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The Effect of Contextual Learning Trough Teaching Materials Application-Based on Problem Solving Ability

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a b s t r a c t

Explanation of material is still in the form of calculations and teaching materials used are in the form of teaching modules that are not based on contextual problems. This is difficult to apply in bold learning, so students still have difficulty solving problems. This study aims to measure the effectiveness of contextual learning using application-based teaching materials on students' problem solving abilities. This research method uses true experimental, while the research design used is a randomized posttest only control group. The subjects in this study were class VII A and VII B with a total of 64 students. The data collection in this research uses quantitative data and the instrument used is a mathematical problem solving ability test. Data analysis in this study was using one-sample t-test and independent t-test. The results of the calculation that students have achieved the minimum criteria completeness score that is more than 70, this can be seen in the results of the one-sample t-test which obtained a sig value of 0.008 and students who used contextual learning with application-based teaching materials were better than contextual learning. This can be seen in the independent t-test, which obtained a value of sig .000, meaning that the value of sig < 0.05. So that contextual learning uses application-based teaching materials for problem solving that is effectively applied in learning mathematics.

Keywords:
Applications; Contextual; Problem-Solving; Teaching Materials.

INTRODUCTION

Learning in schools today must encourage students' abilities to achieve learning goals (Haqq, 2020; Sakinah, Darwan, & Haqq, 2019). Achieving learning objectives requires innovation to be carried out. This is in line with the statement explaining that the innovations that have been made in education are making interactive teaching materials, which are teaching materials that combine two or more media such as audio, text, graphics, images or animation. (Kurniawati & Nita, 2018).

Teaching materials are one of the devices / materials in the learning process that help students or readers understand certain materials (Juniantari, Mahayukti, Gita, & Suryawan, 2020; Rizki & Linuhung, 2017). In line with this, teaching materials are all information in the form of text, visuals, audio or a combination of the three that are needed by students to be studied, in order to achieve complete and integrated competence. As with teaching materials in learning mathematics, teaching materials also need to make it easier for students to understand the material taught by the teacher (Hidayat, Hapizah, Susanti, & Scristia, 2020).

The teaching materials are able to use android applications that students are accustomed to using today's mobile devices. In line with this that along with the development of technology, the development of teaching materials is directed at the use of technology, with the use of this technology also makes learning mathematics more interactive, interesting, and fun. Utilization of technology at this time is utilizing smartphones or mobile phones based on Android or IOS that are already owned by students (Hariyono & Widhi, 2021).

Nowadays, almost every student has an android smartphone, and uses it almost for every situation including for studying. Android is a software platform used for mobile devices consisting of an operating system, software, middleware, and the main user of the application. Android in this study will be used as an application that is installed on a smartphone in the form of a learning application (Astra & Mardiana, 2018; Komariah, Suhendri, & Hakim, 2018). Therefore, learning using Android-based teaching materials is an innovation that can be applied in learning.

Learning using application-based teaching materials is something that needs to be done in current learning, application-based teaching materials also support student success in the learning process (Hakim, 2018). This kind of learning makes students more flexible in learning with these teaching materials, besides this application-based teaching material contains evaluations that can develop complex problem solving into simple ones. The teaching materials are set to be Android teaching materials because students are now familiar with smartphones and almost all students have smartphones.

But in reality, not a few students use Android for things that are not useful, such as playing games, updating status on social media and so on. If you don't pay attention, this will have a negative impact on students (Kristiwati, Irfan, & Arifuddin, 2019). In line with this, there is a tendency that the higher the intensity of using Android in a negative way, the lower the student's learning discipline (Cecep, Mutaqin, & Pamungkas, 2019). In other words, students will be lazy to study because they are addicted to using Android. Therefore, to minimize the negative impact of using Android, Android-based teaching materials are needed that can be used anytime and anywhere. So that teachers are able

to carry out their role as educators not only in the classroom but wherever and whenever students use Android (Gideon, 2018; Palevi, Saputri, & Vebrianto, 2020).

