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Critical Thinking Skills Through Literacy and Numeration Oriented Mathematics Student Worksheet

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Abstrak

Tujuan penelitian pada artikel ini mendeskripsikan kemampuan berpikir kritis melalui Lembar Kerja Peserta Didik (LKPD) matematika berorientasi literasi numerasi yang terdapat tiga aspek yaitu 1) menganalisis permasalahan, 2) penyelesaian masalah, dan 3) penarikan kesimpulan. Jenis penelitian pada artikel ini adalah deskriptif kualitatif. Teknik pengumpulan data melalui observasi partisipatif, wawancara mendalam, dan analisis dokumen. Validasi data dilakukan dengan triangulasi sumber dan waktu. Teknik analisis data dilakukan secara induktif. Hasil penelitian, kemampuan berpikir kritis melalui Lembar Kerja Peserta Didik (LKPD) matematika berorientasi literasi numerasi dapat dikelompokkan menjadi tiga. 1) kemampuan menganalisis permasalahan terkait aspek mengidentifikasi masalah (soal) dari berbagai sudut pandang dengan memahami konsep dan mengembangkan strategi permasalahan dilakukan dengan dibiasakan menganalisis permasalahan dalam Lembar Kerja Peserta Didik matematika berorientasi literasi numerasi. 2) Aspek kemampuan penyelesaian masalah terkait pada indikator menyelesaikan masalah, sebagian peserta didik mampu memecahkan masalah dengan menalar dan berpikir logis serta pengembangan konsep perlu dibiasakan. 3) Kemampuan berpikir kritis pada indikator penarikan kesimpulan terkait dengan mengkomunikasikan ide baru masih perlu dibiasakan dan mengkomunikasikan dalam konteks sehari-hari.

Kata Kunci: Berpikir Kritis, Literasi Numerasi, Lembar Kerja Peserta Didik, Matematika

Abstract

The research objective of this article is to describe critical thinking skills through the Student Worksheet (LKPD) which is oriented toward numeracy literacy and has three aspects, namely 1) analyzing the problem, 2) completing the sheet, and 3) drawing conclusions. The type of research in this article is descriptive-qualitative. Data collection techniques with participatory observation, deepening, and document analysis. Data validation is performed by triangulation of sources and time. The data analysis technique was done inductively. The results of the study, the ability to think critically through the numeracy-oriented Student Worksheet (LKPD) of mathematics can be divided into three. 1) analytical skills related to aspects of Identifying problems (questions) from various points of view by understanding concepts and developing problem strategies that are carried out by getting used to analyzing problems in Mathematics Student Worksheets that are oriented towards numeracy literacy. 2) Aspects of problem-solving abilities related to problem-solving indicators, students can solve problems and think logically and concept development needs to be familiarized. 3) The ability to think critically on indicators related to the communication of new ideas still needs to be familiarized and communicated in everyday contexts.

Keywords: Critical Thinking, Numerical Literacy, Student Worksheets, Mathematics

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INTRODUCTION

Changes in education demand human resources as the main component when the learning process takes place. This is based on human resources as a transfer of knowledge in everyday life. Facing educational change requires productive, effective, communicative, collaborative, systematic, logical and critical thinking human resources (Morrar, Arman & Mousa, 2017; Faiz & Kurniawaty, 2022). Seeing the development of education that is needed today, one of them is having the ability to have numeracy literacy to be able to think critically. Government policy with the Minimum Competency Assessment (AKM) program as a guide for improving the quality of education, especially in the field of mathematics. Mathematics teachers have a dominant role in developing numeracy literacy to familiarize students with critical thinking (Sutama et al., 2017). Likewise, innovation in learning tools today depends on what teachers think and do.

Mathematics as the key to opportunity and change. In addition, mathematics is one of the compulsory subjects in formal education. The process of learning mathematics cannot be separated from the process of numeracy literacy. Therefore, the ability to think critically, solve problems, interpret results are factors that encourage the implementation of active and effective learning. This is in line with (Glowa, 2016) which states that numeracy literacy prioritizes students (student centered) which means that students are required to develop concepts according to their understanding so that critical thinking processes occur. Numerical literacy is contextual, communicative, exploratory and stimulates students to think critically.

