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# STUDENT ANALYSIS THINKING ABILITY THROUGH BLENDED LEARNING WITH VIDEO TUTORIALS

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## Abstrak

Penelitian ini bertujuan untuk mengetahui perbedaan kemampuan berpikir analisis siswa sebelum dan setelah mengikuti pembelajaran menggunakan *blended learning* berbantuan video tutorial dan responnya. Sampel pada penelitian ini adalah 26 siswa kelas XI IPA 5 SMA Negeri 1 Palembang. Penelitian ini merupakan penelitian kombinasi dengan *sequential explanatory design*. Teknik pengumpulan data pada penelitian ini adalah tes tertulis, survei dan wawancara. Instrumen yang digunakan antara lain lembar tes, angket respon dan pedoman wawancara. Teknik analisis data yang digunakan adalah uji Friedman karena data tidak memenuhi asumsi kenormalan. Hasil uji Friedman menunjukkan bahwa $sig = 0{,}00 < \alpha$ untuk $\alpha = 0{,}05$ sehingga $H_0$ ditolak yang berarti tedapat perbedaan yang signifikan dari kemampuan berpikir analisis siswa sebelum dan setelah mengikuti pembelajaran dengan *blended learning* berbantuan video tutorial. Dengan uji lanjut Bonferroni, terlihat bahwa yang berbeda signifikan adalah hasil *pretest* dan *post test 1* serta *pretest* dan *post test 2*, sedangkan *post test 1* dan *post test 2* tidak berbeda secara signifikan. Selain itu, berdasarkan hasil angket, respon siswa setelah mengikuti pembelajaran dengan *blended learning* berbantuan video tutorial sudah cukup baik. Berdasarkan hasil yang diperoleh, *blended learning* berbantuan video tutorial dapat meningkatkan kemampuan berpikir analisis siswa sehingga penggunaannya sangat direkomendasikan. Dalam penggunaan *blended learning*, guru sebaiknya menyiapkan aktivitas pembelajaran asinkronous dan sinkronous dengan baik.

**Kata kunci**: Asinkronous,; *blended learning; k*emampuan berpikir analisis; sinkronous

## *Abstract*

*This study aims to determine the differences in students' analytical thinking skills before and after participating in learning using blended learning assisted by video tutorials and their responses. The sample in this study were 26 students of class XI IPA 5 SMA Negeri 1 Palembang. This research is a combination research with sequential explanatory design. Data collection techniques in this study are written tests,surveys and interviews. The instruments used are test questions, questionnaire and interview guidelines. The data analysis technique used is the Friedman test because data does not meet the normality assumption. Friedman test results show that sig = 0.00 < for = 0.05 so that $H_0$ is rejected, which means that there is a significant difference in students' analytical thinking skills before and after participating in learning with blended learning assisted by video tutorials. With Bonferroni's follow-up test, it can be seen that the results of pretest and posttest 1 and pretest and post test 2 are significantly different, while posttest 1 and posttest 2 are not significantly different. In addition, based on the results of the questionnaire, the student's response after participating in learning with blended learning assisted by video tutorials was quite good. Based on the results obtained, blended learning assisted by video tutorials can improve students' analytical thinking skills so that its use is highly recommended. In using blended learning, teachers should prepare both asynchronous and synchronous learning activities.*

***Keywords***: *Asynchronous; blended learning, students' analytical thinking skills, synchronous*

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## INTRODUCTION

The ability to think analytically is the basis of higher-order abilities (Wulandari et al., 2018). The ability to think analytically is needed by an individual because this ability is the basis for the formation of new knowledge and skills (Rasheva et al., 2018). In addition, in solving a problem, an individual must develop their analytical thinking skills (Firdaus & Sinesis, 2017). Analytical skills are important for an individual to have in sorting, filtering and choosing which ideas will be forwarded when the individual has many ideas in his mind (Lane, 2020).

In the midst of the importance of analytical skills, the reality on the ground shows that children's analytical skills in Indonesia are still lacking (Iswanto et al., 2017). According to the 2018 Program for International Student Assessment (PISA) study, the percentage of students in Indonesia who are able to reach level 2 and above in mathematics is around 28% where the international average is 76%. As for those who reach level 5 and above, students in Indonesia are only around 1% with an international average of 11%. In addition, Indonesia's score in mathematics is 379, which is far below the international average score of 489. (OECD, 2019).

