as 34 people.

Research Procedure

The procedure in this research was carried out in several stages, namely: 1) Preliminary analytical study, here the researcher made initial observations which then formulated the problem and identified it using literature studies and determined the development of research tools and research instruments which were then given to the validator to be tested for feasibility to be tested on students. 2) Determination of the research subject, here the researcher determines the population and selects the sample to be given treatment in the form of using an android-based mathematical language dictionary media. 3) Pre-test administration, predetermined samples will be given pre-test questions to see students' initial learning outcomes before being given treatment. 4) Application of Learning Media, after giving the pre-test then the use of media in the form of an Android-based mathematical language dictionary was applied to students during 4 meetings. 5) Giving a post-test, giving post-test questions is carried out after giving treatment to the sample which then obtains the final learning results in the research. 6) Evaluation and report writing, all learning outcomes that have been obtained from further research are evaluated to obtain quantitative data where the data is then analyzed using statistical analysis in the form of normality tests and t tests to conclude the final results of the research which are then reported in writing according to the guidelines set out in scientific writing.

Data Collection Techniques and Instruments

The data collected is a type of quantitative data with data collection techniques using student learning outcomes tests. For the instrument used, there are 10 questions in the form of an essay test which have been declared valid based on the results of validation by the mathematics teacher and have been tried out. The items on the instrument are designed to measure students' understanding abilities which are useful for knowing the results of learning mathematics before and after being given treatment.

Data analysis technique

Analysis of the data that has been collected is carried out using inferential statistical tests to do hypothesis testing. Hypothesis testing is carried out by conducting a prerequisite test first, namely the normality test using the Liliefors test from student learning outcomes data that has been obtained either pre-test or post-test. The prerequisite test hypothesis being tested is as follows:

Ho: The distribution of learning outcomes data is normally distributed

Ha: The distribution of learning outcomes data is not normally distributed

Ho's rejection criterion for level $\alpha = 0.05$ if Lcount is greater than Ltable. Then, after the prerequisite test was met, a paired sample t-test was then performed with $\alpha = 0.05$. The hypothesis tested is as follows:

Ho: There is no difference in learning outcomes between before and after learning using learning media

Ha: There are differences in learning outcomes between before and after learning using learning media

Test criteria reject Ho if the significance value (sig) < 0.05 and accept Ho if the significant value (sig) > 0.05.

Result and Discussion

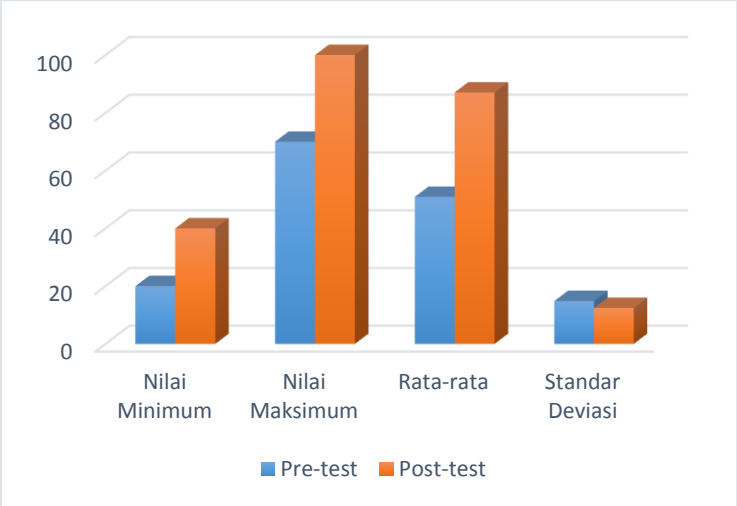
Results

After carrying out a descriptive analysis of the students' mathematics learning outcomes data tested with the pre-test and post-test questions, the results obtained can be seen in Table 1.

Table 1. Pretest and Posttest Data on Student Learning Outcomes

Test	Min Value	Maximum Value	Average	Standard Deviation
Pre-test	20	70	50.88	14.84
Post-test	40	100	87.06	12.43

From Table 1, the pretest data is obtained with a minimum value of 20 and a maximum of 70, and the mean and standard deviation are respectively 50.88 and 14.84. Meanwhile, the posttest data obtained with a minimum value of 40 and a maximum of 100, and the mean and standard deviation were respectively 87.06 and 12.43. It can be seen that the difference between the average pretest and posttest learning outcomes is 36.18 which indicates that there has been an increase before and after being given treatment. These results can be clearly compared in Figure 2.