Numerical literacy refers to the benchmarks contained in PISA and TIMSS. The Program for International Student Assessment (PISA) has become an official international standard activity carried out by the Organization for Economic Corporation and Development (OECD) as a tool to measure students' skills in reading, mathematics, and science (numerical literacy). The existence of the PISA program in each country can evaluate and improve the abilities of all students. According to the 2015 PISA Mathematics Framework, the results of the latest 2015 PISA survey which placed the numeracy literacy ability of Indonesian students at rank 63 out of 70 countries with a relatively low level of achievement where almost all Indonesian students in this survey were only able to reach level three. (OECD, 2017). Numerical literacy is a person's ability to formulate, use, interpret mathematics in various contexts. Numerical literacy is one of the three abilities that are the focus of the PISA assessment (Dewantara, 2019).

In Indonesian schools, students are accustomed to being given questions at levels C-1, C-2 and C-3, while the PISA assessment refers to questions and the development of HOTS questions. For this reason, numeracy literacy skills include the ability to analyze, give reasons, convey ideas effectively, formulate, solve, and interpret problems in various forms and situations (OECD, 2017). Mathematical numeracy literacy questions are tested to demand critical thinking skills, reasoning, problem solving and making conclusions (Ambarita et al., 2018; Hidayat et al., 2022). Based on these results, the numeracy literacy of students is low. Supported by the fact that students in Indonesia only have the ability to know (C-1) (Anisa et al., 2021). There are several factors that affect the achievement of numeracy literacy, one of which is the learning device. Decree of the Minister of Education and Culture (Kemendikbud) Number 719/P/2020 regarding Guidelines for Curriculum Implementation in Education Units in Special Conditions that provide opportunities and conditionality to students in accordance with contextual learning to improve critical thinking skills. The use of appropriate learning tools affects the ability of students in the critical thinking process (Dwicky Putra Nugraha, 2021).

The results of preliminary observations and documentation of the Learning Implementation Plan (RPP) and Student Worksheets (LKPD) in mathematics subjects at SD Muhammadiyah 16 Surakarta show that teachers in implementing the Teaching and Learning Process (PBM) have not referred to the RPP and LKPD with numeracy literacy. The teacher in the research area is monotonous, because the teacher only uses the LKPD that is in the textbook or module that is often used. So the problem at the research site is that there are no

numeracy literacy-oriented math student worksheets. This can be interpreted that the critical thinking process is not optimal in learning mathematics at Muhammadiyah 16 Surakarta Elementary School.

The results of the interviews showed that students in the research area tended to have difficulty in interpreting the questions found in everyday life. This is in line with the research results (Arif et al., 2019) which states that students in learning mathematics tend to memorize material and formulas rather than understanding concepts so that students have difficulty solving problems that require analysis, understanding concepts, manipulation and interpretation. Therefore, critical thinking skills at Muhammadiyah 16 Surakarta Elementary School need to be developed and cultivated. In improving critical thinking, students are required to optimize in understanding concepts, solving problems and communicating them. This is supported by (Maulidiya & Nurlaelah, 2019) which states that students' critical thinking skills will be optimal if teachers have creativity in managing learning. Besides that, (Kus, 2018) states that skilled and highly interdisciplinary teachers will produce students to think critically.

Another alternative for students to think critically is to get used to working on AKM questions and full of challenges. Students who are successful in solving AKM questions, students' critical thinking skills will be optimal (Larasati & Isnani, 2017). This is in line with the research results (Novitasari, M., Utama, Narimo, S., Fathoni, 2019; Yantoro et al., 2021) which states that mathematics learning is a holistic activity that integrates knowledge, technology, values and skills to stimulate and foster critical thinking. In addition, it is able to develop potential and abilities at the level of concept understanding (Suprianti et al., 2021). Regarding the habituation of critical thinking skills, Minister of Education and Culture Regulation (Permendikbud) Number 23 of 2015 states that students who are accustomed to working on high-level questions will have high competence and thinking skills. Therefore, educators must have optimal abilities and skills as a center of education. This will be useful in facilitating students to be confident and create something creative, innovative and think critically in learning mathematics

The ability to think critically in mathematics can be optimized through routine and non-routine exercises with worksheet facilities as a guide to determine students' numerical and verbal abilities. Each teacher analyzes the level of understanding, numerical abilities and verbal abilities of students, so that teachers can direct students to be more critical in solving math problems (Irawan, 2016). Teachers can be called agents of change and change agents must be professionally competent to develop a mindset in learning (Iskandar & Zulela, 2021). Critical thinking ability in elementary school mathematics learning can be observed from the indicators of analyzing problems, solving problems and making decisions. This is in line with (Purwati, R., Hobri & Fatahillah, 2016) which identifies critical thinking indicators, namely interpreting problems, analyzing, evaluating and inferring. Based on this description, the general purpose of this research and development is to make a model of the Elementary School Mathematics Student Worksheet. The purpose of the research in this article is to describe the critical thinking skills of elementary school students including 1) the ability to analyze problems, 2) the ability to solve problems logically and 3) the ability to draw conclusions.

