JEMS (Journal of Mathematics and Science Education), 11(2), 2023, 580-588
DOIs: 10.25273/jems.v11i2.16691

A Critical Thinking Capability Analysis of Student Worksheets in A Collaborative Learning Environment

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Abstract:
Kemampuan berpikir kritis dalam matematika merupakan salah satu keterampilan berpikir yang diperlukan siswa untuk memperoleh prosedur pemecahan masalah dan menemukan hasil yang logis, khususnya dalam menghadapi perkembangan di abad ke-21. Salah satunya dengan menerapkan pembelajaran kooperatif berbantuan LKPD. Penelitian ini bertujuan untuk mengetahui kemampuan berpikir kritis siswa dalam menerapkan pembelajaran kooperatif berbantuan LKPD secara langsung. Penelitian ini menggunakan penelitian deskriptif dengan pendekatan kualitatif. Subyek penelitian ini adalah 30 siswa kelas VIII-I. Instrumen penelitian meliputi RPP, lembar observasi, tes, dan wawancara. Teknik pengumpulan data menggunakan observasi, tes, dan wawancara. Hasil penelitian menunjukkan bahwa hasil post test siswa menunjukkan bahwa 17 siswa pada kategori kemampuan berpikir kritis tinggi memperoleh skor 72,36%, siswa tiga kategori memperoleh skor 9,67%, dan siswa pada kategori kemampuan berpikir kritis rendah memperoleh skor 6,67%. Penerapan lingkungan belajar kooperatif dengan dukungan LKPD juga dapat membantu meningkatkan aktivitas siswa selama pembelajaran matematika, dengan rata-rata aktivitas sebesar 82,1%.,

Keywords: Berfikir kritis; LKPD; Pembelajaran Kooperatif

Abstract:
The ability to think critically in mathematics is one of the cognitive abilities that students require in order to learn problem-solving techniques and arrive at logical conclusions, particularly while dealing with advances in the twenty-first century. One method is to use live worksheet-assisted cooperative learning. The goal of this study was to assess students' critical thinking abilities when using LKS-assisted cooperative learning. This study employs a descriptive research design with a qualitative methodology. Thirty eighth-grade students participated in the study. Lesson plans, observation sheets, assessments, and interviews are examples of research instruments. Data collection methods include observation, exams, and interviews. Students' post-test results showed that 17 students scored 72.36% in the category of high critical thinking ability, three categories of students scored 9.67%, and students in the category of low critical thinking ability scored 6.67%. Adopting cooperative learning settings with LKPD support can also aid enhance student engagement throughout mathematics instruction, with an average of 82.1% activity.

Keywords: Critical thinking; Worksheet; Cooperative learning

Introduction

The ability to think critically is one of the talents required to handle the problems of the twenty-first century. Critical thinking is required to prepare the next generation to lead the country forward (Defiyanti & Sumarni, 2020). Mathematics is one of the key sciences in the development of science and technology in Indonesia in the twenty-first century, where it has advanced at an astonishing rate. Critical thinking is one of the skills that students must have in order to navigate the twenty-first century (Anastasia & Ariani, 2020; Rachmantika & Wardono, 2019; Samura, 2019; Supatmo & Ghufron, 2019; Susandi, 2020). High-level reasoning includes critical thinking skills, which are typically defined by good analysis and decision-makin consideration (Hairun et al., 2020). Critical thinking is one of the thinking talents that students must develop in order to learn problem-solving procedures and reach

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logical conclusions in mathematics (Sachdeva & Eggen, 2021; Yumiati & Kusumah, 2019).

Learning mathematics in Indonesia frequently emphasizes memorizing formulas, conducting computations, and applying fundamental principles. The exam only tests memory, formula calculation, and the application of mathematical ideas to specific frequent issues. in order to erode kids' critical thinking abilities 2018 (Widana, 2018). Students must continue to improve their critical thinking skills in math. These findings are supported by evidence TIMSS (2015), Indonesia is ranked 44th out of 49 participating countries, with a 397 average score. Because the average Indonesian student has not been able to come up with a range of answers when working on a specific topic, they can only reach a low level, which means they can only reach the knowing stage but have not yet reached the critical thinking stage (Arifuddin, 2019; Samura, 2019).

One option teachers can use to address these challenges is to use LKPD. Liveworksheet is a website dedicated to the advancement of LKPD. Liveworksheet is an electronic resource that contains images, text, animations, and videos to keep students from becoming bored (Haqiqi & Syafira, 2021; Khikmiyah, 2021). One of the learning models that can be combined with E-LKPD development is the cooperative learning model. Teachers are expected to inspire students to collaborate with one another through cooperative learning (Nurhasanah et al., 2020).

Previous study has shown that the cooperative learning technique can help students improve their critical thinking, mathematical communication, and learning outcomes Gunur & Dangus (2019); Machfud (2018); Nasution (2018); Rambe & Hamid (2019); Setiawan (2019); Susanti & Adamura (2020); Overweight (2021). Furthermore, research that has been undertaken by Brooke et al. (2021), Hardiyanti et al. (2018), and Sagita et al. (2020), How successfully LKPD based on cooperative learning models may increase student learning outcomes.