While the teaching materials used by teachers so far can be said to be very limited. The teaching materials used so far are textbooks or ebooks, these teaching materials cannot be categorized as contextual based so that students find it difficult to understand the contents of the book (Kusumadewi, Neoloka, & Yasin, 2020). In addition, the fact is that the existing books have not integrated teaching materials with computer media. Most of the existing materials are not contextual-based or related to the real world, so that mathematics learning is considered by some students to be a difficult subject. This is due to many factors, for example the low level of student learning to learn mathematics, it could also be due to the material that is considered difficult or even from the teaching materials that make it difficult for students. (Abbas, Ismail, & Dayani, 2021; Rizki & Linuhung, 2017). One of the causes of the low level of student learning is the problem solving ability of students.

The statement is shown by Trends in International Mathematics and Science Study that the low level of student learning, one of which is the low problem solving ability which states that mathematical problem solving in Indonesia is still considered low, while the TIMSS results state that the average mathematics of students in Indonesia is 406, ranked 40th out of 42 participating countries (PIRLS, 2016). The Program also demonstrates it for International Student Assessment (PISA) provided by the Organization for Economic Cooperation and Development (OECD, 2019) showing that Indonesian students rank 72 out of 78 countries tested in mathematical problem-solving abilities. According to the survey results, students' mathematical problem-solving abilities are still lacking.

The findings of the study's observations and interviews at schools revealed that the low skill of students' mathematical problem solving was caused by the fact that most of the pupils struggled when given issue solving challenges that were applied to real-world situations. These kids' difficulties stem from the fact that they are not addressing non-routine situations. Therefore their mathematical problem-solving abilities have not been honed. In-class practice questions are still typically in the form of common questions. When the teacher asks challenging questions comparable to those shown in the class, the students are guided to solve the problems using the taught strategies. As a result, students assume it is adequate to answer mathematical problems by copying or replicating the teacher's work.

Based on this description, the researchers conducted research with the aim of measuring the effectiveness of contextual learning using application-based teaching materials on students' problem solving abilities.

LITERATURE REVIEW

Teaching materials are any resources or materials that are systematically arranged that are used to aid teachers in carrying out learning activities in order to provide a favorable learning environment for pupils. The outline includes the knowledge, attitudes, and skills that students must acquire to fulfill their learning objectives (Hamdani, 2011; Legendari & Raharjo, 2016). Teaching materials are any items (including information, tools, and texts) that are organized systematically, and their contents are competencies that students must learn (Bawamenewi, 2019). Furthermore, it is mentioned that one of the critical components in the learning process is instructional materials. The availability of superior teaching materials can improve the learning process by making it more conducive, methodical, and practical. Teaching materials must provide students with minimal knowledge following the skills to be attained; teaching materials should provide

sources of information and knowledge and serve as a guide in the learning process (Lestariningsih & Suardiman, 2017; Lukman & Ishartiwi, 2014).

Android application is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications. The android platform consists of a Linux-based operating system, a GUI (Graphic User Interface), a web browser and end-user applications that can be downloaded and developers can freely work and create the best and open applications for use by various devices (Munir & Setyoningsih, 2018). The existence of Android is one of the platforms that can be developed in learning, namely integrating Android-based teaching materials. This Android-based teaching material is something new in the world of education, this learning media is usually in the form of an educational application or application that contains learning materials and materials (Hakim, 2018). These application products can be downloaded on smartphones and gadgets with the Android operating system, usually already available on Google Play or the Play Store. Basically, learning media based on Android applications is a learning media product in the form of an application that can be downloaded or downloaded on an Android-based smartphone.

Mathematical problem solving is overcoming obstacles to reach the desired results (Putri, Suryani, & Jufri, 2019). A teacher's role in teaching pupils problem-solving abilities is to encourage students to accept and answer inquiries and direct them to problem-solving solutions (Ahmad & Asmaidah, 2018). Problem-solving abilities must be emphasized during the mathematics learning process because students will be pushed to think extensively and creatively to solve the challenges they meet. The primary goal of teaching problem-solving in mathematics is not merely to provide students with a set of skills or methods but also to allow students to reflect on what they think (Elita, Habibi, Putra, & Ulandari, 2019). In this example, consideration of what is thought refers to pupils' understanding of their ability to devise many viable solutions to issues.

