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The Effect of Problem Based Learning Model Assisted by Edunum Application on Numeracy Skills

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Abstract

The purpose of this study was to determine the effect of Problem Based Learning model assisted by EduNum application on students' numeracy skills at SMAN 4 Kendari. The method in this study used Quantitative and Quasi Experiment type of research with Post-Test Only Control Grub Design research design. The results showed that there was an effect of Problem Based Learning model assisted by EduNum application on students' numeracy skills at SMAN 4 Kendari. This is based on the results of descriptive analysis for the numeracy skills of students in the class using the Problem Based Learning learning model assisted by EduNum application has an average of 81.11 with a percentage of 50% high ability category, 43.33% medium ability category and 6.67% low ability category while the class using the Problem Based Learning learning model without the help of EduNum application has an average of 71.39 with a percentage of 26.67% high ability category, 53.33% medium ability category and 20% low ability category. The results of inferential statistical analysis (independent test) obtained significant greater than 0.05 which means that there is an effect of Problem Based Learning learning model assisted by EduNum application on the numeracy skills of students at SMAN 4 Kendari.

Keywords:edunum; numeracy, problem based learning.

INTRODUCTION

The problem of low quality of educational outcomes is a fairly complex problem because the causes can consist of many factors. To deal with the problem of the low quality of educational results, it is necessary to look for various possible causes related to various factors that affect the success of student learning in a particular field of study, for example mathematics (Irsyad et al., 2023). In learning mathematics in Indonesia, students' ability to master mathematics is quite low. The 2018 (PISA) results were released on Tuesday, December 3, 2019. Based on the results of the study, the PISA ranking for Indonesia in 2018 fell when compared to the PISA results in 2015. In the math category, Indonesia ranked 73 out of 79 countries with an average score of 379. This result decreased compared to 2015 where the results reached an average score of 386, (Siagian et al., 2023). While the results of TIMSS 2015 Indonesia is ranked 44 out of 49 countries with a score of 397 and is in the category (low 400) low (Ulwiyah et al., 2024).

The process of learning mathematics at school also faces a number of problems. Teachers must choose and determine the right learning materials, strategies and media in order to help students achieve certain competencies. Learning mathematical concepts, generally uses symbols so that ideas or concepts can be communicated. With so many symbols or abstract concepts used, students think negatively about mathematics and think that mathematics is a difficult subject to learn (Dewi & Simamora, 2022). According to (Marasabessy et al., 2023)

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said that the difficulties experienced by students in learning mathematics, namely tend to be unable to read problems properly, unable to remember the right concepts or principles to use in solving mathematical problems, and unable to understand the problems faced in everyday life, or it can be said that students do not understand numeracy problems.

Numeracy skills are knowledge and skills in the use of various types of numbers and symbols related to basic mathematics to solve practical problems in different daily life contexts, analyze information presented in various forms (graphs, tables, maps, etc.), and be able to use interpretations to predict and make decisions (Gal et al., 2020). According to (Saefurohman et al., 2021) in simple terms, numeracy skills are the ability to use, understand and analyze mathematics in different contexts to solve different problems in everyday life. In our daily lives, math is very often used, for example when shopping, calculating the distance or time we take to go to a place, calculating land area, and all of that requires numeracy. From these different activities, numeracy skills are needed to make the right decision (Schreiber-Barsch et al., 2020).

Students who have good numeracy skills can get good learning achievement. Conversely, students who do not have good numeracy skills will have low learning achievement. Mathematics learning is inseparable from numeracy activities (Iswara et al., 2022). However, numeracy is different from thematic skills, although both are based on similar insights and skills, but the difference is in the empowerment of insights and skills.

The facts that occur in the learning process in class X SMA Negeri 4 Kendari are that learning only leads to the Poblem Based Learning learning model without using media assistance, so that the use of application media has never been applied in learning activities, providing material concepts by mathematics teachers to students is done concisely accompanied by solving simple example problems, students have difficulty when solving problems in the form of daily life problems or numeracy problems, learning assessment indicators still lead to numeracy skills only, and the use of technology in learning by mathematics teachers is still minimal. If this phenomenon is allowed to continue, it will have an impact on student learning achievement results. Therefore, it is necessary to have a learning strategy that trains students to be broader in understanding learning and the use of technology in learning to ensure the results of working on problems and visualizing abstract mathematical concepts.

Efforts to support students' understanding of mathematics require appropriate and dynamic learning designs following current development trends. Learning in the new paradigm adapts the concept of Merdeka Belajar program which is oriented towards learning outcomes by considering the potential and characteristics of students so that teacher competence is needed in designing and flowing good learning. One of the steps that can be taken is to implement mathematics learning using the Problem Based Learning model. The Problem Based Learning model is a learning that can train students in solving everyday problems (Bosica et al., 2021). This learning model has distinctive characteristics in the form of learning that begins and focuses on problems.