METHOD

This research as a whole is research and development. The type of research in this article is an ethnographic qualitative research. Ethnographic qualitative research guides researchers to explore and photograph social situations (Utama, 2019) about students' critical thinking skills that are usually done by elementary school students. The research was conducted at Muhammadiyah 16 Elementary School Surakarta, Central Java in the 2022/2023 academic year.

Data collection techniques by observation, in-depth interviews and document analysis. Observations are made when the mathematics learning process takes place by observing the activities of students related to critical thinking skills. In-depth interviews were conducted on students and teachers related to critical thinking skills,

both aspects of analyzing problems, solving problems and drawing conclusions. Document analysis is carried out to analyze archives related to lesson plans, student worksheets, and math work results.

Validation of research data was done by triangulation of sources and time. Analysis of research data was carried out inductively, with the process of collecting data, reducing data, presenting data, and drawing conclusions reciprocally (Sutama, 2019). Data collection activities to data analysis in this research article are illustrated in Figure 1.

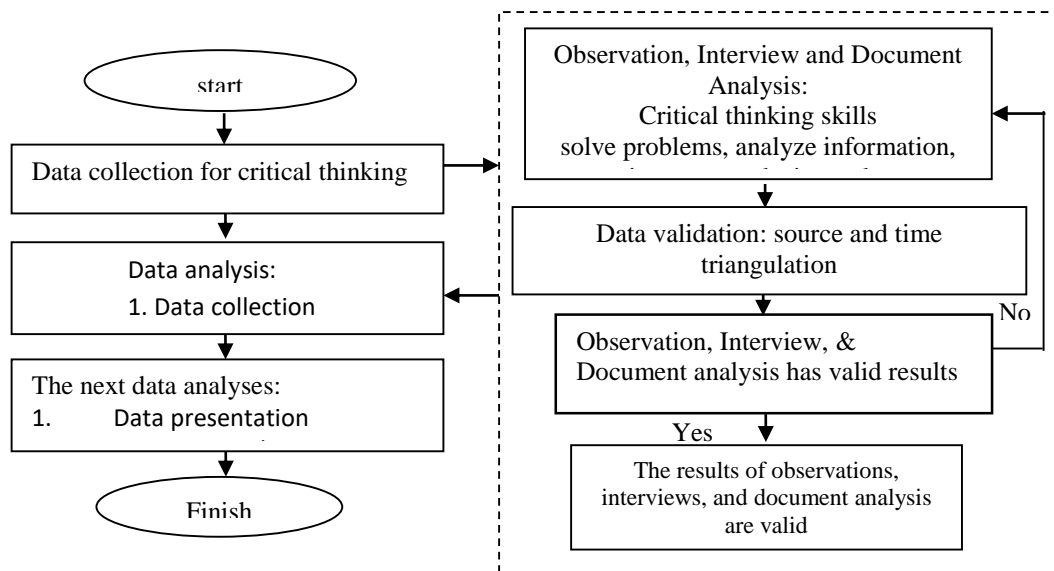


Figure 1. Data collection activities to data analysis

RESULTS AND DISCUSSION

Critical thinking skills in learning mathematics, make a positive contribution to students, especially in 1) analyzing problems, 2) solving problems and 3) drawing conclusions. The three mathematical critical thinking skills with numeracy literacy in elementary school students are briefly described below. Critical thinking skills in the aspect of analyzing problems, students are able to identify problems (questions) from various points of view by understanding concepts and developing problem strategies. Examples of student work showing critical thinking skills in the aspect of being able to analyze problems are presented in Figure 2.

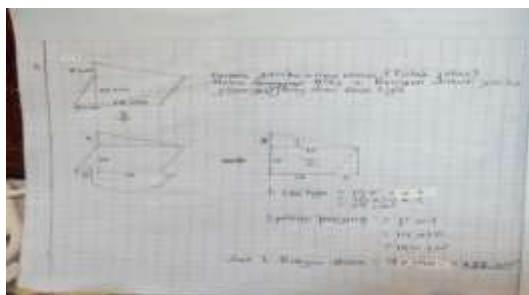


Figure 2. Problem Analysis

Excerpts of interviews with students when analyzing problems are presented as follows (A = researchers; B = students)

A: Have you been able to analyze the problems given?

