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Analysis of the Need for Mathematics Student Worksheets Oriented Towards Discovery Learning to Enhance Critical Thinking Abilities

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Abstract

Critical thinking ability is a 21st-century learning skill that students must possess. Students with low critical thinking skills will encounter difficulties in problem-solving. The critical thinking skills of students are still lacking due to the use of inadequate teaching materials that do not meet the students' needs. This research aims to analyze the need for student worksheets (LKPD) oriented towards the Discovery Learning model to enhance students' critical thinking skills. This research is of a qualitative analysis type. The study was conducted at MIN 2 West Lampung. The subjects of this research were 1 teacher and 25 students in Grade VA. Data collection was conducted through observation and interviews. The activities carried out during the observation phase involved observing teaching and learning activities, analyzing lesson plans (RPP), and analyzing the learning resources used in the classroom. During the interview phase, the research results indicate that both teachers and students require student worksheets (LKPD) oriented towards discovery learning that can enhance critical thinking skills.

Keywords
critical thinking; student worksheets (LKPD); discovery learning.

I. Introduction

In the 21st century, possessing the ability to think critically is crucial among students as it is regarded as a significant skill for learning (Kalelioglu & Gulbahar, 2013; Kriel, 2013). In order to attain success in the 21st century, it is imperative for every student to acquire and hone critical thinking skills as they hold utmost importance (Perdana et al., 2019). Critical thinking is a methodical process employed in decision-making to effectively address problems, encompassing activities such as analyzing and evaluating data within the realm of scientific inquiry (Julian & Suparman, 2019), Critical thinking is defined as the learning process in which students express their ideas to solve problems (Quitadomo, 2009), Critical thinking supports intellectual curiosity (Subekti & Suparman, 2019). Facione describes critical thinking as purposeful assessment that results in interpretation, analysis supported by evidence, and the assessment is based on it (Bailey R & Mentz, 2015). Critical thinking skills are the ability to analyze and evaluate information, present clear questions and problems, gather relevant information, formulate abstract ideas, be open-minded, and inform effectively (Adhitya et al., 2023).

Critical thinking skills must be developed in students because critical thinking is one of the indicators to determine the quality of learning (Alsaleh et al., 2020). To cultivate students with proficient critical thinking competencies, it is essential to offer learning experiences that actively enhance and foster their abilities to think critically.

The solution to the aforementioned problem is a student worksheet (LKPD) model that utilizes an effective, conducive, engaging, and enjoyable learning approach. The

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Learning and Knowledge-Building Pedagogical Design (LKPD) is designed on a learning model that aims to facilitate students in constructing knowledge, empowering them to explore concepts directly from the learning materials. This approach serves to stimulate their thinking abilities and enhance their overall learning experience.

After conducting a literature review on various learning models, it has been determined that the discovery learning model is particularly suitable. This model effectively positions the teacher as a facilitator, granting students the opportunity to actively explore and engage with the learning material. The utilization of the discovery learning model proves to be highly effective in the learning process as it actively engages students in the exploration and discovery of the concepts being taught (Yuliana et al., 2017). The discovery learning model provides numerous benefits in learning, such as training students in inquiry (Does W, 2016), developing critical thinking skills, problem-solving abilities, and fostering collaborative skills within groups (Binti Suyatno, 2019). The discovery learning learning model is a learning model that focuses on students being able to collect information independently which is useful for increasing knowledge and improving 21st century skills so that learning objectives can be achieved optimally. The purpose of the discovery learning learning model for students is very good, where students can be actively involved in the learning process so that it can stimulate students' critical thinking skills. The discovery learning model makes students actively seek learning materials that can increase the independence of students.

To implement learning using the discovery learning model, supporting teaching materials are needed. Student Worksheets (LKPD) are sheets that contain summarized materials and structured tasks that students must complete (Prasetia & Suparman, 2019). Student worksheets (LKPD) are worksheets that provide instructions and steps in the learning process (Pansa, 2017). The implementation of LKPD offers students a valuable opportunity to actively engage and interact within the learning process, consequently fostering the enhancement of their critical thinking competencies (Bertiliya et al., 2021). Mathematics learning activities require LKPD as a support in carrying out teaching and learning activities in class. Indicators of mathematical critical thinking in students in solving deep problems can be achieved by using LKPD based on discovery learning. The use of discovery learning-based worksheets can spur students to be able to think critically which is very important so that mathematics learning outcomes can be achieved optimally. So, the use of LKPD as supporting teaching materials in the process of learning mathematics is very necessary.