The low analytical ability can be caused by several factors, one of which is because students are not used to solving HOTs problems (Supriyadi et al., 2019). Characteristics of learning mathematics in schools are still accustomed to routine questions and LOTs (Rahayu et al., 2018). This is because the learning process only focuses on writing, memorizing, making formulas and working on procedural questions (Abdullah et al., 2017). Therefore, learning is needed that facilitates students to think at a higher level where conceptual understanding should be given before learning.

One of the ways that teachers can do is implementing blended learning. Blended learning is face-to-face learning that is combined with online learning by using media and theory in the learning process (Wardani et al., 2018). Blended learning combines the best aspects of e-learning, face-to-face and practice (Kristanto et al., 2017). Blended learning can improve analytical skills which are included in higher order thinking skills because blended learning facilitates online access to information and discusses problems with the teacher during face-to-face activities (Ekawati & Kartika, 2019). In addition, blended learning provides access to online learning, delivery of theoretical and practical materials completely and systematically combines face-to-face and online learning that can train students' thinking skills (Fatwa & Djuniadi, 2016). However, the research was carried out before the COVID-19 pandemic so that synchronous learning was carried out face-to-face which required a meeting between teachers and students. In this study, virtual face-to-face learning will be used as an alternative because during the COVID-19 pandemic, as currently, face-to-face synchronous learning cannot be used.

In carrying out learning with blended learning, teachers can be assisted by the use of video tutorials. Video tutorial is a presentation of information both learning material and the process of operating a system that is packaged in the form of a video (Sumantri, 2019). The use of video tutorials in learning aims so that teachers do not have to explain teaching materials repeatedly, but simply re-

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present the videos that have been made so that the teacher's focus can be directed to the development and deepening of the material. (N. Ekawati et al., 2015). The use of video tutorials can assist student in understanding learning materials with higher order thinking skills including analytical thinking because the examples given are explained clearly. (Syaidah et al., 2018).

Based on the description above, the purpose of this study is to find out (1) the differences in students' analytical thinking skills before and after participating in learning with blended learning assisted by video tutorials (2) Student responses to learning with blended learning assisted by video tutorials.

## METHOD

This research is a combination research with sequential explanatory design. The sample in this study was a class of students of XI IPA 5 SMA Negeri 1 Palembang which consist of 26 people who were selected using simple random sampling technique. Data collection techniques in this study were written tests, surveys and interviews. The instruments used were test questions, questionnaire and interview guidelines. Written tests and interviews were used to determine students' analytical thinking skills, while questionnaires were used to determine student responses after learning with blended learning assisted by video tutorials. The procedure in this study can be seen in Figure 1.

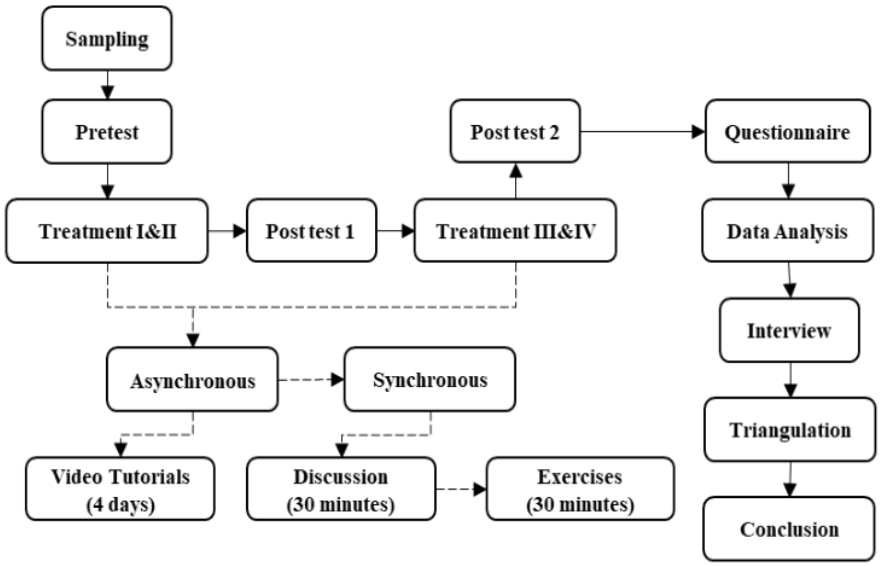


Figure 1. Research procedure

To obtain data on students' analytical thinking skills, three tests were held, namely pre-test, post-test 1, and post-test 2. The test questions used were in the form of descriptions and were made based on indicators of analytical ability. The indicators and descriptors of analytical thinking skills used in this study are described in Table 1.

