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Analysis of Critical Thinking Abilty Judging from Independent Learning and Learning with E-Module Assisted Flipped Classroom Model Material Changes in Form V

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Abstrak

Tujuan penelitian ini adalah untuk meningkatkan kemandirian belajar siswa dan kemampuan berpikir kritis IPA kelas V pada materi perubahan wujud melalui model flipped classroom berbasis e-modul. Teknik pengumpulan data menggunakan wawancara tidak terstruktur, angket, tes, dan dokumentasi. Teknik analisis data dianalisis menggunakan analisis kuantitatif, yaitu uji t satu variabel, uji beda, uji N-Gain, dan uji regresi, dan selanjutnya menggunakan analisis kualitatif. Hasil penelitian: (1) Kemampuan berpikir kritis siswa lebih dari nilai KKM yaitu 75 dengan hasil nilai t_{hitung} = 1,778 (>1,706) dan nilai signifikansi 0,015 (<0,05); (2) Terdapat peningkatan kemampuan berpikir kritis siswa sebesar 35,11% setelah pembelajaran dengan model flipped classroom berbantuan *e-modul* ; (3) Ada pengaruh kemandirian belajar terhadap kemampuan berpikir kritis siswa sebesar 85,7% sehingga dapat disimpulkan bahwa semakin besar kemandirian belajar siswa maka semakin tinggi kemampuan kemampuan berpikir kritis siswa

Kata Kunci: Kemampuan berpikir kritis siswa, kemandirian belajar, flipped classroom, dan e-modul

Abstract

The purpose of this study was to improve students' learning independence and critical thinking skills in science in grade V on the material of changes in form through the flipped classroom model based on e-modules. Data analysis techniques were analyzed using quantitative analysis, namely one variable t-test, difference test, N-Gain test, and regression test, and then using qualitative analysis. The results of the study: (1) Students' critical thinking skills are more than the KKM value of 75 with the results of the calculated t value = 1.778 (> 1.706) and a significant value of 0.015 (<0.05); (2) There is an increase in students' critical thinking skills by 35.11% after learning with the flipped classroom model assisted by e-modules; (3) There is an influence of learning independence on students' critical thinking skills by 85.7% so that it can be concluded that the greater the students' learning independence, the higher the students' critical thinking skills.

***Keywords**: Students' critical thinking skills, independent learning, flipped classroom, and e-modules.*

Introduction

The ability to think at a higher level is a skill that students must have in order to face the demands of the 21st century, one of which is the ability to think critically. Critical thinking abilities are influenced by students' mastery of concepts regarding the material being studied. It is impossible to master critical thinking skills if students do not master the concepts of the material being taught. (Ramdani et al., 2020). Students with high learning independence are able to gain more knowledge from the material studied than students who only rely on teacher explanations in delivering learning material. Learning independence is one of the factors driving student motivation in learning, thus influencing decision making.

The low critical thinking skills of students also occur in the Rogoselo 02 State Elementary School environment, Doro District, Pekalongan Regency. This can be seen in the science learning material on changes in form in Class V.Students' critical thinking abilities are very important in microscopic and abstract science learning where this requires good analysis, evaluation and interpretation of students' thoughts.(Yustiqvar et al., 2019). It is very important for students to master critical thinking skills, especially in the 21st century. So critical thinking skills are fundamental. However, in reality, many students face obstacles. As can be seen from the evaluation results, 80% of students have not been able to solve questions related to critical thinking skills, interest and motivation to learn are still low, and learning independence is low.

A teacher's policy in choosing learning models and the use of learning media has a big influence on student success, namely making students enthusiastic and motivated to learn so that students will not get bored or fed up when learning.

From these problems there are two learning problems, namely; 1) Lack of independence in student learning because students are less active in asking questions and only listen monotonously to explanations from the teacher. 2) Lack of student interest during learning will influence the low level of students' critical thinking abilities. So we need learning models and media that are able to attract students' interest, enthusiasm and independent learning so that they can change the learning atmosphere from previously teacher-centered to student-centered. To answer this problem, researchers offer a solution by using the flipped classroom learning model assisted by E-Modules in science subjects. This is because the flipped classroom learning model is a learning method that is often known as the inverted learning model. Reverse here means reversing what students have been doing in class and doing it at home. According to Johnson (2013), the Flipped Classroom learning model is a form of teacher strategy in minimizing commands/instructions and maximizing interaction between students. So, with the flipped classroom learning model, students are expected to have capital knowledge about the material that will be studied in class through the modules that have been sent by the teacher. This flipped classroom model is a form of teacher strategy in minimizing commands/instructions and maximizing student interaction.

