



# Analysis Student Critical Thinking Skill on Physic Learning with E-Modules type Information Search during The Covid 19 Pandemic

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**Abstract:** This research was conducted after the development of e-modules for Newton's Laws. This was to analyze the students' critical thinking skills consisting of indicators providing basic alignment, using logic thinking, providing arguments, conducting evaluations, and making decisions. The study was conducted on 62 students at two high schools in Surakarta. The study used descriptive analysis methods using differences in gain values, normality tests, homogeneity, and paired t sample tests and was conducted in 2021. The results showed that students' critical thinking skills increased after using E-module. The increase was derived from an N-Gain value of 0.60 for overall critical thinking skills and for each aspect of the increase in the moderate category. This research is expected to capture the profile of students' critical skills and the effectiveness of e-modules in online learning.

**Keywords:** Critical thinking; E-module; Information search

## Introduction

COVID-19 (Coronavirus Disease-2019) is a new outbreak that causes problems in various aspects of the global (Wang et al., 2020). The COVID-19 outbreak originated in Wuhan (Li et al., 2020). In December 2019, COVID-19 struck the city of Wuhan where the number of cases is increasing rapidly but clinical information of infected patients is limited. In general, this disease is clinically characterized by respiratory symptoms (Huang et al., 2020).

One strategy to control the spread of viruses is to minimize human interaction. One of the policies taken by the government is to close schools. On March 18, 2020, 107 countries had implemented school fees nationwide related to COVID-19. Indonesia also implements this strategy to control the spread of COVID-19 (Viner et al., 2020). The results showed that school closures reduced the spread of coronavirus by 5.6% (95% CI = 4.1-6.9), almost the same as H1N1 which is 7.6% (95% CI = 5.2-9.7) and H3N2 (95% CI = 3.1%; 2.5-3.2) (Jackson et al., 2021).

The massive spread of the virus force the government to issue social distancing and physical distancing policies to prevent more massive and widespread transmissions. This policy is enforced nationally, not only the affected areas (Ahmad, 2020). COVID-19 outbreak had also affected the education system (Nurkholis, 2020). The Indonesian government through the Ministry of Education and Culture had issued policies to prevent COVID-19 spread by disbursing schools and universities (Susilawati et al., 2020). Other impacts also change the method of learning, from the face-to-face learning to online ones (Windhiyana, 2020).

Online Learning System implementing distance education to equalize the quality of learning access. Some studies said online learning is more flexible, short, practical, and can be done remotely without gathering in the same place. Online Learning policies can reduce the spread of the COVID-19 (Wargadinata et al., 2020). However, teachers must prepare sufficient learning methods or media so that learning goals can still be achieved, especially to improve aspects of knowledge,

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attitudes, and skills. The selection and use of learning media also need to be adjusted so that learning can run effectively and efficiently. Learning activities in distance learning systems require online communication technology so that learning can be done anytime and anywhere (Mulyanti et al., 2020).

The learning process in Indonesia has not been enough to encourage students' critical thinking skills. Reality showed the tendency to emphasize on memorization. Therefore, teachers should train students' critical thinking and HOTS (Sanjaya, 2010).

Various efforts to improve the learning quality continues to be carried out, including through the development of teaching materials, and learning media and the use of ICT. ICT facilitates interactive multimedia in learning that can facilitate and improve students' critical thinking skills.

One alternative solution for those problems was e-module (DEPDIKNAS, 2015). Modules are learning materials that are systematically designed based on a specific curriculum and. Modules are packaged into smallest units of learning and allow to be studied independently in a specific unit of time. Modules are learning tools that contain materials, methods, goals, instructions, exercises, and assessments (Hamdani, 2011)

E-module means for e-learning. E-learning is defined as the use ICT in learning (Pelet, 2015). E-modules can be as multimedia that it can be a better learning resources than the usual print media module. Multimedia combines two or more media elements, such as text, images, graphics, photos, sound, film, and animation in an integrated manner. Multimedia gave benefits both learners and students, such as the learning process become more interesting, interactive, time efficient, improved learning quality, and flexible implementation.

Various media can be used to accommodate the needs in online learning. Learning media also has various advantages (Rusman, 2012). Other research shows that e-modules can empower students' critical thinking skills (Perdana et al., 2017). In this study, examined and analyzed the media needed by the teacher to empower not only students critical thinking skills but also students" in distance learning during the COVID-19 pandemic.

This study uses the information search-type learning model. It was a learning model with students looking for information from various sources both individually and in groups. It provokes students' activeness. Research showed that with active learning students will become more active (Pinheiro & Simões, 2012). Learning done in groups can improve students' critical thinking skills (Karami et al., 2012). In addition, group learning students can improve students' character

such as responsibility (Eliasa, 2014). The media as teaching materials is more effectively used in high school students (Lawut et al., 2019).

Field observations on 40 teachers in Surakarta showed that 95% of teachers need media and will implement information search type electronic modules to improve students' critical thinking skills (Sani et al., 2021).

Indicators of critical thinking were defined as follows: 1) formulating the main points, 2) uncovering existing facts, 3) choosing logical arguments, 4) detecting bias with different points of view, and 5) drawing conclusions (Ennis, 1996). Other critical thinking indicators are as follows: 1 Can determine and understand the problem; 2) give reasons when answering and concluding; 3) predicting the conclusions; 4) applying existing concepts to solve problems; 5) presenting the same problems as existing ones; and 6) checking answers with the truth (Herdiman et al., 2018). From several previous studies, the indicators of critical thinking in this study were: 1) provide basic explanations, 2) give arguments, 3) execute logical thinking, 4) evaluate, and 5) make decisions and determine actions.