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Table 1. Indicators and descriptors of analytical thinking skills

| Indicators | Descriptors |
|---|---|
| Determine data that is relevant or not relevant to a concept | 1) Determine what data is contained in the question |
| | 2) Interpret every data that has been obtained |
| | 3) Determining the problem |
| | 4) Determine relevant data to solve problems |
| Connecting one concept to another | 5) Using the data that has been obtained to relate it to other concepts |
| | 6) Solve problems using other concepts that have been determined |
| Explain the cause-and-effect relationship | 7) Using a data as the cause of a selected solution step |
| | 8) State the consequences of using the data |

Analysis of written test data was carried out using the ANOVA test with 1 repeated measurement path (RM one way ANOVA) with a significant level of 5%. The hypothesis in this study is

$H_0$: There is no significant difference in students' analytical thinking skills before and after participating in blended learning assisted by video tutorials.

$H_a$: There is a significant difference in students' analytical thinking skills before and after learning with blended learning assisted by video tutorials.

Before implementing the RM one way ANOVA, the assumptions that must first be tested are random sampling, independence of observation, the data's standardized residuals are normally distributed, and data sphericity. If at least one of the aforementioned assumptions is not met, then the RM one way ANOVA cannot be applied and the Friedman test will be used. All statistical tests in this study were performed using SPSS. After statistical tests, descriptive analysis was then carried out based on the results of interviews and relevant research.

Student responses in this study were measured using a questionnaire in the form of statements based on three response dimensions, including cognitive, conative and affective. Response indicators and descriptors used in this study are described in Table 2.

Table 2. Student response indicators and descriptors

| Dimensions | Indicators | Descriptors |
|---|---|---|
| Cognitive | 1) Understand the material easily | Easily understand the material presented in the video |
| | 2) Rate view | Rate video views |
| | 3) Obtain study instructions and information clearly | Obtain study instructions and information contained in the video clearly |
| Affective | 4) Get motivation to learn | Gaining motivation to learn through blended learning |
| | 5) Increase curiosity | Increase curiosity in learning the material presented during blended learning |
| | 6) Add interest | Increase interest in mathematics after learning with blended learning |

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| Dimensions | Indicators | Descriptors |
|---|---|---|
| Conative | 7) Train yourself | Increase knowledge while learning with Blended Learning which is manifested by behavior |

Questionnaire data were analyzed using a Likert scale and student responses were then grouped into several criteria which can be seen in Table 3.

Table 3. Student response criteria

| Actual Score Percentage ($p$) | Criteria |
|---|---|
| $20{,}00\% \leq p < 36{,}00\%$ | Very poor |
| $36{,}00\% \leq p < 52{,}00\%$ | Poor |
| $52{,}00\% \leq p < 68{,}00\%$ | Fair |
| $68{,}00\% \leq p < 84{,}00\%$ | Good |
| $84{,}00\% \leq p < 100{,}00\%$ | Very good |

## RESULTS AND DISCUSSION

This study focuses on the differences in students' analytical thinking skills before and after participating in blended learning and their consistency. To find out the difference, a pre-test and 2 post-tests were conducted. First, blended learning was conducted in 2 meetings for each post-test. Based on the characteristics of blended learning, learning activities consist of asynchronous and synchronous (Figure 1). The data obtained were then analyzed using the RM one way ANOVA.

### Assumption Test

***Random sample and independency of observation***

The sample selection technique used is simple random sampling so that the random sample assumption is met. Each research subject obtained a score on each test carried out starting from pre-test to post-test 2 so that the assumption of independence of observation was fulfilled.

***Normality test***

The normality test used is the Kolmogrov-Smirnov. The results of the normality test can be seen in Table 4.

Table 4. Normality test

| | Kolmogorov-Smirnov[a] | | |
|---|---|---|---|
| | Statistic | df | Sig. |
| Pretes | ,285 | 26 | ,000 |
| Post test 1 | ,352 | 26 | ,000 |
| Post test 2 | ,159 | 26 | ,088 |

In Table 4, it can be seen that the data from pre-test and post-test 1 are not normally distributed because the value of $sig < \alpha$. However, for post-test 2 data, it was obtained that $sig = 0.088 > \alpha$ which means that post-test 2 data was normally distributed. Based on this, the assumption of normality is not met.