To attract students' interest in learning the flipped classroom model, it can be combined with E-Module media, this is because of E-Module mediais a module which was originally a printed learning media, its presentation was transformed into electronic form (Winatha, Suharsono, & Agustin, 2018). In this case, e-modules can be interpreted as learning media in the form of teaching materials which contain images, videos, audio , as well as animations that can increase students' enthusiasm, interest and motivation in learning, so that students don't get bored and focus more on the material they are studying.

Method

This researchusing a mix method design type "The Explanatory Sequential Design". With two research stages, starting with quantitative research and continuing with qualitative research. The priority of collecting and analyzing qualitative data is carried out at an early stage. Building on the results of the analysis in the first stage, the researcher continues to the next stage with quantitative methods to test or generalize based on initial findings. The researcher then interprets how the qualitative research results are built on the initial findings (quantitative data).Main weight on strategyThis is found in quantitative data.

The experimental design used in this research is*Quasi Experimental Design*. The sampling technique is Cluster Random Sampling. The selection of 2 class samples was intended to simplify the research process because it was carried out in 1 group, namely the Budi Utomo group. As a sample there are two classes which include:class V at SDN 02 Rogoselo as the experimental class and SDN 03 Rogoselo as the control class.

Data was collected through interviews and documentation. To verify the accuracy of the data in this research, data triangulation was used.Instruments are used to measure the variables studied,critical thinking ability tests, questionnaires and learning tools. AnalysisQualitative data in this study was used to describe students' critical thinking abilities in terms of students' learning independence in science learning based on high, medium and low groups. Qualitative data analysis was carried out using four steps, namely validity testing

data, data reduction, data presentation, and drawing conclusions.

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Results and Discussion

- **Research result**
  1. **Description of Research Data**
     1) **Quantitative Research**

In the first stage, collect and analyze quantitative data, to answer the formulation of the research problem"Can learning using the Flipped Classroom model assisted by E-Modules achieve quality learning?".

Quantitative Research was carried out in the 2023/2024 academic year semester 1 (August - October 2023).

2) Qualitative Research

Qualitative research was carried out in the 2023/2024 academic year, semester 1 (September 2023). The process of implementing qualitative research was carried out in the stages of giving an independence questionnaire, giving initial prose writing ability questions and interviews.

2. Analysis Prerequisite Test

1) Normality Test

Based on the normality test with the Shapiro-Wilk test, the experimental class pretest score was 0.092, the experimental class posttest was 0.740, the control class pretest was 0.271, and the control class posttest was 0.116. It is clear that the value . So it is accepted, so that the pretest and posttest data from the experimental class and control class are normally distributed.$sigsig > \alpha = 0{,}05 H_0$

2) Homogeneity Test

Based on the homogeneity test, the Sig value was obtained. 0.308. It is clear that the values thus received from the experimental and control class posttest data have the same variance (homogeneous)$sig > \alpha = 0{,}05 H_0$

3. Final Analysis

1) Descriptive statistics

Based on the statistical measurement table for descriptive analysis, it is known that the average score of 15 students in the control class was 71.67 while the average of 15 students in the experimental class was 68.67. At first glance it can be assumed that the average score for achieving science problem solving abilities for control class and experimental class students is much different. To strengthen this assumption, it is necessary to test the hypothesis

2) Inferential statistics

This research used a one sample t-test (Hypothesis 1), paired sample t-test and N-Gain test (Hypothesis 2), and Linearity Test, normality test and simple linear regression test (Hypothesis 3).

a. Hypothesis 1

Table 2. Determining the Average Value of Critical Thinking Ability in Science

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Results of critical thinking skills in science	15	79.67	10.77	2,780

Table 3. Determining Significant Values

One-Sample Test

	Test Value = 70					
			Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	Q	Df			Lower	Upper
Results of science critical thinking abilities	17 78	14	,015	4,667	-1.30	10.63

