International Journal of Elementary Education
Volume 7, Number 2, Tahun 2023, pp. 196-203
P-ISSN: 2579-7158 E-ISSN: 2549-6050
Open Access: https://doi.org/10.23887/ijee.v7i2.61607

High-Order Questions Improve Students' Critical Thinking Skills In Elementary Schools

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ARTICLE INFO

Article history:
Received January 12, 2023
Accepted May 14, 2023
Available online May 25, 2023

Kata Kunci:
soal berpikir tingkat tinggi, kemampuan berpikir kritis, sekolah dasar

Keywords:
high-order thinking questions, critical thinking skills, elementary school

ABSTRAK

Salah satu keterampilan yang sangat penting dan mapan untuk memenuhi tuntutan pekerja di abad ke-21 adalah berpikir kritis. Di era sekarang ini, sangat penting untuk mengajarkan dan melatih kemampuan berpikir kritis siswa bahkan sejak sekolah dasar, namun masih banyak siswa yang memiliki kemampuan berpikir kritis yang rendah. Penelitian ini bertujuan untuk menganalisis dan mendeskripsikan pengaruh keefektifan soal tingkat tinggi dalam mengembangkan kemampuan berpikir kritis siswa di sekolah dasar. Metode penelitian menggunakan desain eksperimen one-group pretest and posttest design yang dilakukan di tiga sekolah dasar, Populasi penelitian ini sebanyak 3 guru dan 102 siswa. Instrumen dalam penelitian kuantitatif ini meliputi kuesioner, observasi, dan pedoman wawancara. Teknik analisis data pada penelitian ini yaitu analisis deskriptif kualitatif dan kuantitatif, serta statistic inferensial. Hasil penelitian menunjukkan bahwa terdapat perbedaan yang signifikan antara nilai pretest dan posttest siswa yang diperoleh dari hasil belajar soal jawaban soal tingkat tinggi. Kedua, soal tingkat tinggi kategori efektif untuk mengembangkan kemampuan berpikir kritis siswa di sekolah dasar.Disimpulkan bahwa pertanyaan High-order dapat meningkatkan keterampilan berpikir kritis pada siswa sekolah dasar.

ABSTRACT

Critical thinking is an essential and well-established skill for meeting workers' demands in the 21st century. In today's era, teaching and training students in critical thinking skills, even from elementary school, is essential. However, there are still many students who have low critical thinking skills. This study aims to analyze and describe the effect of the effectiveness of high-level questions in developing students' critical thinking skills in elementary schools. The research method used a one-group pretest and posttest experimental design, which was carried out in three elementary schools. The population of this study was three teachers and 102 students. Instruments in this quantitative research include questionnaires, observations, and interview guidelines. Data analysis techniques in this study are descriptive qualitative and quantitative analysis and inferential statistics. The study results showed a significant difference between the pretest and posttest scores of the students obtained from the results of studying the high-level questions. Second, high-level questions are practical for developing elementary school students critical thinking skills. It is concluded that high-order questions can improve critical thinking skills in elementary school students.

1. INTRODUCTION

One very important and well-established skill to meet the demands of workers in the 21st century is critical thinking (Syawaludin et al., 2019; Van Laar et al., 2020). Characteristics of these 21st century skills (twenty first century skills) that future generations should possess. It is very difficult to imagine a teacher currently in the 21st century not realizing how important it is to prepare students to face the challenges of the 21st century. The ability of teachers to develop their teaching abilities is also in line with issues related to learning and innovation skills, including: 1) Creativity and innovation, 2) Think critically and be able to solve problems, 3) Communication and collaboration, and 4) literacy skills (Arwanda et al., 2020; Jalinus et al., 2021; Makhrus et al., 2018; Rusdin, 2018). Critical thinking skills are part of learning skills in addition to other skills such as creativity, communication, and collaboration (Anggraeni et al., 2019; Dewi, 2019; Nurrohmi et al., 2017). Likewise, the increasing types of jobs in the future that require reliable workers who have critical thinking skills. Critical thinking skills are not only a necessity but also a challenge to be realized in students, especially at the elementary school level (Fitriani et al., 2021; Sanderayanti, 2015; Sartika, 2019). In this era it is very important to teach and train students' critical thinking skills even from elementary school because there will be a difference in the mastery of students who are trained to think critically and those who are not (Illahi et al., 2018; Lombardi et al., 2022). Furthermore, it was explained that the best time to teach critical thinking skills is in the early years of basic education and that is not something that is impossible to do (Davidi et al., 2021; Ennis, 2011; Lombardi et al., 2022). Educators have