Based on the observation of learning resources in the school, student worksheets (LKPD) have not been used because the teachers have never attempted to develop their own student worksheets. Instead, they rely on the questions and materials provided in the textbook package. Consequently, the effective enhancement of students' critical thinking skills has been hindered as they are primarily exposed to problems that already provide example solutions within the textbook package. The teacher mentioned that students face difficulties in solving problems without example solutions provided. The aim of this research is to evaluate the requirement for student worksheets based on the discovery learning model, with the ultimate objective of enhancing students' critical thinking skills. The analysis encompasses curriculum evaluation, examination of learning resources, assessment of student characteristics, and conducting a comprehensive needs analysis.

II. Research Method

This research utilizes qualitative analysis, employing the steps of data reduction, the process involves data presentation and drawing meaningful conclusions. The researcher employs the interactive model proposed by Miles and Huberman as a framework to analyze the collected data. For reference, Figure 1 illustrates the interactive model utilized in this study.

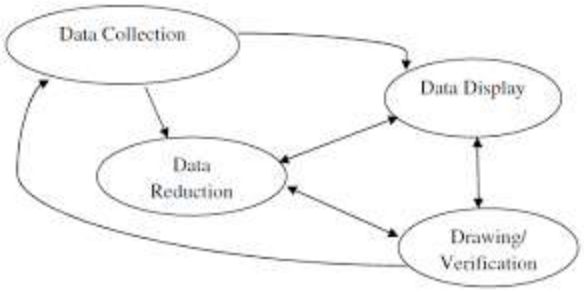

Figure 1. *Data Analysis Techniques*

Data analysis techniques according to Miles and Huberman's interactive model can be explained as follows:

(1) Data reduction is the stage of simplifying data where data that is not in accordance with the needs of teaching materials and does not describe the expected conditions will be discarded so that it will facilitate drawing conclusions. These data were obtained from observations and interviews during the learning process.
(2) Data display is the data collection stage that describes the condition of students' mathematics teaching materials which are arranged in a systematic and easily understood manner about the conditions of teaching materials that are suitable for the needs of students in improving critical thinking skills.
(3) Verification is the stage of drawing conclusions after we carry out data analysis from the results of observations and interviews that we have conducted.

The subjects of this research were 1 teacher and 25 students from Grade V at MIN 2 West Lampung. The research was conducted on Wednesday, May 17, 2023. The data collection instruments used were observation and interviews. The interview guidelines were used to interview teachers in order to gather information about students' critical thinking abilities, Various learning models and instructional materials have the potential to enhance students' critical thinking skills. The researcher interviewed one of the teachers to gather information about the curriculum being used, student characteristics and learning resource needs, learning models used at the school, and the students' critical thinking abilities. In the observation phase, classroom activities, lesson plans (RPP), and learning resources used in the teaching and learning process were observed and analyzed.

The collected data underwent a comprehensive analysis involving data reduction, data presentation, and the subsequent drawing of conclusions.

III. Result and Discussion

The analysis of the Mathematics student worksheets needs is designed based on a preliminary analysis that aligns with the objective of this research, which is to determine the appropriate teaching materials to meet the needs of students in mathematics education, thereby enhancing students' critical thinking skills. This research was conducted by analyzing the curriculum, analyzing learning resources, analizing learning models, analyzing student characteristics, and analyzing student needs. The following are the results and discussion of these analyses.

3.1 Curriculum Analysis

Based on the interview with one of the mathematics teachers at MIN 2 West Lampung, the school is using the 2013 curriculum. The learning resources are already aligned with the competency standards and learning objectives of the 2013 curriculum. In the upcoming academic year 2023/2024, MIN 2 West Lampung will adopt the Merdeka curriculum.

3.2 Analysis of Learning Resources

Based on the observation of the learning resources used at MIN 2 West Lampung, both teachers and students use the Mathematics textbook package. The Mathematics textbook package used already includes mathematics learning materials and provides example problems. However, the problems presented in the textbook package are still the same as the example problems, which does not enable students to think critically in solving those problems. Hence, there is a need to incorporate student worksheets as supplementary materials alongside the Mathematics textbook package. Making innovative student worksheets is expected to be able to improve students' abilities in solving hot math questions, so that students will get used to thinking about how to solve the problems contained in these math problems so that students' critical thinking skills will be stimulated.