Based on calculations using the proportion test with a real level of 5%, SPSS calculations obtained a Sig value. (2-tailed) = 0.015 < 0.05. So it is rejected, meaning that the average science critical thinking ability of students learning the flipped classroom model assisted by e-modules on material changes exceeds the KKM. This is reinforced based on the results of the test data of 12 students out of 15 students who completed the test, meaning that the percentage of the experimental class was around 80% who completed the KKM.$t_{hitung} \geq t_{tabel} \leftrightarrow 1{,}778 > 1{,}706 H_0$

b. Hypothesis 2

Based on the results of the control class prostest t-test, the Sig. (2-tailed) = 0.139 0.05, so there is no difference in the results of the science problem solving abilities of students in the control

class with respiratory material during the posttest, while the results of the science problem solving abilities of students in the experimental class with respiratory material during the posttest in the Experimental class Sig. (2-tailed) = 0.008 < 0.05, so there is a difference in the results of the students' science critical thinking abilities in the control class on material changes in form during the posttest. So there is an increase in science critical thinking skills after learning.

The calculation of the normalized Gain score in this study is as follows:

$$= \frac{Skor\ Postest\ Eksperimen\ -Skor\ Posttest\ Kontrol}{Skor\ Maks - Skor\ Postest\ Kontrol} \times 100 = \frac{79{,}67 - 68{,}67}{100 - 68{,}67} \times 100 = \frac{11}{31{,}33} \times 100 = 35{,}11$$

Based onthe results of the calculation, obtained a gain score, namely 35.11. This score shows that 30 ≤ N-Gain ≤ 70. So it can be concluded that there is an increaseScience critical thinking skills, flipped classroom model learning using e-modules, material changes in formsof 35.11 or a moderate increase.

c. Hypothesis 3

Table 4
Simple Linear Regression Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1391,938	1	1391,938	78,200	,000b
	Residual	231,395	13	17,800		
	Total	1623,333	14			

a. Dependent Variable: science critical thinking abilities

b. Predictors: learning independence

0.00 <0.05 is obtained, so H0 is rejected. So, it can be concluded that there is a significant influence between learning independence on critical thinking skills in science material Changes in Form with the Flipped Classroom learning model assisted by e-modules. After that, the regression coefficient test was carried out with the following hypothesis formulation:

$H0$: $\beta = 0$ (regression coefficient is not significant).

H_1:$\beta \neq 0$ (significant regression coefficient).

The test criteria used are if the significance value is > 0.05 thenH_0accepted.

Table 5 Coefficients of Simple Linear Regression Test

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	Q	Sig.
1	(Constant)	15,523	7,335		2,116	,034
	Learning independence	1,948	,220	,926	8,843	,000

Dependent Variable: science critical thinking abilities

In the Coefficients output results, the Sig value is obtained. (constant) = 0.034 < 0.05 and Sig. (curiosity) = 0.000 < 0.05, soH_0rejected. So, the regression coefficient is significant. Because the assumptions about the linearity of the model and the significance of the regression coefficients are met, the linear regression equation obtained can be used.

From the Coefficients output results, it can be seen that the Constant value (∝) is 15.523 and the coefficient valueβ(independence in learning) of 1.948. The following is the form of a simple linear regression equation for these two variables:

$$Y=\alpha+\beta X= 15.523 + 1.948$$

Table 6. Model Summary of Simple Linear Regression Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926a	,857	,846	4,219

a. Predictors: (Constant), learning independence

Based on the Model Summary output, it is known that the correlation/relationship value (R) is 0.926, which indicates a strong and positive relationship between the two. From this output, a coefficient of determination (R square) value of 0.857 was obtained. Which means that the influence of the learning independence variable and the science critical thinking ability variable on material changes in student form is 85.7% of students caused by other factors.

4. Qualitative Analysis

This pretest research was conducted at SDN 02 Rogoselo with a total of 15 students as subjects. The pre-test of science critical thinking skills with this questionnaire was carried out before using the flipped classroom learning model assisted by E-modules, which was used to measure students' abilities before receiving treatment. Then, scores were obtained for critical thinking skills in science which were grouped into low, medium and high categories.

The following data was obtained:

Table 6.
Science Critical Thinking Ability PreTest Ability Value

Range	Qty	Percentage	Student Code
46-60	2	13%	S1, S14,
61-75	11	73%	S2, S3, S4, S6, S7, S8, S10, S11, S12, S13, S15,
76-90	2	13%	S5, S9,

Based on the results of the science critical thinking ability pretest, it can be seen that science critical thinking ability is very diverse. Namely, of the 15 students at SDN 02 Rogoselo who received the low ability category, there were 2 children with a score of 13%, with a score range of 46-60 obtained by students with serial numbers 1 and 14. For medium level ability with a score range of 61-75, 11 were obtained. students with a percentage of 73%, namely students with serial numbers; 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, and 15. For the high category, 2 children were obtained with a percentage of 13% with a score range of 76-90, obtained by students with serial numbers 5 and 9

Based on this table and the criteria that have been determined, the researcher determined the research subjects based on the results of critical thinking skills regarding material changes, namely 2 students with the highest scores, 2 students with average scores, and 2 students with the highest scores.