Based on these explanations, this research aimed to analyze the students' critical thinking skills by using information search type e-module as learning media. And this research are important because it explanation about the thinking skill on physic learning during the pandemic covid-19.

## Method

This research was conducted on 62 students of from two High Schools in Surakarta. Data were collected using tests that contained aspects of critical thinking skills in each question. The data were analyzed using N-Gain. N-Gain calculation is the normalization of gain obtained from pretest and post-test results. N-Gain calculations performed to find out the improvement of students' critical thinking skills before and after using e-module. From the N-Gain values, the effectiveness of e-module media was shown. According to Hake (1998), calculation of N-Gain as in equation (1) and classification of the average N-Gain (See Table 1).

$$(g) = \frac{\% (G)}{\% (G)_{maks}} = \frac{\% (S_f) - \% (S_i)}{100\% - \% (S_f)} = \frac{\% (G)}{\% (G)_{maks}} \tag{1}$$

**Table 1.** Criteria of N-Gain

Averages	Criteria
$((g)) \geq 0.7$	High
$0.7 > ((g)) \geq 0.3$	Medium
$((g)) < 0.3$	Low

## Result and Discussion

Data on the student’s critical thinking skills before and after the use of e-modules can be seen in Table 2.

**Table 2.** Students’ Results

Test	Average	Max	Min	N-Gain
Pretest	54.18	76	20	0.60
Posttest	82.06	98	66	

The data showed the pretest score in pretests have the average of 54.1, the min was 20 and the max was 66. For the post-test, the average score was 82.06, with the lowest of 66 and the highest of 98. The obtained N-Gain value was 0.60. The average increase in each aspect of critical thinking can be seen in Table 3.

**Table 3.** Average N-Gain for each Indicator of Critical Thinking Ability

Indicators	N-Gain	Categories
Provide a basic explanation	0.54	Medium
Using logical thinking	0.41	Medium
Giving arguments	0.50	Medium
Conducting evaluation	0.52	Medium
Making decision	0.53	Medium

Improvement of critical thinking skills can be calculated using normalized N-gain. Before the N-gain test is normalized, it must be tested for the normality, homogeneity, and paired test of t-test samples using the SPSS. The results of the analysis can be seen in Tables 4, 5 and 6.

**Table 4.** Normality Test Results

Data	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	dF	Sig.	Statistic	dF	Sig.
Pretest	.127	62	.192	.963	62	.313
Posttest	.089	62	.200	.977	62	.682

**Table 5.** Homogeneity Test Results

Test of Homogeneity of Variances (Pretest)			
Levine Statistic	df1	df2	Sig.
2,385	1	62	.127
Test of Homogeneity of Variances (Posttest)			
Levine Statistic	df1	df2	Sig.
3,079	1	62	.085

The normality test obtained the significance value (p) for pretest= 0.313 and posttest= 0.682. The homogeneity test obtained significant value (p) of 0.127. The paired sample T-test obtained significance (p) of 0.000 (p <0.05).

Based on the research data, critical thinking is crucial for students. Critical thinking skills, identified by

Scheffer and Rubinfeld (2000), are important skills that lead to the “expansion” of the mind when using cognitive skills that support the development of reflection, mental flexibility, and openness of consciousness.

**Table 6.** Paired Sample Test Results

Paired Sample Statistic			
Pair	Mean	N	Std. Deviation
Pretest	54.18	62	.127
Posttest	84.4242	62	.846696
Paired Sample Correlation			
Pair	N	Correlation	Sig.
Pretest-Posttest	62	.138	.445
Paired Sample Correlation			
Pair	N	Sig. (2-tailed.)	
Pretest-Posttest	62	.000	

Students’ active participation help them think better through self-exploration of problems in simulated experiences, and clarify their ideas before submitting a critique and answers (O’Flaherty & Costabile, 2020). In other resarch it was found that online learning supports and improves critical thinking (Sims, 2009).

The data analysis showed the increase in students’ critical thinking skills after using e-modules. Improvement of students’ critical thinking abilities is presented in the results of table 1 calculations. The average pretest result is 54.18 and the posttest is 82.06, so it can be concluded if the average post-test result is greater than the average pretest result.

The normality test with Shapiro-Wilk test obtained the significance value (p) for pretest= 0.313 and posttest= 0.682. The analysis showed that the value (p) is greater than 0.05 which means data have normal distribution. The homogeneity test using Levene’s Test obtained significant value (p) of 0.127; (p) > 0.05. It indicated that the data is homogeneous. The paired sample T-test gained significance (p) of 0.000 (p <0.05), it showed the differences in students’ critical thinking skills in learners before and after the use of e-modules.

Based on the analysis data, it shows that the value of N-Gain was 0.60. It concluded that the increase in students’ critical thinking skills was moderate. Improvements also occurred in each aspect of critical thinking ability. The highest increase was in aspect of provides a basic explanation (average N-Gain of 0.54). The aspect with the lowest N-Gain average was using thinking logic (0.41).

## Conclusion

The results showed that e-module is effective to improving students’ critical thinking skills. With this information, e-module media becomes an alternative

and is planned by teachers to assess students' critical thinking skills.

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#### Author Contributions

The main author, Sukarmin, contributed to doing validation investigation, formal analysis, focused on methodology, conducting research, and review writing research article. The second author, Dwikie Mahendra Sani, contributed to formal analysis, writing original draft and assisted in the data collection process. All author have read and agree to the published version of the manuscript.

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#### Conflicts of Interest

The authors declare no conflict of interest.

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