B: Yes, but not 100%

A: What did you do to be able to analyze the given problem?

B: Find the shape of the parallelogram by first making the auxiliary lines.

Based on Figure 2 and the interview excerpts, students master the concepts that are understood to determine the problem strategy as a basis that can show critical thinking skills on indicators of analyzing problems.

The results of interviews with elementary school teachers where the study was conducted, stated that critical thinking skills in the aspect of analyzing problems were explicitly used in the Mathematics Student Worksheet oriented to numeracy literacy, but students were given the opportunity to explore outside of mathematics in various situations. In addition, the elementary school teacher where the study was conducted also conveyed at the beginning of each lesson. Furthermore, the primary school teacher where the research was conducted stated that for students' critical thinking skills, teachers tried to innovate numeracy-based problems and strategies that involve problems in everyday life.

The skills and innovation of teachers in learning support the success of students in critical thinking on elementary school numeracy literacy questions. Critical thinking skills on indicators of solving problems, some students are able to solve problems by reasoning and thinking logically and concept development needs to be developed. Physical evidence that shows critical thinking on indicators of solving problems is presented in the figure 3.

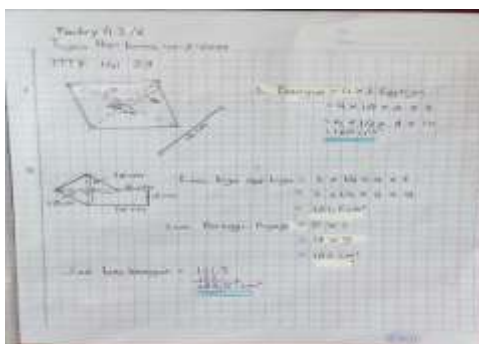


Figure 3. Solving Problems

Based on Figure 3, some students are able to solve problems related to reasoning, logical thinking and concept development with the help of a facilitator. Problems that need to be solved in various strategies and then interpret these results to predict and make decisions. This needs to be developed and accustomed to cultivating students to think critically.

Worksheet, it must be gradual, and there are steps. The results of interviews with elementary school teachers where the research is located, less than optimal critical thinking skills in problem-solving aspects are the main cause because teachers do not get used to students working on numerical literacy-based questions. For example, in the Indonesian language material, the teacher does not familiarize students with analyzing the reading, what is the implied or explicit message so that students only skim without knowing the meaning and problems in the reading. In addition, the teacher does not familiarize students with making concept maps as a basis for understanding the material to be studied.

The ability to think critically on indicators of drawing conclusions related to communicating new ideas still needs to be familiarized. Examples of student work that show indicators of drawing conclusions are presented in Figure 4.



Figure 4. Drawing Conclusions

Figure 4 shows some students are able to draw conclusions, related to communicating new ideas. Determining both deductive and inductive results can show that students are able to communicate by showing the work process from beginning to end. The ability to think critically on the indicators of drawing conclusions by communicating new ideas was shown by several students being enthusiastic in expressing their opinions at the reflection stage. The results of interviews with elementary school teachers where the research is conducted, drawing conclusions are used in mathematical critical thinking skills focusing on finding new ideas and communicating in everyday contexts. Furthermore, the elementary school teacher where the research was conducted, stated that drawing conclusions in the context of the real world had been carried out through a Minimum Competency Assessment. This effort is deemed not optimal in its implementation, because the teacher realizes that he is not yet proficient in constructing mathematical problems at a high level.

Discussion

Critical thinking skills in learning mathematics, make a positive contribution to students in the ability to analyze, solve problems and draw conclusions. This is in accordance with the results of the study (Purwaningsih & Wangid, 2021) that in learning mathematics by providing simple explanations, understanding concepts, concluding and finding new ideas becomes the basis for students to think critically. Teachers enrich innovations and learning strategies to support students' critical thinking skills. Mathematical skills across subjects as well as in everyday life contribute and influence in deepening critical thinking skills (Rosiyannah, 2021). In addition, the habit of understanding symbols and skilled in counting become the basis for thinking in numeracy literacy. Students are accustomed to understand notation and are skilled at counting in learning. Mathematical skills across subjects as well as in everyday life contribute to broadening and deepening understanding of numeracy (Alkema, 2020; Yuliyani, D.R. & Setyaningsih, 2022). No less important, the skills and abilities of teachers in classroom management are very supportive for the success of critical thinking in numeracy literacy.