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concerns that today's students tend to easily give up facing challenges or problems if they are not equipped with critical thinking skills (Seibert, 2020). Educators must realize the need to adjust, reflect, and transform different and diverse learning practices for students, because their way of thinking can be generated through fixed routines in teacher teaching practices (Bezanilla et al., 2019; Hidayat & Sari, 2019; Ossa Cornejo et al., 2018). Several findings indicate that teachers are still constrained in terms of knowledge, education, and training in order to guide students' skills on how to evaluate, process, and critically reflect on information so that teachers need to be well prepared in promoting critical thinking skills in the future (Lombardi et al., 2022; McLaren, 2015).

Critical thinking is important for the future of students to face the many challenges that will arise in their lives, careers, and at the level of their personal obligations and responsibilities (Azizah et al., 2018; Hamdu et al., 2020; Purnami et al., 2021). Critical thinking as higher-order thinking which, when taught effectively, will encourage logical thinking, problem solving, and contribute to increased education, and employment as part of planned educational outcomes by 2050 (Dwyer et al., 2011). Critical thinkers can analyze their own thinking and can consciously improve their own reasoning; can raise vital questions and issues, collect and assess relevant information, think openly, and communicate effectively (Fatmawati et al., 2019; Syawaludin et al., 2019; Yildirim & Ozkahraman, 2011). With critical thinking skills will give birth to critical thinkers who can benefit life in the future.

Based on this, the researcher believes that today's students' critical thinking needs to be developed so that students become independent thinkers. As well as with the ability to think critically it will not be easy to receive incorrect information (hoax). Problems given in learning can train students to think critically, analytically and synthetically. Problems can be raised in learning activities through learning with cognitive learning models. This cognitive learning model has the perspective that students process information and lessons through their efforts to organize, store, and then find relationships between new knowledge and existing knowledge. However, it cannot be denied that there are still findings of students' critical thinking skills in the low category. Weak students' critical thinking skills are also the impact of the lack of students receiving assistance/guidance by the teacher during the learning process. The assistance/guidance in question is in the form of activities in the form of stimulation to stimulate students to think critically. One of the activities in question is to propose and carry out activities based on high-level questions which we know as Higher Order Thinking Questions.

Higher Order Thinking Questions or high-level questions can train high-level thinking skills that lead to mastery of students' critical thinking skills (Dahlan et al., 2020; Ilmi et al., 2020; Rahmatih et al., 2021). High-level questions facilitate class performance in both multiple choice and essay forms encouraging students to think deeply about material, facilitating semantic coding, rote memory, and leading students to review and rethink factual material that is thought out in more complex ways (Barnett & Francis, 2012; Cetin et al., 2019; Kurniati et al., 2016). A good question for measuring students' critical thinking skills is a question that is able to sharpen one's higher-order thinking skills (Sari & Siregar, 2020). In this study, high-level questions on learning were designed to develop students' critical thinking skills in elementary schools. This study aims to analyze and describe the effect of the effectiveness of high-level questions in developing students' critical thinking skills in elementary schools.

2. METHOD

The method in this study was an experiment conducted in three elementary schools, including SDN Komp: Teachers' Training College 1, Monginsidi 1 Preferred Elementary School, and Athirah Kajolalido Islamic Elementary School. The research design used was a one-group pre-test-post-test design, namely an experimental study carried out in only one group that was randomly selected, and no stability and clarity tests were carried out before the group was given treatment. The pre-test was carried out for each class V, namely class VB SDN Komp IKIP I, class VA SDN Unggulan Monginsidi I, and class V Al-Mughiny SD Islam Athirah Kajolalido Makassar City. A total of 3 teachers and 102 students were involved in this study. Instruments in this quantitative research include questionnaires, observations, and interview guidelines (Siregar et al., 2022). This research requires various instruments to measure higher-order thinking questions' effectiveness in developing critical thinking skills for elementary school students. Furthermore, indicators and sub-indicators of critical thinking are presented in Table 1.

