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IMPLEMENTATION OF GUIDED DISCOVERY LEARNING IN MATHEMATICS LEARNING CLASS X OF THE INDEPENDENT CURRICULUM: IMPLEMENTATION, CHALLENGES, AND IMPACTS

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Abstract

This study addresses the gap between the student-centered orientation of the Merdeka Curriculum and the persistence of teacher-centered mathematics learning that limits students' conceptual understanding. The study aims to examine the implementation, challenges, and impacts of the Guided Discovery Learning model in Grade X mathematics instruction. A qualitative descriptive approach was employed, involving a mathematics teacher and Grade X students. Data were collected through classroom observations, semi-structured interviews, and documentation, focusing on the stages of Guided Discovery Learning: stimulation, problem statement, data collection, data processing, verification, and generalization. The findings reveal that Guided Discovery Learning was implemented at a good level, with the stimulation and problem statement stages effectively fostering students' active engagement. However, the generalization stage requires further reinforcement through more structured scaffolding. Several challenges were identified, including limited instructional time, variations in students' prior abilities, and students' reliance on teacher-centered learning habits. The study concludes that Guided Discovery Learning has a positive impact on mathematics learning, as reflected in increased student participation, improved confidence in expressing ideas, and deeper conceptual understanding. These findings imply that Guided Discovery Learning is an appropriate model to support student-centered learning and enhance higher-order thinking skills in alignment with the Merdeka Curriculum.

Keywords: Guided Discovery Learning; Merdeka Curriculum; mathematics learning; conceptual understanding; student-centered learning

INTRODUCTION

Education is a human right, formal and non-formal. Man cannot be detached from education, ever since as a child is educated by the parents and education will go on for life. Education is one of the vital needs for human life (Kalyani, 2024). Today's education has to meet the needs of the 21st century. The aims of the government is to upgrade education in Indonesia. One of those things that did happen is a change in the curriculum. The purpose of the Merdeka Curriculum is to set the stage for sounder, challenging education and opening through diversity (Maulida et al., 2024).

Mathematics is one of the subjects that has been learned from early age, ranging from elementary school to higher education in adulthood (Oktavia et al., 2022). Learning outcomes on mathematics can be observed from the material understanding mastered and student learning achievement achieved (Purwono, 2020). Reality, however, students learning outcomes for mathematics are still below the target because students have not understood

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the concept What they learn. There are numerous cases where students simply can not get the right concept as well as principles in solving mathematical problems (Sefti & Jupri, 2025).

Mathematics learning is often faced with problems concerning students, teachers, and other facilities (Wiryana & Alim, 2023). Based on the results of observations through interviews with one of the mathematics teachers at SMA S Nugraha Bandung, in general, students still consider mathematics to be just a subject with a set of formulas, symbols, and numbers, and to master it, they must memorize it. Furthermore, some students still lack active participation in learning and appear to be dominated by the teacher. This results in learning that focuses only on memorizing material, so that mastery of mathematical concepts is still relatively low, especially in applying mathematical concepts to solve everyday problems.

The Merdeka Curriculum emphasizes student-centered learning with the aim of developing conceptual understanding, independent learning, and critical thinking skills (Fathonah et al., 2025). In mathematics learning, this requirement necessitates teachers to design learning activities that provide space for students to actively construct knowledge. However, mathematics learning practices in schools are still often dominated by expository methods, so student engagement is not yet optimal.

One effort that can be made to address this problem is to vary the learning model, namely by using the Guided Discovery Learning (GDL) model, which is a learning model based on constructivism theory, where students are encouraged to discover concepts through structured activities with teacher guidance (Mishra, 2023). Learning with the Guided Discovery Learning model allows students to manage new information they have acquired with information they already have (Cahyani et al., 2025). This is in line with the principles of the Merdeka Curriculum because it places students as active subjects in learning. However, the implementation of GDL in mathematics classes faces challenges, such as time constraints, student readiness, and the ability of teachers to design discovery activities.

A number of studies show that GDL can increase student activity and understanding. However, this study specifically analyzes the implementation, challenges, and impact of GDL in the context of the Merdeka Curriculum. Therefore, this study aims to analyze the implementation of Guided Discovery Learning in mathematics learning in grade X of the

Merdeka Curriculum in terms of learning implementation, challenges faced, and its impact on learning.