The description of critical thinking skills in the aspect of analyzing problems related to understanding concepts and developing problem strategies for students can be interpreted as being entrenched. That is, some elementary school students where the research is able and accustomed to formulating problems in accordance with the meaning of concepts that have been understood and are able to develop strategies. The elementary school teacher where the study was conducted stated that to cultivate critical thinking skills, cooperation between teachers, parents and students is needed. Because these abilities are used not in an instant way but must practice continuously continuously.

This requires high commitment so that students are motivated to think critically and innovatively in a pleasant learning atmosphere. Furthermore, the elementary school teacher stated, to cultivate a culture of learning mathematics, one must develop a different mindset. Teachers always remind that math is challenging and fun. Challenging to complete, and fun to complete. This is in line with (Baiduri, 2019; Novitasari et al., 2020) which states that efforts to understand concepts in building strategies require logical and systematic thinking.

Critical thinking skills in problem solving aspects can be observed from student learning outcomes and learning activities both in understanding strategies and thinking systematically. The ability to think critically in solving problems can make students think more systematically and structured in learning mathematics (Umbara & Suryadi, 2019). If this is used to be done, the students' critical thinking skills in the problem-solving aspect are no longer in doubt. It would be even better if to train and improve students' critical thinking skills integrated into other subjects and even in everyday life. In line with opinion (Kusumah et al., 2016) contextual approach is able to improve the critical thinking process of students.

The culture of critical thinking is built through patterns and learning processes. The teacher's pedagogic competence is the main thing that needs to be considered. If the teacher's pedagogic competence has been optimal, it will be easier for students to get used to logical thinking patterns both in learning and non-learning. Teacher facilities that support learning are able to encourage students' thinking to conclude new ideas and communicate them appropriately. This consistency is a challenge in the world of education, especially for teachers. However, the ability to think critically becomes a culture by implementing numeracy literacy-based learning with students being encouraged to think and express their ideas critically. Numerical literacy is the main point for developing critical thinking students both in learning and in society (Kebudayaan, 2017). Through this numeracy literacy-based student worksheet (LKPD), students will build creativity and can indirectly train critical thinking processes. Cultivating the use of LKPD seen from the aspect of effectiveness has equivalence as teaching materials with the attractiveness of student response questionnaires (Yanti et al., 2022).

If it is able to optimize the ability of students, then students will be more confident and able to compete in a changing world. This is in line with the results of the study which concluded that critical thinking skills are useful in improving analytical skills, creativity, the ability to utilize ideas or information, and information seeking and self-reflection skills (Hidayah et al., 2017). Educators who have good communication skills improve critical thinking skills (Putri & Dafit, 2022). This means that critical thinking skills are able to be cultured by organizing fun innovative learning. Therefore, even though a teacher has limitations, it is better not to give up, he must always try so that students do not fall behind the others.

CONCLUSION

Mathematics Student Worksheets numeracy literacy oriented to cultivate students to have critical thinking skills. Aspects of critical thinking skills for grade IV Muhammadiyah Elementary School 16 Surakarta in the academic year 2022/2023 are grouped into three, namely 1) analyzing problems, 2) problem solving and 3) drawing conclusions. The results of each aspect are explicitly used in learning mathematics, but students are given the opportunity to get used to it in everyday life in various situations.

The ability to analyze problems related to aspects of identifying problems (questions) from various points of view by understanding concepts and developing problem strategies is carried out by getting used to analyzing problems in numeracy-oriented Mathematics Student Worksheets. For this reason, the elementary school teacher where the study was conducted stated that for students' critical thinking skills, teachers tried to innovate numeracy-based problems and strategies that involve problems in everyday life. Aspects of problem-solving abilities are related to indicators of solving problems, some students are able to solve problems by reasoning and thinking logically and concept development needs to be familiarized. The ability to think critically on indicators of drawing conclusions related to communicating new ideas still needs to be familiarized and communicated in everyday contexts. Drawing conclusions in the context of the real world has been carried out through a Minimum Competency Assessment. This effort is considered not optimal in its implementation, because the teacher realizes that he is not yet proficient in constructing mathematical problems at a high level.

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