

Students' Problem-Solving Ability and Attitude Towards Blended Learning Using Assessment Book (BUPENA) and Tutorial Video

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ABSTRACT

The purpose of this study was to determine students' problem solving abilities and attitudes towards blended learning using BUPENA (Assessment Book) and Video Tutorials. The subjects in this study were 24 students of class XI SMA Negeri 1 Palembang. This research is a mixed method research. The data were collected through pretest, posttests, interview, questionnaire, and observation. Since assumptions of normality test was violated, Friedman test was used. The test shows that $\text{sig.} < 0.05$, which means there are significant different on students' problem solving ability as the effect of blended learning using tutorial video and BUPENA. Wilcoxon signed rank test confirmed that the implementation of blended learning using tutorial video and BUPENA helps students to develop their problem solving ability. Observation and questionnaire data indicated that this learning has a positive impact on student attitudes, especially with the help of BUPENA. Students' attitudes tend to be stable and increase during learning. From these results, teacher could use blended learning to enhance students' problem solving ability. Teacher must also carefully design tutorial video to help students learn at home. Moreover, it is suggested that teacher use BUPENA in instructional process.

Keywords: Problem Solving, Blended Learning, BUPENA, Tutorial Video.

1. INTRODUCTION

One of the basic abilities that students must develop is problem solving skills [1]. The ability to solve problems in learning mathematics provides great benefits for students to see the relationship of mathematics with other subjects and also in life [2].

Despite of those benefits, the problem solving skills of students in Indonesia are still not satisfactory [3]. The PISA results show that Indonesia is in the 6th lowest position with an average score of 379, while the average score in PISA is 489 and only 11% of students can solve math problems with complex models, and can determine, compare and evaluate problem solving strategies well [4]. The lack of students' ability to solve non-routine problems is also shown by the TIMSS results, where Indonesia is ranked 44 out of 49 participating countries [3, 4].

There are many factors that can cause students' low problem-solving abilities, including the learning process that makes students only focus on writing, memorizing

formulas, and working on questions that are directly related to the formula [5], poor quality materials and learning media [6, 7], and poor mathematical perceptions and attitudes [8, 9]. Therefore, we need a series of learning processes that centred on student activities in solving mathematical problems by utilizing good quality media and teaching materials.

In the new normal era, one of the learning approaches that can be applied is blended learning. Blended learning is a combination of face-to-face learning and online learning [10]. As the concept of face-to-face is no longer requires physical presence, blended learning can be considered as any combination of instructional models or approaches [11], and emphasizes on the use of internet or technology [12]. Blended learning consisted of synchronous, where students and teacher present at the same time in the same platform, and asynchronous learning, where students can learn from anywhere and anytime from any source [13].

The main advantage of blended learning is that it minimizes problems with time, distance, place, and the number of students in class [13]. Because, in blended learning, students are required to learn about learning topics before conducting discussions so that face to face learning becomes more optimal [14]. Through blended learning, students become more reflective and collaborative [12]. They become more skilful in using technology [12]. Moreover, students can learn from any source and have control over their own learning speed [15]. As a result, student's learning outcomes and mathematical problem solving abilities can improve [12, 15].

In its implementation, blended learning needs to be supported by quality teaching materials and media. One of them is by using a video tutorial. In addition to explaining the concept of mathematics, selecting video as a learning medium can make learning interesting and fun for students [16, 17]. The use of video tutorials on blended learning is carried out at an asynchronous stage before virtual face-to-face meetings. Apart from video tutorials, the learning process using blended learning can also be supported by an assessment book (BUPENA). BUPENA is designed as a supporting material in learning to help students in the learning process which includes various features, namely concept exploration, practice questions, challenge questions, activities, and competency tests [18]. The use of BUPENA in mathematics learning is highly recommended, especially in online-based learning because this book meets the standards for mathematical practice and there is a barcode that can guide students to video solving mathematical problems [19-22]. At the synchronous stage, learning emphasizes reinforcement, discussion and solving mathematical problems. BUPENA is very helpful at this stage because it has many practice questions with various contexts and levels of difficulty [6].

In addition to problem solving, the factor that influences success in learning mathematics is students' attitudes [23, 24]. Since blended learning is relatively new among students in Indonesia, it is important to know how students' attitudes towards blended learning using video tutorials and BUPENA. The focus of students' attitudes that will be observed are independence, hard work, discipline, cooperation, and communication [25].