The results of the work of the six selected research subjects were used to represent each level for deeper analysis with interviews related to critical thinking skills regarding material changes in form. The research subjects used were S-5, S-9, S-6, S-11, S-1, and S-4.

5. Analysis of the results of critical thinking skills in science

Table 7.
TablePretest and Posttest Results of Research Subjects

No	Subject	KMP Pretest	KMP posttest	nformation
1.	S-5	90	100	Increase
2.	S-9	80	95	Increase
3.	S-6	65	85	Increase
4.	S-11	65	85	Increase
5.	S-1	55	65	Increase
6	S-4	65	80	Increase

Based on Table 7 above, the research subjects in the lower group, average group and upper group experienced an increase in their ability to think critically about material changes in form with varying levels of improvement. In the lower group, namely S-1, there was an increase of 10 and S-4, there was an increase of 15. In the average group, namely S-6 and S-11, there was an increase of 20. The increase in the upper group, namely S-5, was 10 and S- 9 equals 15.

Analysis of indicators of science critical thinking skills regarding changes in form was carried out based on the results of work on test questions and the results of interviews with determined research subjects. The researcher took 2 questions on the results of the research subject's work using critical thinking skills using 4 indicators, namely: (1) interpreting, (2) analyzing, (3) evaluating (4) solving problems

6. Analysis of Student Learning Independence

Table 8.
Experimental Class Student Learning Independence Data

Student	Pre-	Meeting 1	Meeting 2
S-01	2	2.7	3
S-02	2.7	3	4.2
S-03	3	3,4	4
S-04	2	2.7	3.5
S-05	3	4	4.7
S-06	2.6	3.5	4
S-07	3	3,4	3
S-08	2	2.7	3.5
S-09	2.6	3,4	4.7
S-10	3	3.6	4
S-11	2.6	3,4	4
Student	**Pre-**	**Meeting 1**	**Meeting**
S-12	2.6	3,4	4.2
S-13	2.7	3	3.5
S-14	3	3,4	4
S-15	2	2.7	3.5
Average	2.59	3.22	3.85

Based on data from the learning independence questionnaire at the pre-meeting, learning meeting 1 and meeting 5, students in the experimental class experienced increased learning independence.

Based on data from the student learning independence questionnaire at pre-meeting, learning meeting 1 and meeting 5, students in the experimental class experienced increased learning independence.

Based on table 8. in pre-learning students were given a learning independence questionnaire with an average score of 2.59, at the first meeting they got an average score of 3.22 and at the fifth meeting the average was 3.85. So it can be concluded that the experimental class experienced an increase in learning independence.

In this study it can be concluded that in class V of SDN 02 Rogoselo in the final assessment (posttest) regarding learning independence there were 2 students in the moderate or lower category with a percentage of 13%, 11 students in the good or middle category with a percentage of 74% and 2 students in the category very good or above with a percentage of 13%.

If we look at the data obtained, it can be concluded that in the high or very good category, the indicators of student learning independence have been met, namely self-confidence, active learning, discipline in learning, responsibility in learning and motivation in learning. However, in the middle or good category, there are 3 indicators that are met. Meanwhile, the lower category means that students have met only one indicator of learning independence.

- **Discussion**

1. Quantitative Discussion

Based on the results of research on hypothesis 1 in the experimental class using the flipped classroom learning model assisted by e-modules, it shows that the average value of students' critical thinking abilities in science regarding changes in form has reached the KKM. This is based on the two-way Anova test obtained $F_{hitung} > F_{tabel}$, so that H_0 rejected, the three population averages are not identical, in other words the population averages of the science lesson results for the change in student form material for the experimental class with the flipped classroom learning model assisted by e-modules and the control class with the conventional model are not the same or it can be interpreted that there are differences The results of the science lesson material change in the form of students between those who received the flipped classroom learning model assisted by e-modules and the conventional model. The results show that the tailed Sig.2 value is 0.115 or more than 0.05, meaning that the average of experimental class students is more than the KKM. The results of this research analysis are in accordance with the hypothesis which states thatStudents' critical thinking abilities in the flipped classroom learning model assisted by E-modules achieved classical BTA, namely the proportion of students who achieved learning completeness was more than 75%.