### Hypothesis Testing: Friedman Test

Because the assumption of normality is not met, RM Anova cannot be used to test the hypothesis, so the Friedman test is used. The results of the Friedman test carried out with the help of SPSS 25 can be seen in table 5.

Table 5. Friedman test

| Test Statistics[a] | |
|---|---|
| N | 26 |
| Chi-Square | 33,937 |
| df | 2 |
| Asymp. Sig. | ,000 |

From Table 5, it can be seen that $sig = 0.00 < \alpha$ with $\alpha = 0.05$ so that $H_0$ is rejected. Therefore, there are significant differences in students' analytical thinking skills before and after participating in blended learning.

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Furthermore, to find out which parts are significantly different, further tests were carried out using the Bonfferoni test which can be seen in Table 6.

Table 6. Bonfferoni test

**Pairwise Comparisons**

Measure: analyticability

| (I) analytica | (J) analytic | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| 1 | 2 | -22.266* | 3.080 | .000 | -30.169 | -14.363 |
| | 3 | -23.683* | 2.680 | .000 | -30.558 | -16.807 |
| 2 | 1 | 22.266* | 3.080 | .000 | 14.363 | 30.169 |
| | 3 | -1.417 | 3.179 | 1.000 | -9.573 | 6.739 |
| 3 | 1 | 23.683* | 2.680 | .000 | 16.807 | 30.558 |
| | 2 | 1.417 | 3.179 | 1.000 | -6.739 | 9.573 |

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

From table 6, it is obtained that the value of sig. from pretest-posttest 1 and pretest-posttest 2 significantly different which means that blended learning assisted by video tutorials significantly affects students' analytical thinking skills. While the value of sig. for post test 1-post test 2 did not differ significantly which implies the consistency of the treatment given. Based on this, it can be seen that learning with blended learning assisted by video tutorials can consistently improve students' analytical thinking skills. Learning with blended learning assisted by video tutorials and BUPENA can consistently improve students' problem solving abilities (Faradilla et al., 2021). Blended learning using video tutorial gives significant gain in thinking abilities, learning achievement and character such as critical thinking, curiousity, hard work and so (Sudiarta & Widana, 2019). The blended learning model is very suitable to be applied by integrating face-to-face learning and online-based learning which are consisted of video tutorials, discussion of materials, case examples and discussion forums (Karma et al., 2019).

**Descriptive Analysis**

The results of the written test data analysis showed that the students' analytical skills improved after participating in blended learning. During the pretest, most students did not write down the information obtained from the questions and immediately worked on the questions. However, during the post test, they were able to write down the information and interpret it. The following Figure 2, Figure 3 and Figure 4 are examples of answers from SA.

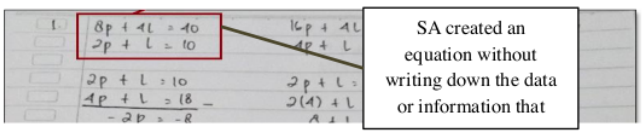


Figure 2. SA pretest answers

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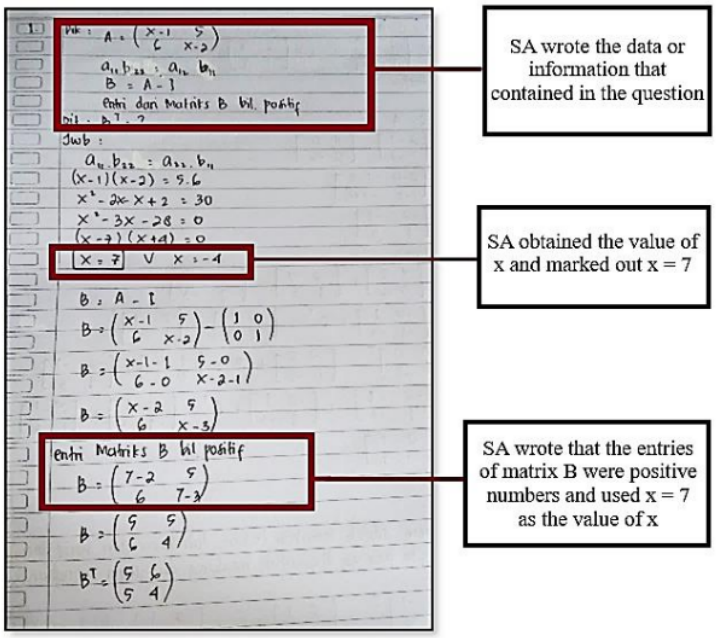