Based on the advantages and benefits provided by blended learning, BUPENA and video tutorials on learning, researchers try to combine and apply them to the learning process to determine students' problem solving abilities. Therefore, the purposes of this study are to determine (1) the differences in students' solving abilities before and after implementation of blended learning using BUPENA and video tutorials, and (2)

students' attitudes toward blended learning using BUPENA and video tutorials.

2. METHOD

This research is a mixed method of quantitative and qualitative analysis, with the design of equivalent time series. The sample of this research were 24 eleventh grade students of SMAN 1 Palembang that were chosen randomly. The data were collected through tests, questionnaire, observation and interview. All research procedure is given in Figure 1.

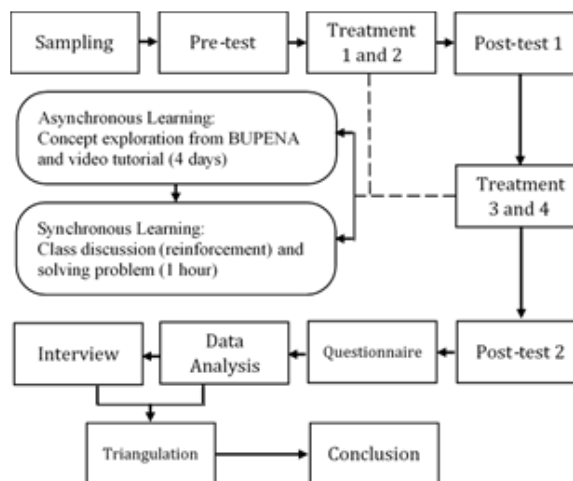


Figure 1. Research procedure.

Students' problem solving ability was measured through pre-test, post-test 1, and post-test 2. Student's scores determined based on problem solving's indicators and descriptors in Table 1.

Table 1. Indicators and descriptors of student's problem solving ability.

Indicators	Descriptors.
Understanding the problem.	<ul style="list-style-type: none"> Identifying the information contained in the questions. Formulating questions that represent the problem. Determining the information needed to solve the problem.
Devising a plan.	<ul style="list-style-type: none"> Determining the methods that can be used to solve the problem. Comparing and determining effective methods of solving problems.
Carrying out the plan.	Solving problems and getting the right answer.
Linking back.	Making conclusions in accordance with the problem.

The repeated measure analysis of variance (RM-Anova) was applied to find the difference between students' problem solving ability before and after treatment with significance level of 0.05. The hypothesis are:

H_0 : no significant different of students' problem solving ability before and after the implementation of blended learning using BUPENA and tutorial video.

H_a : there is significant different of students' problem solving ability before and after the implementation of blended learning using BUPENA and tutorial video.

The assumptions of RM-Anova were random sampling, independency of observation, the data's standardized residual are normally distributed, and data's sphericity. If at least one of these assumptions were not satisfied, then Friedman test will be implemented. All hypothesis were tested with SPSS. Descriptive analysis took place to verify the result based on interview, observation, and related researches.

Students' attitudes explained in this research were independence, hard work, discipline, cooperation, and communication. The data obtained from observation and students' response recorded in questionnaire with Likert scale. Students' responses concluded based on criteria in Table 2.

Table 2. Criteria of students' response.

Percentage (x)	Criteria
$20\% \leq x < 36\%$	Very poor
$36\% \leq x < 52\%$	Poor
$52\% \leq x < 68\%$	Intermediate
$68\% \leq x < 84\%$	Good
$84 \leq x \leq 100\%$	Very good

3. RESULT AND DISCUSSION

This research focuses on two dimensions of students' problem solving ability as the effect of the treatments, which are the difference and the sustainability. To answer these questions, the researchers conducted a pre-test and 2 post-tests. The time between tests is 2 treatments. Each treatment consisted of asynchronous and synchronous learning. The asynchronous stage consisted of 4-day concept exploration and video tutorial, while the synchronous stage consisted of an hour discussion and exercises (Figure 1). These results then analysed with one way analysis of variance with repeated measure. Prior to the analysis, assumptions of independency of observations, normality, and sphericity were tested.