Based on the results of hypothesis 2 from the pretest and posttest scores of the experimental class, there was an increase in science critical thinking skills after implementing the flipped classroom model assisted by e-modules. This is because the tailed Sig.2 value in the Paired Sample t Test is less than 0.05 so hypothesis 2 is accepted. The increase in critical thinking skills of class V science students at SDN 02 Rogoselo is equal to35.11 from the results of the N-gain calculation, which means that the experimental class experienced a moderate increase.

In the second hypothesis test, the aim was to find out whether there was a significant difference in the achievement of science critical thinking skills between students who received the flipped classroom learning model using E-modules and students who received conventional learning. The comparison is as follows:

1) Comparison of science critical thinking abilities (initial) between students who received the flipped classroom learning model using E-modules and students who received conventional learning.

Benjamin S. Bloom in Wulandari (2005) states that initial abilities are very necessary to support students' understanding before being given new knowledge. For this reason, in this study the researcher gave pretest questions to determine initial science critical thinking abilities in the control class and experimental class. This is necessary because one of the requirements of sequential explanatory research is that the initial science critical thinking skills of control class and experimental class students must be equivalent,

so that it will make subsequent data analysis techniques easier.

The results of the descriptive statistical test of critical thinking skills in science (initial) in the control class of 15 students were: maximum value in science = 85, minimum value = 55, average = 71.67 with median = 75, mode = 80, and standard deviation = 9.940 . Meanwhile, in the experimental class, the results of descriptive statistical tests on the science critical thinking skills (initial) of 15 students were: maximum value in science = 90, minimum value = 55, average = 68.66 with median = 70, mode = 65, and standard deviation = 8.756.

Based on descriptive statistics, the science critical thinking abilities (initial) of students who will receive problem-based learning in the experimental class and students who will receive conventional learning are not significantly different at the significance level α = 0.05. So the requirements for quantitative research in the control class and experimental class have been fulfilled.

ResultsThis test shows that there is an influence of the form of learning on students' (initial) science critical thinking. The form of learning used in this research is learning using the flipped classroom model assisted by E-Modules.

The flipped classroom learning model is based on E-Modules as a step to direct students towards science critical thinking skills (initial) so that students can solve the problems they face.Thing iThis means that students who study using the flipped classroom model have been trained in science critical thinking skills.

2) Comparison of the achievement of critical thinking skills in science between students who received the flipped classroom learning model and students who received conventional learning.

The achievement of critical thinking skills in science in the control class and experimental class can be seen from the post-test results. The post-test to measure the achievement of students' critical thinking skills in science was carried out after each student in the control class and experimental class had learned five meetings. Learning in the control class and experimental class is carried out by the same teacher. The difference lies in the treatment of the two classes.

In the experimental class, students received learning using the flipped classroom model assisted by e-modules, while in the control class, students received conventional learning. The forms of questions tested in the post-test are the same as those given in the pre-test.

The post-test data in this study is referred to as the achievement of students' critical thinking skills in science. From the results of hypothesis testing using two independent one-party t-tests, it was concluded that the achievement of science critical thinking skills of students who received learning using the flipped classroom model assisted by e-modules was significantly higher than students who received conventional learning at the α = 0 level. 05.

The post-test results showed that students in the control class experienced a change in their average score from 71.67 to 73.67. This means that for students who received conventional learning, the increase in the achievement of critical thinking skills in science was 2. Meanwhile, students in the experimental class also experienced an increase in the average score from 68.67 to 79.67. This means that for students who received learning with the flipped classroom model assisted by e-modules, the increase in the achievement of critical thinking skills in science was 11.

Based on the explanation above, it appears that the achievement of science critical thinking skills of students who receive learning using the flipped classroom model assisted by e-modules is significantly higher than students who receive conventional learning. Why is that? Achieving critical thinking skills in science is an achievement where students appear to be able to solve or find answers to problems and tasks in science learning. Furthermore, indicators of critical thinking skills in science according to researchers include: (1) interpreting, (2) analyzing, (3) evaluating (4) solving problems

Furthermore, based on the results of simple linear regression analysis, it shows that there is an influence of learning independence on science critical thinking skills using the flipped classroom learning model assisted by e-modules. The results of this analysis are in accordance with hypothesis statement 3, namelyStudent learning independence has a positive effect on students' critical thinking abilities in the experimental class in learning science material on changes in form in class V, obtained a large amount of learning

independence regarding the ability to think critically in the science of material changes in formstudents amounted to 85.7%, meaning that the remaining 14.3% were influenced byother factors. The higher the student's learning independence, the higher and higher the value of critical thinking skills in science material changes in form. Based on this, the flipped classroom learning model assisted by e-modules is able to increase students' learning independence and improve critical thinking skills in science lessons regarding changes in form in class V.