Table 1. Critical Thinking Indicators and Sub-Indicators Number of Pre-Test Questions

Critical Thinking Indicators and Sub-Indicators	Number of Questions
1. Provide a simple explanation (elementary clarification) / 1.1. Focusing Questions/1.1.1 Identifying or formulating problems- 1.1.2 Identifying or	4 (1,2,3,4)

Critical Thinking Indicators and Sub-Indicators	Number of Questions
formulating criteria to determine possible answers/1.2. Analyzing Arguments/1.3. Responding to an explanation or challenge/ 1.3.1. Why?	
2. Build basic skills (basic support)/ 2.1. Adjusting to sources/2.1.1 Ability to give reasons	6 (5,6)
3. Summarize (inference)/3.1. Induce and consider the results of induction/ 3.1.1. Generalize	1(7)
4. Provide further explanation (advanced clarification)/4.1. Defining terms and considering them/4.1.1. Operational Form	1 (8)
5. Develop strategy and tactics (strategy and tactics)/ 5.1. Interact with others/5.1.1. Labelling	2 (9,10)

3. RESULT AND DISCUSSION

Result

The results of the initial investigation of the study were preceded by conducting pre-tests in three schools namely, Komp IKIP I Elementary School, Unggulan Monginsidi I Elementary School, and Athirah Kajolalido Islamic Elementary School, Makassar City. The pre-test was conducted to find out how far the students' critical thinking levels were in the three elementary schools. The pre-test results from the three elementary schools were Komp IKIP I Elementary School, Unggulan Monginsidi I Elementary School, and Athirah Kajolalido Islamic Elementary School, Makassar City. The pre-test was carried out for each class V, namely class V-B SDN Komp IKIP I, class V-A SDN Unggulan Monginsidi I, and class V Al-Mughiny SD Islam Athirah Kajolalido Makassar City.

Based on the results of the pre-test analysis on fifth-grade students at the three elementary schools, the results varied at each elementary school. The results obtained from SDN Komp. IKIP Makassar achieved a grade average of 53 out of 40 students who took the pre-test. Meanwhile, the results obtained from SDN Unggulan Monginsidi 1 achieved a class average of 52 out of 40 students who took the pre-test. Furthermore, the pre-test results of SD Islam Athirah achieved a class average score of 57 out of 22 students taking the pre-test. This shows that in general teachers have not applied critical thinking activities to their students. It can be seen in the table related to the pre-test results of students' critical thinking activities showing that the average percentage of students' critical thinking activities is only able to fulfill 54%, which means that students critical thinking activities are still very low. Other findings that are relevant to this problem show that critical thinking skills are low and not optimal at the elementary school level due to the lack of habituation and a lack of process-oriented learning activities to develop students' critical thinking skills, such as students are only asked to listen to the teacher's explanation, do exercises, and revisit the classical exercises (Nahdi, 2015)(Puspita & Dewi, 2021).

Effectiveness data analysis was obtained from the results of the pre-test and post-test. The test results were then analyzed quantitatively to find out whether there were differences in student learning outcomes before and after going through the answers to high-level questions on teaching materials. The pre-test and post-test results were then analyzed using a paired t-test to find out the difference between the pre-test and post-test results. Hypothesis testing used paired t-tests with the help of SPSS 23 software. Based on the t-test results presented, it can be seen that the calculated t-value is -18.158. The t distribution table is searched at a = 5%: 2 = 2.5% (two-tailed test) with degrees of freedom (df) n-1 or 39-1 = 38. Thus the result of the t table is 2.093. Test criteria: Ho is accepted if t-count <t-table, Ho is rejected if t-count > t-table. Based on Probability: Ho is accepted if the P value > 0.05, Ho is rejected if the P value < 0.05. Comparing t-count with t-table and probability. T-count value < t-table (18.158 < 2.093) and P value (0.000 <0.05). It can be concluded: because the t-count < t-table (18.158 < 2.093) and P value (0.000 < 0.05) then Ho is rejected and Ha is accepted, which means that there is a significant difference between the pretest value and the posttest value.

Based on the results of the t count, it is obtained that the t count is negative, meaning that the pre-test average value is lower than the post-test average value. The value exposure can be seen in the Mean in Paired Sample Statistics. The mean before is 52, while the mean after is 74. So the difference in the average score of the pretest and posttest is 22. This shows that there are significant differences in student learning outcomes through answers to high-level questions on teaching materials so that they are categorized as effective. The results of the analysis of the level of effectiveness in Table 2.