3.1. Assumption Test

3.1.1. Assumption of random sample and independency of observation

Since the sample were chosen by simple random sampling, hence the assumption of random sample of the population is satisfied. From pre-test to post-test 2, each participant only produce one grade in each tests. Therefore, this research satisfied the assumption of independency of observation.

3.1.2. Assumption of normality

To test the normality, the standardize residuals were generated from students' test results using SPSS. The Shapiro-Wilk analysis was implemented to test the normality of these residuals. The result of normality test can be seen in Table 3.

Table 3. Tests of normality.

	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest	,839	24	,001
posttest1	,938	24	,150
posttest2	,946	24	,222

The result in Table 3 shows that pretest's significance value is less than 0.05, which indicates that the data from students' pretest's result is not normally distributed. Hence, the assumption of normality is not satisfied.

3.2. Hypothesis Testing: Friedman

Since normality assumption was violated, hence Friedman test was performed to test the research hypothesis. The Friedman test was performed using SPSS, and the result shown in Table 4.

The result shows that significant value is less than 0.05, which means there are significant different on students' problem solving ability as the effect of blended learning using tutorial video and BUPENA.

Table 4. Friedman test.

Test Statistics ^a	
N	24
Chi-Square	29.692
df	2
Asymp. Sig.	.000
a. Friedman Test	

To find which class is different from other classes, Wilcoxon signed rank test applied as shown in Table 5.

Table 5. Wilcoxon signed rank test.

Test Statistics ^a			
	posttest1 - pretest	posttest2 - pretest	posttest2 - posttest1
Z	-4.257 ^b	-3.934 ^b	-2.453 ^c
Asymp. Sig. (2- tailed)	.000	.000	.014

- Wilcoxon Signed Ranks Test
- Based on negative ranks.
- Based on positive ranks.

From Table 5, since all significant values are less than $\frac{0.05}{3} = 0.017$, we can see that all classes are significantly different. From this result, we can conclude two things:

- The implementation of blended learning using tutorial video and BUPENA helps students to develop their problem solving ability.
- The development of students' problem solving ability is not sustainable, where students' problem solving score are decreased.

3.3. Test Result: Descriptive Analysis

Although students' problem solving ability increased from pretest, some mistakes still occurred in students' work. The majority of students' mistakes in solving problems in this study were errors in calculating operations and determining the concepts to be used. Figure 2 and Figure 3 are examples of students' answers in solving test questions.

In Figure 2, it can be seen that student A's first mistake was identifying problems. Students state that $\frac{1}{n_1+n_2} = \frac{7}{12}$. Meanwhile, the information obtained was actually $\frac{1}{n_1} + \frac{1}{n_2} = \frac{7}{12}$. The errors began to appear in the first steps of solving them. The student wrote $\frac{1}{n_1+\frac{1}{n_2}} = \frac{7}{12}$ while the initial information was different. This causes in the third step it can invert the two sides and this causes the next solution to be skewed from the real problem's solution.

Handwritten pretest answer showing algebraic steps. The student starts with $\frac{1}{b_1 + b_2} = \frac{7}{12}$ and proceeds through several steps of manipulation, including cross-multiplication and simplification, leading to a final result of 96.

Figure 2. Pretest answer

Handwritten posttest answer showing matrix operations. The student is asked to find matrix B given $B = C - A$. They perform the subtraction of matrix A from matrix C, resulting in $B = \begin{bmatrix} -2 & -1 \\ 1 & 3 \end{bmatrix}$.

Figure 3. Posttest answer

Based on Figure 3, it can be seen that student B was able to understand the problem well. The student was able to identify the information and problems contained in the questions as well as the information he needs to solve these problems. This student has also been able to determine the methods that he can use to solve these problems properly and correctly. However, these students still could not determine which method was more effective. He chose to use the method of solving it repeatedly rather than simplifying the equation.

These findings are in line with the research result from Ainin, et al [26], where some of the students' mistakes in solving matrix problems, including errors in number operations, understanding concepts, determining formulas, determining determinants, adjoining, modeling, calculation results, solving processes, and errors in determining the final result.

This is also supported by the results of interviews with several students which show that students can solve problems well when given problems. Furthermore, in the post test 2, the average score of students was decreased compared to the results of the post test 1. According to the students, this was also caused by the difficulty level of the material tested on the post test 2 which was more difficult than the material in the post test 1. It can be seen in the following transcript excerpt from an interview conducted to one of the students in class XI SMA Negeri 1 Palembang.