Figure 3. *Post test* 1 answer of SA

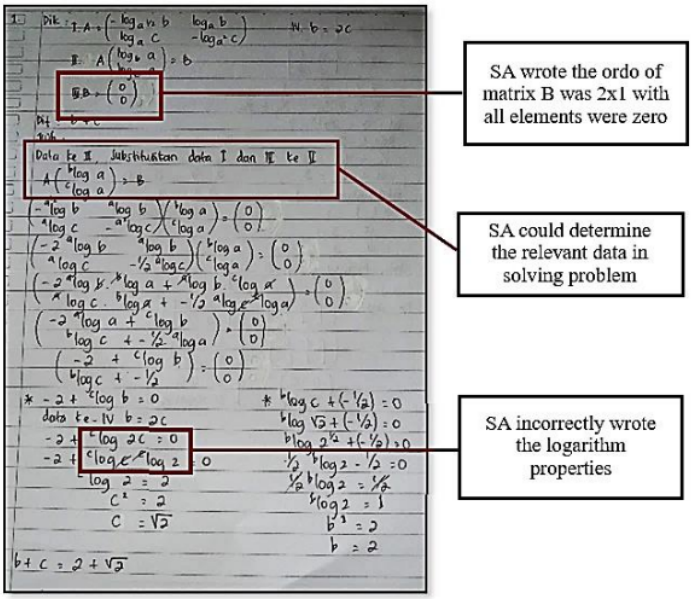


Figure 4. *Post test* 2 answer of SA

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From the three figures, it can be seen that the comparison of SA students' answers during the pretest, post test 1 and post test 2. When working on the pretest questions, SA students immediately worked without first stating what information was contained in the questions and how they understood the information and problems. what is in the question. In addition, SA students also did not explain what data they used to solve the questions. Students more often solve problems in a direct way and are not accustomed to writing down what information is contained in questions such as what data is there, what data is not there and what is the condition of the data because they think it is unnecessary and just a waste of time, even though it can be one of the causes of errors in solving problems (Akbar et al., 2017). (Irwanto et al., 2017) confirms that the low score of students' analytical thinking are caused by the students' inability to describe and present data, formulate problem formulation and identify the variables of experiment. In contrast to the results of the SA pretest, some students were unable to relate the concept of a given plane figure to the concept of a system of linear equations. This is due to their basic thinking. The cause of student errors in connecting a data with other data or a concept with another concept is the student's humanistic thinking (Ardiyanti & Farihah, 2019).

However, after participating in learning with blended learning assisted by video tutorials, the way SA students solve problems can be seen during post test 1. When doing post test 1, SA students begin to write down what information they get, formulate questions, and use the data obtained. exist to solve problems. For the selection of the value $x = 7$ he wrote, the SA student explained that because from the data he obtained the desired matrix B was a matrix with all positive elements so he chose $x = 7$, this information was obtained during interviews. The following is an excerpt from interviews conducted by researchers with SA students.

*Researcher : In the section you get two x's, so what is chosen by x equals how much?*
*SA : x is equal to 7*
*Researcher : why?*
*SA : because what matrix B is asking for is a positive integer, miss.*

For post test 2, student A writes down the information in the questions and interprets it, it can be seen when he writes down $B = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ which means he understands the meaning of zero matrix B information. When interviewed, the reason for writing B is a zero matrix of order $2 \times 1$ because from the second data, matrix B is the product of matrix A of order $2 \times 2$ and a matrix of order $2 \times 1$ so that the product of the multiplication is matrix B must be of order $2 \times 1$.

*Researcher : So the order of matrix B is made 2 times 1, right?*
*SA : yes, miss, adjusted to the data that was miss.*
*Researcher : which data?*
*SA : the data from A earlier, right because of that later, you will multiply the second data, then the result will be two times one.*

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In addition, SA wrote down what data they use to solve the problem. Student A can determine which data is relevant and can be used in solving problems.