Picture2. Analysis Results*Pretest and Posttest data*

Furthermore, a prerequisite test for inferential statistics was carried out, namely the normality test. This test uses the Lilieforster test on student pre-test learning outcomes and post-test learning outcomes in Table 2.

Table 2. Normality Test Results using Liliefors

Test	lcount	ltable
Pre-test	0.13995	0.15195
Post-test	0.14908	0.15195

Based on Table 2 it is known that the value of Ltable is 0.15195 so that each value of Lcount>Ltable then Ho is accepted which indicates that the distribution of learning outcomes data is normally distributed and fulfills the prerequisite test so that the paired sample t-test can be carried out in Table 3.

Table 3. Paired Sample T-Test Results

Means		t	df	Sig. (2-tailed)
Pre-test	***Post-test***			
50.88	87.06	-12.92	33	0.00

From Table 3 it can be seen that the significant value (Sig 2-tailed) is $0.00 < \alpha = 0.05$ so that Ho is rejected and Ha is accepted. In other words, there are differences in learning outcomes between before and after learning by using learning media. It can be concluded that water can influence the use of Android-based math language dictionary media on student learning outcomes.

Discussion

Through the research results obtained from analyzing the data showed that the average pre-test result was 50.88 and the post-test average result was 87.06 which indicated that there was an increase from before and after being given treatment. Based on the results of data analysis using the t-test, a significant value (Sig 2-tailed) was obtained, namely $0.00 < \alpha = 0.05$ which indicated that water could influence the use of android-based math dictionary media on student learning outcomes.

Based on the results of the study it is also known that student learning outcomes have increased after being taught using the Android-based mathematical language dictionary media. This is caused by several factors including the learning factor in this context, namely learning by using the android-based mathematical language dictionary media. The syntax for using learning media in learning is starting when the teacher is in class, at first the teacher explains some of the initial learning material, here the teacher facilitates students to observe and trains them to pay attention and the teacher gives freedom to students to ask questions to be able to visualize their views regarding their understanding.Novitasari & Fathoni (2022)revealed that giving freedom to students to ask questions about material that is not yet understood is one of the teacher's efforts to overcome difficulties in learning mathematics. After seeing that no one else will ask questions, the teacher uses the media-based mathematics dictionary to help students learn about mathematical symbols or terms that are not known to students, here students are given the freedom to study independently but with teacher supervision to understand each meaning of symbols and terms that are interrelated. After understanding, students can try the exercises available in the application to develop their ability to solve math problems with peers. By doing learning communication between peers students can grow self-confidence and will be more motivated to solve math problems, and be able to think at a higher level,(Ahdiyat, 2014).

In addition, the factors that affect other student learning outcomes are the use of Android-based learning media. The media was developed to assist students in dealing with math problems. According to the opinion of(Tumanggor et al., 2020)that android-based learning media programs can help student activities in learning mathematical formulas or concepts, besides that the use of these media is practically used anywhere and anytime. Furthermore, this Android-based dictionary media will be able to increase students' learning interest in learning mathematical formulas or concepts. This will be able to improve students' mathematics learning outcomes.

Based on the explanation above, there are differences in the learning outcomes of students who use the Android-based mathematical language dictionary media and those who do not use the media. This is because the use of Android-based learning media can increase students' motivation and mathematical communication skills in participating in mathematics learning.(Jihad & Lasmanah, 2019). Based on this, it can be concluded that there is an effect of the use of Android-based mathematical language dictionary media on student mathematics learning outcomes. The results of this study are in line withHamdani & Priatna (2021)which revealed that the use of mathematical dictionary media in learning has a positive impact that can improve students' mathematics learning outcomes. It is supported byHidayat et al., (2018)that there is an influence in learning the use of mathematical formulas using an Android-based mathematical dictionary.

Conclusion

Differences in student learning outcomes before and after using the Android-based mathematical language dictionary media. So that it can be stated that there is a significant influence between before and after the use of the Android-based mathematical language dictionary media on student learning outcomes. Therefore, the benefits that can be drawn from this research are that it is hoped that it can add to the insights of mathematics teachers so that they can apply and develop an android-based mathematical language dictionary media in learning to improve student learning outcomes.