Table 2. Results of Effectiveness Level Analysis

Rated aspect	Test Targets	Result	Information
Effectiveness	Student	The average pretest score reached 52 The average value of the post-test reached 74	There is a significant difference between the pretest and posttest scores **Effective criteria**

Measuring the level of effectiveness is carried out by giving an initial test (pre-test) and giving a final test (post-test) which is given to students through high-level questions to develop student's critical thinking skills using previously developed teaching materials. The effectiveness test is obtained from the results of a comparison of the pretest and posttest scores of class V-A students at Unggulan Monginsidi I Elementary School Makassar if there is a significant difference between the pre-test and apost-test scores. Based on the results of the pretest and posttest scores, it can be seen that the average grade for class V-A at SDN Unggulan Monginsidi 1 Makassar City is 52. Furthermore, the posttest score after Social Studies Teaching Materials can be seen that the average grade for class V-A at SDN Unggulan Monginsidi I Makassar City is 74. The questions developed in the pre-test and post-test of students' critical thinking skills to see effectiveness are developments from the problem grids that have been described previously. The frequency data on students' critical thinking skills in answering questions from the posttest results of class V-A SDN Unggulan Monginsidi I are shown in Table 3.

Table 3. Frequency of Critical Thinking Ability of Class V-A Students of SDN Featured Monginsidi I Based on Critical Thinking Indicators

Question Number	Critical Thinking Indicator	Answering Student				
		4	**3**	**2**	**1**	**0**
1	Provide a simple elementary clarification	9	31	-	-	-
2	Provide a simple elementary clarification	6	30	3	1	-
3	Provide a simple elementary clarification	15	25	-	-	-
4	Provide a simple elementary clarification	3	24	13	-	-
5	Build basic skills (basic support)	5	30	5	-	-
6	Provide inference	2	30	7	1	-
7	Provide further explanation	-	25	14	1	-
8	Develop strategy and tactics	7	27	6	-	-
	Total	47	222	48	3	-

Based on the results of the posttest that was carried out at SDN Unggulan Monginsidi 1 as illustrated in the frequency table for students' critical thinking skills in class V-A based on critical thinking indicators, students demonstrated critical thinking skills on a score scale of 4, 3, 2 and 1. The data in the table shows that Of the 8 posttest items in total the overall level of students' critical thinking in answering high-level questions shows that 47 students obtained a score of 4, 222 students obtained a score of 3, 48 students obtained a score of 2, and 3 students obtained a score of 1 out of a total of 8 questions.

On indicator 1 (question number 1), namely giving a simple elementary clarification, only 9 students were able to answer with a score of 4, and 31 students obtained a score of 3. On indicator 2 (question number 2), namely providing a simple explanation (elementary clarification) only 6 students were able to answer with a score of 4 and 30 students got a score of 3, 3 students got a score of 2, and 1 student got a score of 1. On indicator 3 (question number 3), namely giving a simple elementary clarification, only 15 students were able to answer with a score of 4, and 25 students obtained a score of 3. On indicator 4 (question number 4), namely Providing a simple elementary clarification, only 3 students were able to answer with a score of 4, 24 students obtained a score of 3, and 13 students got a score of 2. On indicator 5 (question number 5), namely building basic skills (basic support), only 5 students were able to answer with a score of 4, 30 students got a score of 3, and 5 students got a score of 2. In indicator 6 (question number 6), namely Inference, only 2 students were able to answer with a score of 4 and 30 students got a score of 3, 7 students got a score of 2, and 1 student gets a score of 1. On indicator 7 (question number 7), namely Providing further explanation (advanced clarification), 25 students get a score of 3, 14 students get a score of 2, and 1 student gets a score of 1. On indicator 8 (question number 8) namely Developing strategies and tactics (strategy and tactics), only 7 students were able to answer with a score of 4, 27 students got a score of 3, and 6 students got a score of 2.

Discussion

According to Bloom's taxonomy, high-order thinking is considered the basis for higher-order thinking. This thinking is based on the fact that some types of learning require more cognitive processes than others but have more public benefits (Ani Rahmawati, Nur Lailatin Nisfah, 2019; Samo et al., 2017; Tanudjaya & Doorman, 2020). In Bloom's taxonomy, as an example, abilities that involve analyzing, evaluating, and creating (creating) are considered part of higher-order thinking. High-order thinking skills are thinking processes at a higher level than just remembering facts or explaining something learned to others (Hobri et al., 2018; Wartono et al., 2018; Widyawati et al., 2021). HOTS requires someone to understand, conclude, connect facts with concepts, categorize, manipulate, look for facts if they occur, and find solutions to a problem. Each individual's frame of mind can be processed and developed by deepening more meaningful experiences (Anwar et al., 2020; Kurniawan, 2019). These experiences can be obtained through the development of cognitive thinking processes.