Researcher : From the matrix material that we studied yesterday, which material is the easiest and which is the most difficult?

Student : In my opinion, from the matrix material that we have studied, the easiest matrix material is the addition operation, because in the addition operation we can use commutative properties and it is much easier because each element just needs to be added. In my opinion, the operation of the multiplication of two matrices is a bit difficult because here we have to multiply one element with another and add it and it becomes a little confusing, but for example, if we study harder, God willing, it will run smoothly.

Based on the results of the interview, students found it difficult to multiply the matrix operation. This is because in its operation, students feel confused because they have to combine the multiplication and addition of numbers and must pay attention to the corresponding rows and columns. As research conducted by Fauziah, et al [27], about 45% of students are still confused about matrix multiplication.

3.4. Student's Attitude

Students' attitudes were also the focus of this research. Students' attitudes were measured using observations and questionnaires.

3.4.1. Observation Result

The attitudes that observed in this research were (1) independence, (2) cooperativeness, (3) hard work ethic, (4) communicative, and (5) discipline. The observation scores were analysed and the result can be seen in Figure 4.

Figure 4 shows that the majority of students have good attitude criteria. This means that learning through blended learning using BUPENA and Video Tutorials has a positive impact on student attitudes. In the diagram, it can be seen that the attitudes of students during 4 meetings tend to be stable and increase. In the first week to the third week, the indicators of student attitudes that appeared were still the same, namely around 87% of the total indicators. Meanwhile, in the fourth week there was an increase to 90%, which indicates that the treatment gave an influence on students' attitudes. Based on the results of observations, indicators that rarely appear in students are

communicative, one of which is the courage to ask questions that are confusing. However, this happens because at the time of learning, students feel that there is nothing confusing and need to be asked. Hence, it can be said that blended learning made a positive contribution to students' attitudes [27].

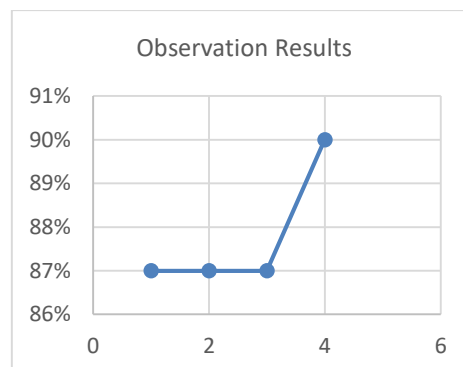


Figure 4. Students' attitude based on observation

3.4.2. Questionnaires Result

Students' response towards all the instruction's elements were also analysed. Students were given 18 statements with 5 Likert-scale on blended learning, BUPENA, and tutorial video. The result is shown in Figure 5.

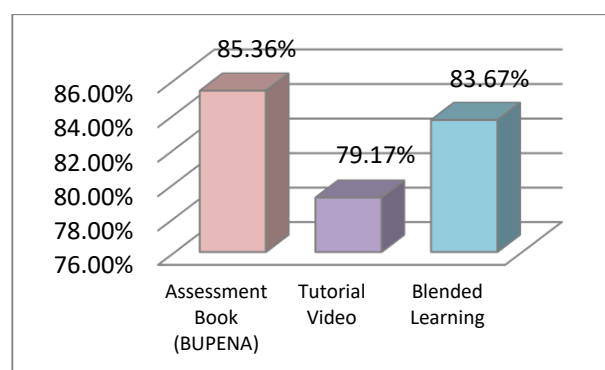


Figure 5. Students' response on questionnaire

From this result, it can be seen that the BUPENA contributes the highest percentage towards student's engagement in learning activity. This may caused by the fact that BUPENA has many features that could support students' higher order thinking skills [6]. More importantly, BUPENA is said has been fulfilled the standard for mathematical practice, even more, has barcode feature that helps students to access learning video from expert whenever they want [22].

4. CONCLUSION

From the result, it can be concluded that the implementation of blended learning with tutorial video and assessment book (BUPENA) can improve students' problem solving ability. It is also found that students'

attitude towards the instruction tend to increase overtime. Hence, it is suggested that the teacher can implement blended learning with all the elements in this research in their mathematics class. It is also suggested that the teacher can carefully create tutorial video to help students can study mathematics at home.

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