References

Abraham, I., & Supriyati, Y. (2022). Quasi-Experimental Design in Education: Literature Review. Mandala Education Scientific Journal, 8(3), 2476–2482. https://doi.org/10.58258/jime.v8i3.3800

Ahdiyat, M. (2014). The Peer Tutor Method for Improving Mathematics Learning Outcomes in Data Processing Materials. Formative Journal: Journal of Mathematics and Natural Sciences Education, 4(1), 71–79. https://doi.org/10.30998/formatif.v4i1.141

Aprilia, A., & Fitriana, DN (2022). Students' Initial Mindset Against Difficult and Scary Mathematics Learning. PEDIR: Journal of Elementary Education, 1(2), 28–40. https://pedirresearchinstitute.or.id/index.php/Pedirjournalelementaryeducation/article/view/69

Hamdani, MF, & Priatna, N. (2021). Development of Android-Based Mathematics Learning Media for SMP/MTs and SMA/MA Students. Juring (Journal for Research in Mathematics Learning), 4(4), 163–170. https://doi.org/10.24014/juring.v4i2.12795

Hidayat, D., Ramli, & Purba, TA (2018). Android-Based High School Mathematical Formula Application Development. Journal of Informatics Engineering Research, 3(1), 43–50.

https://doi.org/10.34012/jutikom.v1i1.308

Jihad, A., & Lasmanah, A. (2019). Android-Based Mathematics Learning to Improve Mathematics Communication Skills in Middle School. Journal of Analysis: Mathematics Education Study Program, 5(2), 199–205. https://doi.org/10.15575/ja.v5i2.6884

Kasman, RN, Rustina, R., & Herawati, L. (2022). Analysis of Students' Mathematical Deductive Reasoning Ability in View of Mathematical Logical Intelligence. Congruent Journal, 1(3), 249–258. https://publikasi.unsil.ac.id/index.php/kongruen/article/view/2552

Kosila, & Septian. (2020). Application of the Assure Type Cooperative Learning Model in Improving Student Learning Outcomes. Journal of Research Innovation, 1(6), 1139–1148. https://doi.org/10.47492/jip.v1i6.241

Novitasari, A., & Fathoni, A. (2022). The Role of the Teacher in Overcoming Students' Learning Difficulties in Elementary School Mathematics. Basicedu Journal, 6(4), 5969–5975. https://doi.org/10.31004/basicdu.v6i4.3168

Purnamasari, M., Isman, J., Damayanti, A., & Ismah. (2017). Efforts to Improve Mathematics Learning Outcomes Against the Concept of Building Material Areas and Volumes of Blocks and Cubes Using the Drill Method of Class VIII Al-Ghazali Islamic Middle School. FIBONACCI: Journal of Mathematics and Mathematics Education, 3(1), 45–52. https://doi.org/10.24853/fbc.3.1.45-52

Rahmah, N. (2013). The Nature of Mathematics Education. Al-Khwarizmi: Journal of Mathematics and Natural Sciences Education, 1(2), 1–10. https://doi.org/10.24256/jpmipa.v1i2.88

Salama, N. (2022). Development of a Mathematics Mini Dictionary in 3 Languages [Fatmawati Sukarno Bengkulu State Islamic University]. http://repository.iainbengkulu.ac.id/id/eprint/9795

Siregar, TJ, & Hasanah, RU (2022). The Effect of the Android Application Assisted Group Inverstigation Learning Model on Students' Mathematical Habbits of Mind. AXIOM*: Journal of Education and Mathematics*, 11(1), 1–10. https://doi.org/10.30821/axiom.v11i1.10776

Sujalmo, N., & Budiarto, MT (2013). Profile of Students' Understanding of Symbols, Letters, and Signs in Algebra in terms of Students' Mathematical Abilities and Rigorous Mathematical Thinking (RMT) Cognitive Functions. MATH Dunesa: Journal of Education Mathematics, 2(3), 1–8. https://doi.org/10.26740/mathedunesa.v2n3.p%25p

Tumanggor, LM, Haryanto, Ee. V., & Akbar, MB (2020). Planning for Android-based Mathematical Formula Learning Media Applications for High Schools. FTIK Journal, 1(1), 451–462. https://e-journal.potential-utama.ac.id/ojs/index.php/FTIK/article/view/880

Wangge, M. (2020). Implementation of ICT-Based Learning Media in the Process of Learning Mathematics in Middle Schools. Fractals: Journal of Mathematics and Mathematics Education, 1(1), 31–38. https://doi.org/10.35508/fractal.v1i1.2793

Winda, R., & Dafit, F. (2021). Analysis of Teacher Difficulties in Using Online Learning Media in Elementary Schools. Journal of Pedagogy and Learning, 4(2), 211–221. https://doi.org/10.23887/jp2.v4i2.38941