Figure 2. *Mathematics textbook for Grade V*

3.3 Analysis of Learning Model

Based on the results of interviews with fifth grade teachers at MIN 2 West Lampung that teachers have not used the recommended learning model in the 21st century. Teachers only use learning methods namely lectures, discussions and questions and answers. The use of these learning methods has not been able to accommodate students' understanding of the material presented. During the learning process there are students who are not active and not critical. Based on the results of these interviews, it can be concluded that the use of this method has not made students think critically about the mathematics material presented.

3.4 Analysis of Student Characteristics

Based on the interview with the mathematics teacher at MIN 2 West Lampung, The research findings indicated that students face difficulties when it comes to solving mathematics problems that deviate from the examples provided by the teacher. Based on classroom observations, it is known that students can solve problems similar to those explained by the teacher, but they struggle when there are no sample solutions provided for the problems.

Based on the interviews and observations conducted in a fifth-grade classroom, The analysis of the collected data reveals that students' critical thinking skills are still at a low level. One of the goals of education is to teach students to be able to think critically. Therefore, the teacher must be able to present learning that trains critical thinking skills to seek learning information independently and be active in the learning process. Critical thinking skills include the ability to interpret data, analyze data, verify the correctness of data, identify problems, solve problems, and evaluate the process of solving a problem. The assessment of students' mathematical critical thinking abilities is based on the critical thinking indicators provided in Table 1.

Table 1. Indicators of Mathematical Critical Thinking Abilities

	Indicators
Creating relationships.	Students are able to reconstruct problems and determine appropriate solutions to the presented issues.
Analyzing data.	Students can identify and make decisions regarding the presented problems.
Analyzing components.	Students can recognize the components involved in a problem.
Analyzing relationships.	Students can analyze the relationships and interactions among the problem components and make decisions to solve the problem.
Critiquing evidence.	Students can provide comments, additions, reductions, and rearrangements of mathematical evidence they have learned.
Solving problems.	Students can overcome and solve problems.

The characteristics of students who are mostly still passive in the learning process will have an impact on low critical thinking skills, so that students cannot carry out student-centered learning. Students also have not been able to solve the problems presented by the teacher and have not been able to solve hot questions given by the teacher, so that students still experience difficulties when going to make a conclusion from a problem that has been presented. The obstacles experienced by students were understanding concepts that were too complicated in mathematics material so that students needed worksheets to support the process of learning mathematics.

3.5 Needs Analysis

A needs analysis is performed to identify the requirements within the teaching and learning process. The availability of creative and innovative learning resources, such as the utilization of student worksheets, represents a promising solution to meet students' needs. Student worksheets can make the learning process more enjoyable. Based on an interview

with the teacher regarding learning resources, the teacher stated that they have never used student worksheets for mathematics education. Teachers are currently relying on questions from printed textbooks, which fall short in effectively enhancing students' critical thinking skills. The questions in the math book are still dominated by questions whose solutions are the same as those in the example questions in the book, so they cannot stimulate students' thinking skills. Hence, there is a pressing need to introduce engaging Mathematics student worksheets within mathematics education to foster significant improvements in students' mathematical critical thinking abilities.

The upcoming development of student worksheets will be oriented towards the *Discovery learning* model, emphasizing an interactive and exploratory approach to learning. *Discovery learning* enables students to discover concepts broadly and apply them in problem-solving processes. *Discovery learning* also facilitates the establishment of connections and the recognition of their interrelationships (Noer S H, 2018). *Discovery learning* has the advantage that students can create knowledge independently, which will last long within the students. The *Discovery learning* model follows a series of steps, The steps encompassed within the Discovery learning model include providing stimulation, identifying problems, collecting data, processing data, validating data, and drawing conclusions.

The stages in the learning process using the Discovery learning model are (1) the teacher presents problems through Student Worksheets (LKPD), the problems presented are problems that can direct students to think critically to solve these problems; (2) students identify and recognize the problems that have been presented by the teacher by exploring the knowledge that students have in order to be able to understand the problems presented; (3) students collect supporting data to solve problems, the teacher monitors the work of students; (4) students and their groups process the data that has been collected; (5) the teacher validates the data that has been collected and processed by students on LKPD; (6) the teacher guides students to make conclusions from the problems that have been solved.

Based on the explanation above, this shows that students need student worksheets (LKPD), so researchers will develop student worksheets based on discovery learning models to improve students' critical thinking skills. So, the LKPD to be developed is designed according to the syntax of the discovery learning model.

IV. Conclusion

Based on the research findings, the following conclusions can be derived: (1) The current teaching materials and learning models employed have not effectively enhanced the students' critical thinking abilities, and (2) The students' critical thinking abilities remain at a low level, (3) Discovery learning based student worksheets are needed to improve the students' critical thinking skills.

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