So, to achieve critical thinking skills in science, students must be able to interpret, analyze, evaluate and solve using science ideas to solve problems whether related to science, other scientific disciplines or in everyday life. In connecting, students must be able to understand newly obtained information to direct it to information that has been received previously.

The research results above are also supported by the results of observations during the research. The learning process using the flipped classroom method assisted by e-modules brings changes to classroom learning. By practicing a lot of connecting concepts in science, students will be more skilled in working on questions. So, to strengthen the results of quantitative research, the researcher continued with qualitative research.

2. Qualitative Research

In this study, differences were obtained in science critical thinking abilities regarding changes in form and student learning independence in subjects in the high, average and low categories. The critical thinking steps used are interpreting, analyzing, evaluating and solving problems. Differences in science critical thinking abilities regarding changes in form in each category can be seen in Table 8 as follows:

Table 8
Critical Thinking Ability Science changes material

Category	Subject	Indicator			
		1	2	3	4
Tall	S-5	Fulfil	Fulfil	Fulfil	Fulfil
	S-9	Fulfil	Fulfil	Fulfil	Fulfil
Currently	S-6	Fulfil	Fulfil	Fulfil	Does not meet the
	S-11	Fulfil	Fulfil	Fulfil	Does not meet the
Low	S-1	Fulfil	Does not meet the	Does not meet the	Does not meet the
	S-4	Fulfil	Does not meet the	Does not meet the	Does not meet the

Based on students' critical thinking skills in subjects with a high category, students are able to fulfill the four existing indicators. Based on the results of the analysis carried out, it can be concluded that subjects in the high category are able to fulfill all the indicators in the four steps of critical thinking in science regarding changes in form, namely(1) interpret, (2) analyze, (3) evaluate, (4) solve problems.

Based on the results of the analysis, it can be concluded that subjects in the medium category are able to fulfill the indicators in the three steps of solving science problems, namely(1) interpret, (2) analyze, (3) evaluate, but have not been able to complete the indicators (4) solve the problem.

Based on the results of the analysis, it can be concluded that science critical thinking skills at the low category level are only able to meet one of the indicators in one step of critical thinking, namely(1) interpret, (2) analyze, (3) evaluate, (4) solve problems.

From the results of this qualitative research, three groups were obtained based on the level of critical thinking ability in science.Namely, based on the initial test on critical thinking skills in science, it was discovered that some students were classified as intelligent, able to complete the test in the correct way and with the correct final results, then students with moderate abilities could only complete a few indicators with incorrect final results, whereas students with low academic abilities, are only able to complete one indicator of critical thinking ability, and fail to complete the tasks given.

After the interview was held, the following information was obtained; in group one, smart

students can work on all indicators of critical thinking, namely interpreting, analyzing, evaluating and solving problems. For group two, students with moderate ability are only able to interpret and analyze, but have not been able to create problem-solving plans, have not been able to take action to evaluate and solve problems. Meanwhile for group three, students with low ability, have only been able to complete one indicator of thinking ability. critical of the four existing indicators of critical thinking, namely interpreting.

From the results of the qualitative research analysis, it is known that the group of students with high critical thinking skills in science has a high level of learning independence, the group of students with moderate critical thinking skills in science has a moderate level of independence, and the group of students with low critical thinking skills in science has a high level of learning independence. the low one. Based on this description, it can be seen that the level of student learning independence influences science critical thinking abilities.

Conclusion

Based on statistical data analysis, research results and discussion of chapter IV, the conclusions that can be drawn from this research are as follows: (1). Students' science critical thinking abilities in the flipped classroom learning model assisted by e-modules achieved classical BTA, namely the proportion of students who achieved learning completeness was more than 75%. (2). The achievement of science critical thinking skills of students who received learning using the flipped classroom model assisted by e-modules was significantly higher than students who received conventional learning. (3). Students' learning independence has a positive effect on science critical thinking skills in the experimental class in class V material change material science learning.

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