Research related to android-based math learning has been an interesting part of researchers' attention in recent years. The results of the study (Hendriawan & Septian, 2019), revealed that the development of JiMath media as an android-based math learning multimedia has a level of effectiveness that meets the category of very feasible with the average numeracy ability increasing. Research (Nisa, 2023), provides results that the use of the quizizz application for the Problem Based Learning model can improve numeracy skills in students. Another study conducted by (Afriana, 2021), there was an increase in student learning outcomes after the implementation of PBL assisted by Diffa_ SAC media, characterized by the average acquisition of student learning outcomes.

In this research, Problem Based Learning is applied differently, namely with the help of the EduNum application, where the Problem Based Learning model assisted by the EduNum

application is a system design model that has the advantage of being able to facilitate system developers in designing the system to be created because of its object-oriented nature. One of them is the Problem Based Learning model with media assistance which is a learning model that involves the activeness of students in solving problems and learning the relationship between knowledge and these problems. The Problem Based Learning model is in line with the theory of constructivism. Where in the theory of constructivism according to Piaget, learning is a process of discovering knowledge or theories that are built according to the reality in the field.

Based on this background, the purpose of this study is to determine the effect of the Problem Based Learning model assisted by the EduNum application on student numeracy skills at SMAN 4 Kendari.

METHODS

The type of research used in this study is experimental research, because this study seeks the effect of treatment in the form of Problem Based Learning model assisted by EduNum on students' numeracy skills. The type of experimental research used is Quasi Experimental Design (pseudo experiment), because not all factors that influence the research can be fully controlled. The research place where researchers conducted data collection in Class X SMAN 4 Kendari with a group of classes used as many as 2 classes, namely 1 experimental class for learning by using the Problem Based Learning model assisted by the EduNum application and 1 control class to use the Problem Based Learning model without the help of the EduNum application.

Data collection techniques used in this study include, data on student learning activities taken by observation using observation sheets, numeracy data taken using numeracy tests, and data on student responses to the use of EduNum applications taken using questionnaires. Data analysis techniques used in this study include description analysis and inferential analysis. Data analysis of student activity was carried out during the Problem Based Learning model assisted by EduNum application in this study by calculating the percentage of student activity tests in learning. Student activity is said to be effective, if each observation item is in the minimum active to very active category. as in Table 1.

Table 1. Student Learning Activities

No	Activities(%)	Criteria
1	76-100	Very Active
2	51-75	Active
3	26-50	Moderately Active
4	≤ 25	Inactive

According to (Astuti et al., 2022) students are said to have achieved complete learning if the score obtained is at least 60 with the criteria for the level of numeracy skills as in Table 2.

Tabel 2. Numeracy Ability Level Criteria

Scor	Level of Mastery
$80 \leq X \leq 100$	High Ability, ,
$60 \leq X < 80$	Medium Ability
$0 \leq X < 60$	Low Ability

RESULTS AND DISCUSSION

Analysis of students' learning activities with the use of Problem Based Learning (PBL) model supported by EduNum application showed significant improvement in students' numeracy skills in each meeting. Each learning session noted that students were consistently

actively involved in the learning process, which was shown through an increase in the average value of their learning activities from one meeting to the next. The EduNum app-assisted PBL model proved effective in facilitating students' engagement, allowing them to be more active in understanding and solving numeracy problems. This continuously increasing learning activity not only reflects the effectiveness of the learning approach, but also shows the overall improvement of students' numeracy skills presented in Table 3.

Table 3. Student Learning Activities

Activity Classification	Meeting 1 (%)	Meeting 2 (%)	Meeting 3 (%)
Visual Activity	77,91	86,25	92,91
Oral Activity	74,16	75,83	85,83
Listening Activity	78,75	82,5	86,67
Writing Activity	78,33	83,75	88,33
Motor Activity	80,41	84,16	87,08
Mental Activity	78,75	82,08	85,41
Emotional Activity	80	82,08	84,16
Average	78,21	82,5	87,2

The results of the questionnaire distribution conducted by teachers to students regarding the use of EduNum application in supporting the learning process with the Problem Based Learning (PBL) model are shown in Table 4. This table summarizes students' responses regarding various aspects of using EduNum application, such as ease of use, navigation, clarity of material presentation, appearance, and instructional quality. Students' positive responses to the app indicate that EduNum plays an important role in facilitating their understanding during learning with the PBL model, as well as making a significant contribution to improving students' engagement and numeracy skills in the classroom.