Numerous research on the usage of live worksheets in numerous topic areas have been undertaken. According to research (Suharsono & Handayani, 2021; Widiyani & Pramudiani, 2021) By using Liveworks to analyze student learning outcomes, you can enhance the motivation of primary school students to learn. According to research (Teresa et al., 2022) is that the active workbook This type of learning is excellent for use as an interactive teaching tool in physics and business education. Aside from that, research by Fitriani et al. (2021); Khikmiyah (2021); Farman et al. (2021); Roskaputri et al. (2021) asserts that interactive worksheet-based training can assist students strengthen their problem-solving and mathematical abstraction skills.

Numerous research have been conducted to improve learning outcomes, communication abilities, critical thinking abilities, and other talents through cooperative learning. However, little study has been conducted on worksheet-assisted cooperative learning. Whereas LKPD-based learning is more commonly used in primary school and other courses. The primary goals of LKPD-based mathematics learning are to develop students' ability to study independently, problem-solving skills, and mathematical abstraction. As a result, researchers are interested in investigating students' critical thinking skills in cooperative learning contexts assisted by worksheets. LKPD is packed into teaching materials so that students can study the information on their own (Taufiq & Basir, 2018).

The purpose of this study is to describe the effects of students' development of mathematical critical thinking abilities during cooperative learning with worksheet support. This research is expected to result in more interesting and effective learning experiences.

Method

The research methodology used is referred to as a qualitative research strategy. A qualitative technique is used since the goal of this study is to assess a worksheet of students using critical thinking indicators adjusted in accordance with Ennis Robert (1985). Qualitative research is a method for interpreting human or social phenomena that involves the creation of a detailed and elaborate image that can be articulated in words, the reporting of in-depth opinions obtained from informant sources, and the use of natural settings (Fadli, 2021; Nata & Manuaba, 2022).

The method of data collection used was document content analysis (content analysis). Ennis describes the study tool as a checklist sheet with critical thinking information, specifically (Putri, 2022):

Table 1 Critical Thinking Indicators

No	Aspects of Critical Thinking	Critical Thinking Sub Indicator
1	Give a brief explanation (Elementary clarification).	Focusing Questions
		Analyze arguments
		Pose clarifying and demanding questions
2	Develop necessary skills (Basic Support)	Consider a source's credibility (criteria).
		Observe and consider the outcomes of your observations
3	Infer (summarize)	Make deductions and think about the results of your deductions.
		Make an induction and think about the results.
		Make a decision and decide the outcome of the consideration
4	Additional explanation (Advance clarification)	Determine terminology and definitions
		Determine assumptions
5	Tactics and strategy (Strategy and tactics)	Define a course of action
		Socialize with others

In this study's data analysis strategy, an interactive model was applied. This interactive model is composed of three parts: data reduction, data presentation, and verification or inference (verification). This investigation's data was obtained in tabular form. The table displays if critical thinking issues are covered in the worksheets for pupils. This study's data presentation stages include (Putri, 2022): (1) Displaying data reduction results based on critical thinking indicators in each learning worksheet; (2) Estimating the proportion of each indicator's appearance that is consistent with critical thinking. The evaluation method employed was giving points or numbers. The following formula was used in this calculation:

Conformity Percentage: x 100%, $\frac{Skor\ yang\ diperoleh}{Skor\ Maksimal}$

The assessment guidelines for the score percentage assessment are as follows:

Table 2. Rating Guide Category Scale

Percentage	Category
100%	Very good
76% - 85%	Good
60% - 75%	Enough

55% - 59%	Not enough
≤ 54%	Less Secal

Source:(Princess, 2022)

Results and Discussion

The findings of student responses in cooperative learning environments facilitated by LKPD (Student Worksheets) are as follows:

Table 3: Student Reactions to LKPD-Assisted Cooperative Learning Settings

Activity		**The number of students**								
		P2				**P3**				
	1	**Active**		**Not Active**		**Active**		**Not Active**		**4**
			$\sum$		$\sum$		$\sum$		$\sum$	
A	Pretest	18	60	12	40	23	76,7	7	23,3	Post-test
B		15	50	15	50	21	70	9	30	
C		30	100	0	0	30	100	0	0	
D		30	100	0	0	30	100	0	0	
E		15	50	15	50	20	66,67	10	33,33	
Amount			310%		90%		346.7%		53.3%	
Average / meeting			77.5%		22.5%		86.7%		13.3%	
Active average						82.1%				
Dead average						17.9%				

Information: Activity A: Give a simple explanation (Elementary clarification)
Activity B: Develop necessary skills (Basic Support)
Activity C: Infer (summarize)
Activity D: Additional explanation (Advance clarification)
Activity E: Tactics and strategy (Strategy and tactics)

Table 3 shows that in P1, students took a pretest to assess their basic critical thinking abilities. P2 and P3 use cooperative learning environments with worksheet support. In P3, there were 77.5% active students and 22.5% inactive students. There were 86.7% of active students and 13.3% of idle students in P3. As a result, the average percentage of active meetings is 82.1%, with a 17.9% percentage of idle meetings. While P2 students are 50% more active in Strategy and Tactics, P3 students are 66.67% more active. As a result of the presentation of already existing activities, all students noted an improvement in their critical thinking skills during the learning process.