High-order thinking skills are thinking skills at a higher level than memorizing, repeating facts, or applying rules (Lu et al., 2021; Wahyuddin et al., 2021). High-order thinking skills are the ability to connect, manipulate, and transform the knowledge and experience one has to think critically to find solutions to new problems. High-order thinking skills are connecting, manipulating, and transforming existing knowledge and experience to think critically to solve new problems (Ichsan et al., 2019; Sasson et al., 2018). By training in HOTS, students will explore students abilities and ways of thinking (Gunada et al., 2021; Riadi & Tantra, 2020). Excess learning of HOTS will be able to improve critical thinking skills.

In learning, from the results of discussions with the teacher, the reason for not doing it is because the material to be taught to the teacher is quite dense or a lot, so the teacher feels that the teacher needs more time for one activity. This was also exacerbated by the learning method from home during the COVID-19 pandemic which made it difficult for teachers to communicate and was limited in conveying abstract learning materials to students. So that in the learning process stimulating students with high-level questions has not been applied to learning activities (Hasanah et al., 2023). Critical thinking skills are very urgent and needed by everyone today, both teachers and students to encourage them to understand, process and analyze various kinds of information as basic provisions for solving problems, living in society independently, and not being carried by negative currents. which leads to conflict (Muslimin & Abidin, 2023; Sutiani et al., 2021; Syawaludin et al., 2019). The source of the data used as the initial investigation process is the ability to think critically using critical thinking indicators as follows 1) Provide a simple explanation (elementary clarification), 2) Build basic skills (basic support), 3) Summarize (inference), 4) Provide further explanation (advanced clarification), dan Develop strategy and tactics (strategy and tactics). The pre-test given is based on a grid of questions that have been developed and packaged into questions with high-level questions. By using this indicator, questions are designed preceded by a grid of questions as attached in the appendix with a total of 8 questions. This question is then used to test students' initial critical thinking skills in the three schools described earlier.

Based on these data it shows that the dominant level of critical thinking of students gets a score of 3. Students show good critical thinking skills even though the results are not optimal. This needs to be supported by various factors and one that has been carried out and tested is to foster students' critical thinking skills through the use of level question-based teaching materials. The development of critical thinking skills must be realized in the integration of observation, analysis, reasoning, assessment, decision-making, generating, and processing information to guide behavior based on intellectual commitment, rationality, and consistency (Ennis, 2011; Ghufron et al., 2023). Student work results in answering high-level questions on teaching materials to measure elementary school students' critical thinking skills are presented in Figure 1.

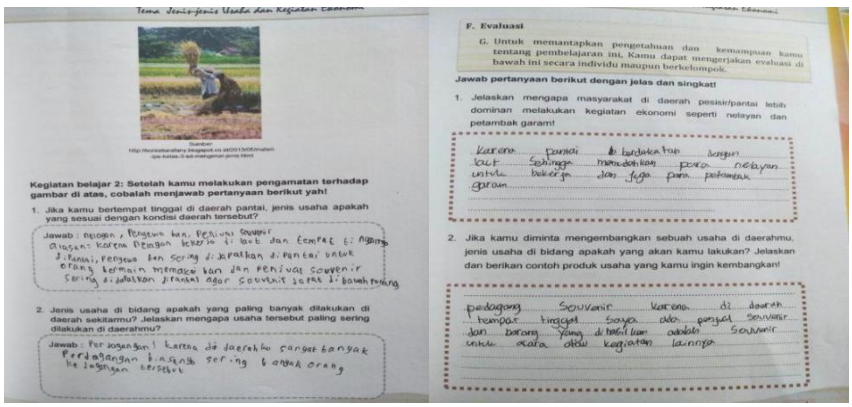

Figure 1. Student Work Results

4. CONCLUSION

Based on the results of data analysis and discussion of the effectiveness of high-level questions to develop students' critical thinking skills in elementary schools, there is a significant difference between students' pre-test and post-test. Test scores are obtained from learning outcomes regarding answers to high-level questions. Second, questions at the high level are effective categories for developing students' critical thinking skills in elementary schools.

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