Tabel 4. Angket Respon Siswa Terhadap Penggunaan Aplikasi EduNum

No.	Aspects of	Percentage (%)	Description
1	Ease of use	81,33	Very good
2	Navigation	89,5	Very good
3	Clarity of presentation	87,83	Very good
4	Display	91,33	Very good
5	Instructional quality	84,16	Very good
	Average	86,83	Very good

From Table 4, it can be seen that the comparison shows that all aspects of the assessment of the use of the EduNum application are in the very good category. The ease of use aspect has a percentage of 81.33%, navigation 89.5%, clarity of material presentation 87.83%, display 91.33%, and instructional quality 84.16%. Based on these results, it can be concluded that the use of the EduNum application has a positive impact and significant benefits for students in improving numeracy skills and supporting the mathematics learning process.

The adequacy of students' numeracy skills is measured based on learning completeness and the difference in numeracy skills between classes taught with the Problem Based Learning (PBL) model assisted by EduNum application and classes that use the PBL model without EduNum application. The results of the analysis showed that students who studied with the help of EduNum application had a higher level of learning completeness. This significant difference indicates that the use of EduNum application in PBL is effective in improving students'

numeracy skills compared to the PBL model that does not use the application. The test of students' numeracy skills in the class taught with the PBL model assisted by EduNum application can be observed in Figure 1, which shows a more consistent and significant increase in student learning outcomes.

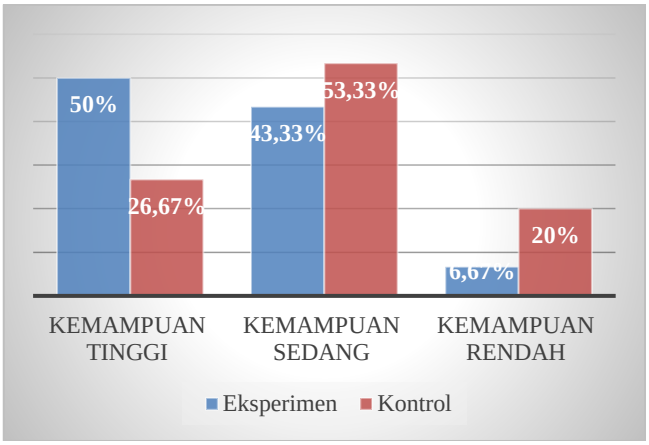

Figure 1. Comparison Chart of Post-Test Data Distribution of Experimental and Control Classes

Students' numeracy skills in the class taught with the Problem Based Learning (PBL) model assisted by EduNum application showed a significant difference compared to the class that used the PBL model without application assistance. The analysis showed that 86.83% of students gave positive responses to learning with the PBL model assisted by EduNum, while 13.37% of students had negative responses. This indicates that most of the students preferred and felt helped by the application of EduNum in the learning process, which contributed to the improvement of their numeracy skills more effectively compared to the method that did not use the application.

From the results of the inferential analysis, the normality test shows that the data distribution is normal. This means that the data obtained from the research meets the assumption of normality, which is an important requirement in conducting further statistical analysis. With normal data distribution, the results of inferential analysis become more valid and reliable for making accurate conclusions about the population under study, as can be seen in table 5.

Table 5. Normality Test

Class	D_{max}	D_{tabel}	Decision
Experiment	0,1914	0,242	H_0 Retrieved
Control	0,1927	0,242	H_0 Retrieved

While from the inferential analysis using the homogeneity test, the results show that the data variance between groups is homogeneous. This means that the variability of the data between the groups being compared is not significantly different, so the assumption of homogeneity of variance is met as can be seen in table 6.

Table 6. Homogeneity Test

F_{max}	F_{tabel}	Decision
1,117	1,84	H_0 Retrieved

From the statistical analysis to determine the effect of students' numeracy skills significantly using the independent sample test with the following results.

Table 7. Hypothesis Test

t_{hitung}	t_{tabel}	**Decision**
3,122	1,672	H_0 rejected

Table 7 shows that H_0 is rejected, indicating that there is a significant difference in students' numeracy skills between the group taught using the Problem Based Learning (PBL) model assisted by EduNum application and the group that did not use the application. With the rejection of H_0, it can be concluded that the use of EduNum application in the learning process with PBL model has a positive influence on improving students' numeracy skills. This result confirms that the integration of technology, such as EduNum app, in problem-based learning method can improve teaching effectiveness and student learning outcomes, especially in numeracy skills. The findings provide empirical evidence that the use of digital learning media in learning not only supports the learning process, but also significantly improves students' understanding and numeracy skills.