*Researcher: Yes, that's right. So we have to find the value of b and c first, right?*
*SA : yes miss.*
*Researcher: how much data did you use?*
*SA : first we use the second data. Then we substitute the first and third data. After that, just substitute again with the fourth data.*
*Researcher: So, what concept do you use for this third data?*
*SA : the concept of logarithm miss.*

Unfortunately, in step 10 the SA student mistakenly used the logarithmic property where he wrote down the result of $\log_c 2c = \log_c 2 . \log_c c$ which should be $\log_c 2 + \log_c c$ which causes there to be confusion in the end result.

Judging from the results of post-test 1 and post-test 2, the analytical ability of SA students is better than the results of the pre-test. This is because SA students have been trained to analyze problems and discuss during synchronous learning. Some active learning processes such as discussions between students and students and teachers as well as listening/paying attention to teacher explanations have a positive impact in improving student learning outcomes in this case analytical skills (Fauzi, 2019). This finding is in line with the research result from (Shindy & Kartika, 2019), that blended learning can improve students' higher order thinking skills because it facilitates online access to information and discusses problems with the teacher. In addition, students' understanding of concepts and the fluency of mathematical procedures after participating in learning with blended learning will be better. The understanding of concepts and fluency of mathematical procedures of students who study with the blended learning model is better than the understanding of concepts and fluency of mathematical procedures of students who only study with conventional learning (Nugraha et al., 2019). Conceptual understanding of students who exposed to blended learning are better than who exposed to conventional teaching method (Setyaningrum, 2018).

At the time of post-test 2, SA students had errors in writing logarithmic properties. This is because SA students are less careful and forget the logarithmic properties. Students are not careful in solving problems of exponential and logarithmic forms so they are prone to make mistakes (Maulid, 2017). In addition, students' mistakes when working on logarithmic problems were caused because they forgot and did not understand the properties of logarithms (Ong & Ratu, 2019).

**Student response**

After participating in learning with blended learning assisted by video tutorials, students were given a response questionnaire containing ten statements. The data from the questionnaire were then analyzed using a Likert scale and the actual score percentage was calculated and determined into five criteria, including Very poor, poor, fair, Good and Very Good. Student responses to learning with blended learning assisted by video tutorials can be seen in Figure 5.

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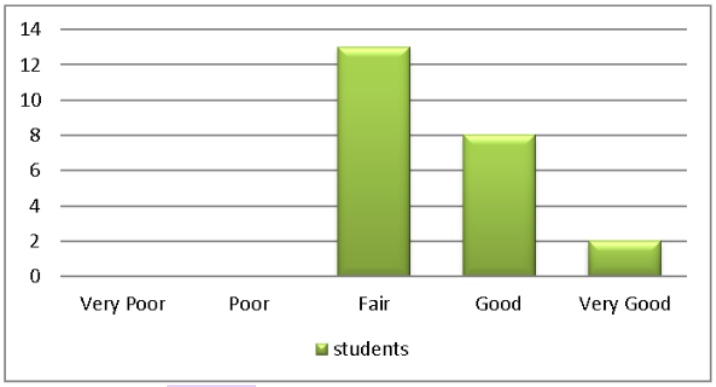


Figure 5. Students response diagram

From Figure 5, it can be seen that the response of 13 students to learning with blended learning assisted by video tutorials is Fairly Good, while those who respond Good are 8 people and 2 others respond Very Good. It can be seen that most of the students' responses are quite good. This is because students have been given a video before learning and they can access it anytime and anywhere according to their respective situations and conditions. In line with the research conducted (Budiyono, 2020) that learning with blended learning gets a positive response because learning materials can be accessed anytime and anywhere. After participating in blended learning, students are mostly give positif response because they can use technology that brings up their enthusiatism (Komala & Sarmini, 2020).

## CONCLUSION AND SUGGESTION

Based on the results obtained, it can be concluded that blended learning assisted by video tutorials can improve students' analytical thinking skills. It can also be seen that most of the students' responses to blended learning assisted by video tutorials are quite good. Therefore, the use of blended learning assisted by video tutorials is highly recommended. In the use of blended learning, teachers should prepare asynchronous and synchronous learning activities properly so that unwanted things do not happen such as student errors in writing a mathematical principle in this case logarithms, lack of student participation, and student readiness in participating in synchronous learning.

The results of this study can be used as a reference for further studies such as development research of video tutorials which are used for asynchronous learning, learning design of blended learning, or implementation of blended learning to improve another thinking ability.

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