This shows an increase in student involvement at the next meeting. This adds to Chen's Research (2017), where instruction is conducted utilizing a computer or similar technology, which dramatically enhances student performance and engagement and favorably affects attitudes while learning. Furthermore, it is congruent with studies that show that using cooperative learning approaches improves students' critical thinking ability (Syafrial, 2018). Students' activeness while their learning activity is high and when taking assessments using the LKPD supplied by the teacher is an indication of their positive attitude. The exam results on students' critical thinking abilities are as follows:

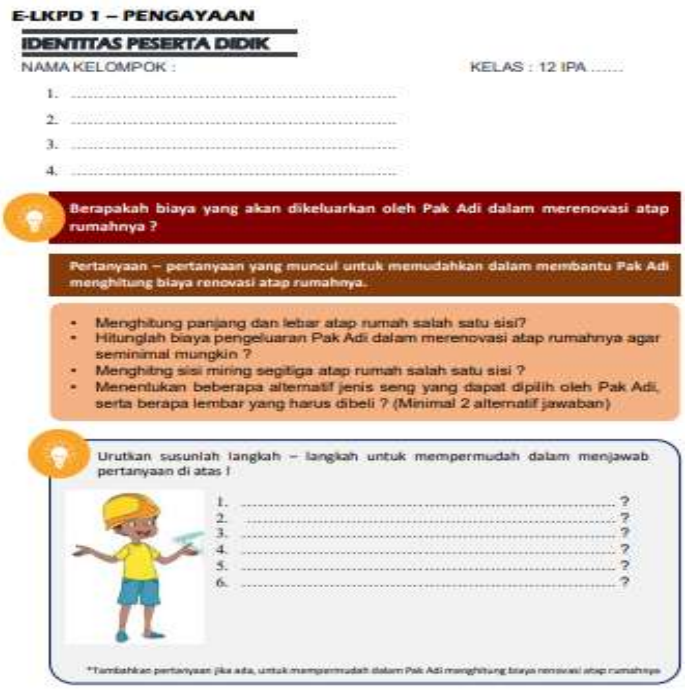

Figure 1. High, Medium, and Low for Critical Thinking Ability Test Results.

Figure 1 indicates that students with strong, medium, or low critical ability may understand the material and data in the questions during the interpretation stage. Several research studies have been carried out by Astiantari et al. (2022), Faiziyah & Priyambodho (2022), and Zetriuslita et al. (2016) able to comprehend inquiries that ask pupils to provide data or justification.

Students with moderate to low critical thinking skills continue to struggle with the analysis step, which leads to errors in the evaluation and conclusion stages as well. This is consistent with research findings Sianturi & Dewi (2022), It explains why students sometimes need clarification when turning statements into mathematical models because they frequently need help comprehending verbal queries (story questions).

As a result of the errors, other indicators had faults as well. Student faults throughout the analytical stage result in inaccuracies during the student evaluation stage. Because each phase is interrelated, each error made throughout the analysis has an impact on the outcomes. The majority of students need to improve their ability to write conclusions from their inference level work.

Table 4. Results of Students' Critical Thinking Ability

Category	Pretest		Post-test	
	$\sum PD$	%	$\sum PD$	%
Tall	8	56,9	17	72, 4
At the moment	7	22,9	3	9, 7
Low	15	20,2	10	17,9

Table 4 shows that 30 students from classes VIII-I took the test. According to the results of the students' critical thinking skills pretest, up to eight students (56.9%) fit into the high category. The intermediate category has seven people and a percentage of 22.9%, while the bottom category has fifteen people and a percentage of 20.2%.

The post-test findings revealed that 17 students scored 72.4% in the high critical thinking ability category, three students scored 9.7% in the medium critical thinking ability

category, and ten students scored 17.9% in the poor critical thinking ability category. An interview exam will be performed to supplement the test results. The interview test will involve six students, with two students representing each indicator.

As previously said, websites that promote cooperative learning can assist students in developing their critical thinking skills Sojayapan & Khlaisang (2018), Umam et al. (2019), and Umam & Azhar (2021) emphasized how the use of LKPD-supported teaching materials could improve students' critical thinking capacity and motivation to study.

Conclusion

Based on the findings of the preceding study, the researcher concluded that students' critical thinking abilities improved in cooperative learning environments using live worksheets. The post-test findings of students in the high critical thinking ability group included 17 students with a percentage of 72.36%, three categories of students with a percentage of 9.67%, and students with a percentage of 6.67% in the low critical thinking ability category. Furthermore, with an average activity level of 82.1%, implementing LKS-assisted cooperative learning settings can help to increase student activity during the mathematics learning process.

Future researchers should create online worksheets with a variety of resources and academic levels to investigate students' capabilities.

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