Based on the level of student activeness, it can be seen that at the first meeting students were still not trained in the use of the Problem Based Learning model assisted by the EduNum application so that their activeness reached an average of 78.21%. After applying the Problem Based Learning model assisted by the EduNum application, student activeness gradually increased, at the second and third meetings it reached 82.38%, and 87.2%, the increase occurred because students who had an interest in participating in the learning could be seen in every activity. This is in accordance with research conducted by (Murtikusuma, 2015), that student activity using the PBL model assisted by application media makes students more active in the process of solving problems and finding concepts, PBL learning can increase interaction between students in one group, interaction between groups and interaction between students and teachers. According to (Amin et al., 2020), the effect of learning activities in the Problem Based Learning model can be seen from the increase in each meeting, which is due to improvement efforts during learning which is a reflection of the first to last meeting. In line with research (Suryawati et al., 2020) the Problem Based Learning (PBL) model has a positive influence on student activity, where this method succeeds in generating enthusiasm for learning. In its application, students become more active in asking questions, discussing, and being deeply involved in the learning process. They are also more motivated to complete the Learner Worksheet (LKPD) given by the teacher.

Based on the results of the distribution of questionnaires given to students regarding the use of the EduNum application on numeracy skills, that the response given is positive where the application has enough impact and benefits for its users, so it can be said to have a positive impact on students. The results of this study are in line with research conducted by (Putra et al., 2015), the use of learning media in the form of applications by utilizing technology that is close to students at this time provides its own interest for students to access the material contained in the application so that the intensity of student learning increases. In line with (Saleh et al., 2019), the presence of learning applications has made a significant contribution in helping students learn mathematics. This application not only facilitates the understanding of mathematical concepts, but also provides flexibility for students to study at any time. The use of the application is considered very good by students, because it provides various features that support the learning process independently or in groups. With this application, students can access interactive materials, practice problems, and explanations, which make learning math more interesting and effective. According to (Ebadi et al., 2023) learning applications are very helpful for students in learning math, many benefits are provided and their use does not interfere

with learning while in class. Therefore, the presence of the EduNum learning application is very helpful for students who are in the concrete operasinal phase in understanding material that is less understood. Learning mathematics by using interesting learning media can accelerate mastery and understanding of subject matter so that it can shorten learning time.

Students' numeracy skills when given the treatment of using the Problem Based Learning model assisted by the EduNum application are better than without the help of the EduNum application. This is in accordance with the theory put forward by (Ambarwati & Kurniasih, 2021), that the use of the Problem Based Learning model assisted by application media has an effect and is better than conventional on numeracy skills. because the learning process in this experimental class has a treatment where students discuss with their groups by digging up information through the application to solve and solve the contextual problems given, and are given a learning evaluation in the form of a video made by the teacher in the application Similarly (Nisa, 2023), the use of media in the Problem Based Learning model can improve students' numeracy skills, which is caused by the treatment given so that students follow the learning well.

The use of the Problem Based Learning model assisted by the EduNum application which is designed to support independent learning at school gets a positive response from students because in its implementation, the EduNum application is able to activate students in learning. This research is relevant to research conducted by (Rachman & Nuriadin, 2022), explaining that the application of the Problem Based Learning model with the help of applications can trigger an increase in student activity in learning along with student learning outcomes in answering numeracy questions. These results are also in accordance with research conducted by (Pangesty & Mulyati, 2022), stating that the application-assisted Problem Based Learning model is effective in improving students' higher numeracy skills in mathematics learning.

In addition, in this study researchers saw that students' social skills were also able to be developed through group discussions and cooperation, so that students were trained to respect friends, and were able to train students to speak in front of many people through the presentation of group work results. In line with (Pamungkas et al., 2022) that the application-assisted Problem Based Learning model is able to improve students' thinking skills, mathematical logic, students' mathematical disposition, and the implementation of all learning. Meanwhile, according to (Subagja, 2023) mathematics learning with the Problem Based Learning (PBL) model supported by application-based learning media can effectively support the improvement of students' numeracy skills, especially in the midst of rapid technological development. Thus, this shows that there is an effect of the Problem Based Learning model assisted by the EduNum application on the numeracy skills of class X students at SMAN 4 Kendari.

CONCLUSION

There is an effect of Problem Based Learning model assisted by EduNum application on numeracy skills in experimental class on the material of linear equation and inequality system at SMAN 4 Kendari. This can be seen in the results of hypothesis testing using independent sample t-test with a significant value of 3.122. The application of Problem Based Learning model assisted by EduNum application in the experimental class of SMAN 4 Kendari shows that the results of numeracy skills on the material of the system of linear equations and inequalities are in the very good category with an average value of numeracy skills of 81.11. Higher than the average numeracy ability of the control class that used the Problem Based Learning model without the help of EduNum application of 71.39.

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