The following are the steps for resolving the mathematical problem: (1) Understanding the problem, which includes identifying the known elements, the elements being asked, and determining the adequacy of the elements for problem-solving; (2) linking known and asked elements and formulating them in the form of a mathematical model of the problem; (3) selecting a solution strategy, elaborating and carrying out calculations, or completing a mathematical model; and (4) interpreting the results of the original problem and re-examining the correctness of the so-called solution (Nasir, 2021; Polya, 1973).

Contextual teaching and learning is an approach that involves active students in the learning process to discover the concepts being studied. The subject matter studied is linked to the knowledge possessed and the real world of students and can encourage students to make connections between their knowledge and its application. in everyday life. Mathematics, which is deemed tough and perplexing, can be modified by studying in the context of the student. After learning mathematics, it is believed that students will be able to solve difficulties, particularly real-world challenges. Therefore learning must be relevant to students' lives (Nurhana & Abdullah, 2021; Selvianiresa & Prabawanto, 2017).

The contextual approach consists of seven components: (1) constructivism; (2) inquiry; (3) ask; (4) learning community; (5) modeling; (6) reflection; and (7) genuine assessment (Guntur, Kartono, & Junaedi, 2020; Mawarni, 2019).

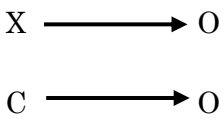
METHODS

Population and Sample

This study's population consisted of all seventh-grade students at SMP Negeri 1 Sukasari Subang in the odd semester of the 2020/2021 academic year, 224 students. The sampling approach employed is random sampling. As a result, the sample chosen is class VII A, 32 students.

Reseach Design

This sort of research uses quantitative methods. This quantitative study has an authentic experimental design, with two groups (experimental and control), and the sampling technique is simple random sampling, as group selection is random. The experimental group was treated with a contextual approach and application-based training materials. The control group, on the other hand, received contextual instructional learning. The quantitative research strategy employed is the randomized post-test-only control group, as shown below (Lestari & Yhudanegara, 2015).



Noted:
X: Learning employs a contextual approach with application-based teaching materials.
C: Learning through contextualized teaching and learning
O: A post-test to assess problem-solving skills.

Data Collection and Analysis

In this study, data collection tests the mathematical problem-solving ability provided to the experimental and control classes. PASW 18 Statistics software will be used to evaluate the data. This study's analysis employed both descriptive and inferential statistics. Descriptive statistical analysis is used to acquire the greatest, lowest, mean, and standard deviation information. While the inferential analysis in this study is using the one-sample T-test and Independent T-test. The one-sample T-test was conducted to find out the students on the results of their solving abilities, namely getting scores above the minimum criteria, while the Independent T-test was conducted to determine the differences between students who used andorid-based teaching materials and did not use these teaching materials. The two tests were analyzed in this study to test the effectiveness of contextual learning using android-based teaching materials. However, before testing the hypothesis, a prerequisite test is first performed. The prerequisite test for this data is that it will be tested for normality and homogeneity.

RESULT AND DISCUSSION

Result

Table 1 shows the outcomes of descriptive statistical data acquired from the mathematical problem-solving ability exam following learning therapy utilizing a contextual method with application-based teaching materials:

Tabel 1. Recapitulation of Problem-Solving Ability Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Post-test Result	64	35	96	63.52	15.090
Valid N (listwise)	64				

Table 1 shows the findings of descriptive statistics on problem-solving ability tests with a minimum of 35, a maximum of 96, an average of 63.52, and a standard deviation of 15,090. It demonstrates that the data are variable. However, the data will be further tested to see the effectiveness of learning. The findings of the pre-test are required to test the learning efficacy hypothesis. A parametric test confirmed this. Prerequisite tests included normality and homogeneity. Table 2 shows the data acquisition results:

Tabel 2. Normality Test Problem Solving Ability Test

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Results	Experiment	.151	32	.063	.948	32	.129
	Control	.121	32	.200*	.962	32	.310

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Based on Table 2, the normality test of problem-solving ability data indicated sig. 0.063 in the experimental class and 0.200 in the control class. So, 0.063 > 0.05 and 0.200 > 0.05 indicate normal results. Table 3 shows the homogeneity test:

Tabel 3. Results of Problem-Solving Ability Test Homogeneity

Levene Statistic	df1	df2	Sig.
.450	1	62	.505

Based on Table 3, the results of the problem-solving ability test were homogeneous if the sig value of 0.505>0.05, which means the data is homogeneous. The data are regular and homogeneous. Thus, the problem-solving ability test can proceed with parametric hypothesis testing. Table 4 shows the results of hypothesis testing using the one-sample T-test:

Tabel 4. One-sample results T-test Problem Solving

	Test Value = 70					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Experiment Result	2.817	31	.008	5.125	1.41	8.84

Based on Table 4, it shows that the results of the one-to-t-test by looking at the sig value of 0.008 means that 0.008 <0.05 so that students have fulfilled their learning requirements with a minimum score of 70 in classes that use contextual learning assisted by application-based teaching materials. This means that the existence of these teaching materials can improve the results of problem solving abilities. This allows students to practice their

abilities in application-based teaching materials. The independent T-test can be seen in Table 5:

Tabel 5. Independent T-test Problem Solving Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	.450	.505	9.669	62	.000	23.219	2.401	18.419	28.019
	Equal variances not assumed			9.669	60.670	.000	23.219	2.401	18.416	28.021

Based on Table 5 shows that the results of the independent T-test by looking at the sig value of 0.000 means that 0.000 <0.05 so that students who apply contextual learning with application-based teaching materials are more than classes that use contextual teaching learning. This means that learning using application-based teaching materials can follow effectively in accordance with the learning stages contained in the teaching materials so that students have no difficulty solving complex problems, while classes that do not use these teaching materials still have difficulty solving problem solving.

Discussion

The learning of students who still use teaching materials in the form of textbooks is currently not effectively applied to students who are familiar with gadgets. This is shown in the results of the study that classes that use the contextual teaching learning model and use teaching materials at school are still not effective enough to be applied in learning mathematics. This statement is proven by the results shown, namely in the difference test conducted with the independent T-test, where this test compares better learning between classes using Android-based teaching materials and classes using only textbooks. This is indicated by the results, namely the value of sig. <0.05 means that the class that uses contextual learning with application-based teaching materials is better than the class that uses contextual teaching learning. In line with this, it shows that by developing Android-based teaching materials and being applied in learning mathematics, it can improve student learning outcomes and these teaching materials are practically used both at school and at home (Hidayat et al., 2020; Irawati & Setyadi, 2021).

In line with this, which states that using Android-based teaching materials can improve student learning outcomes. This study also showed the same thing, namely the results obtained in the class that received learning using Android-based teaching materials had achieved minimum completeness, which was more than a score of 70. This was indicated by the results of the one-sample T-test. This test obtained a sig value of 0.008 <0.05, meaning that all students have completed the minimum. These results explain that contextual learning using Android-based teaching materials can make it easier for

students to solve problems, so that students can develop mathematical problem solving skills. This is in line with showing that comic-assisted contextual learning can improve higher-order thinking skills, it can be seen from the effectiveness of learning mathematics in its application in the classroom (Guntur et al., 2020). In addition, developing an Android-based pocket book can attract students' attention in participating in classroom learning and can improve student learning outcomes (Anita, Thahir, Komarudin, Suherman, & Rahmawati, 2021).

Thus the results that have been obtained with such results can be concluded that contextual learning with application-based teaching materials is effective on the mathematical problem solving abilities of junior high school students. This is reinforced by the theory which states that effective learning achieves goals in the form of increasing knowledge and skills and developing attitudes through the learning process. Based on this understanding, aspects of learning effectiveness can be stated, namely: (1) increasing knowledge; (2) skill improvement; (3) attitude change; (4) behavior; (5) adaptability; (6) increased integration; (7) increased participation; (8) increased cultural interaction (Hamdani, 2011).

CONCLUSION AND IMPLICATION

Contextual learning using application-based teaching materials is effective in learning mathematics. This learning makes it easier for students to solve contextual mathematical problems. The learning is limited to the material of the system of linear equations and the ability to be developed, namely problem solving. However, the implication is that there are still some students who do not have their own smartphones but still have them with their parents. So that learning is hampered if the smartphone is not held by students. Further research can be done using hybrid learning or blended learning so that those who have smartphones are still together with their parents and can maximize it face-to-face.

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