METHODS

This study uses a qualitative approach with a descriptive design. A qualitative approach was chosen because this study aims to facilitate a deep and comprehensive understanding of the implementation process of the Guided Discovery Learning (GDL) model in mathematics learning, rather than to test hypotheses or measure statistical effects. The descriptive design is used to systematically and factually describe how learning takes place in the classroom, including the implementation of learning syntax, the challenges encountered, and the impact on student activities and understanding.

The subjects of this study consisted of mathematics teachers and 30 tenth-grade students at a senior high school. The subjects were selected purposively, considering that these teachers and students were directly involved in the implementation of Guided Discovery Learning-based instruction.

Data collection was conducted using several techniques, namely observation, interviews, and documentation. Observation was conducted to observe the implementation of learning based on the Guided Discovery Learning syntax, including the stages of stimulation, problem statement, data collection, data processing, verification, and generalization. Semi-structured interviews were conducted with teachers and several students to explore information about learning experiences, obstacles encountered, and perceptions of mathematics learning using the Guided Discovery Learning model. Documentation was used to supplement the research data.

To ensure data validity, this study employed technique triangulation by comparing data obtained from observations, interviews, and documentation. In addition, source triangulation was conducted by cross-checking information from teachers and students. Data analysis was carried out using an interactive model consisting of three stages: data reduction, data display, and conclusion drawing. Data reduction involved selecting and simplifying relevant data related to the implementation, challenges, and impacts of Guided Discovery Learning. Data display was conducted in the form of descriptive narratives, while conclusion drawing was performed by interpreting patterns and relationships found in the data.

RESULTS AND DISCUSSION

1. Implementation of Guided Discovery Learning

The results of the observation show that the implementation of the Guided Discovery Learning (GDL) model in mathematics learning for Grade X of the Merdeka Curriculum was carried out well. In general, teachers have implemented learning in accordance with the syntax of Guided Discovery Learning, which includes the stages of stimulation, problem statement, data collection, data processing, verification, and generalization.

At the stimulation stage, the teacher provides initial stimuli in the form of contextual problems related to students' daily lives and the mathematics material being studied. The purpose of providing these stimuli is to arouse curiosity and motivate students to actively engage in the learning process. The results of the observation show that most students showed interest in the problems presented and began to express their initial assumptions.

The problem statement stage was carried out by guiding students to identify problems and formulate questions relevant to the stimulus provided. At this stage, students began to be trained to express mathematical problems systematically. Teachers provided guidance in the form of leading questions so that students could formulate problems correctly. Observations showed that this stage was carried out optimally, although there were still some students who required intensive guidance.

Next, in the data collection stage, students work in groups to gather information from the problems given through exploration and the use of student worksheets (LKPD). Students look for patterns, observe relationships, and record the results of their observations. This stage aims to encourage students to actively interact and exchange ideas with their groupmates.

In the data processing stage, students analyze the data they have obtained to find correlations and mathematical concepts that are being studied. Teachers act as facilitators who provide guidance when students encounter difficulties. The results of the observation show that students are beginning to develop mathematical reasoning, although the level of depth of understanding still varies between individuals.

The verification stage is carried out by presenting the group's findings and discussing them in class. The teacher assists students and checks the accuracy of the concepts they have learned and relates them to formal mathematical concepts. This stage runs smoothly and helps students correct any misunderstandings.

The generalization stage found that not all students were able to formulate conclusions or mathematical concepts independently. Some students still relied on the teacher's explanation in constructing generalizations. This shows that this stage requires reinforcement through more structured scaffolding.

2. Challenges in Implementing Guided Discovery Learning

Based on the results of interviews and observations, there are several challenges in applying Guided Discovery Learning in mathematics learning in grade X. The first challenge is the limited learning time. The process of discovering concepts in Guided Discovery Learning requires relatively more time than conventional learning in general. Limited time allocation requires teachers to adjust the learning materials and strategies so that all syntax can be implemented.

The second challenge is the difference in students' initial abilities. Students with low abilities tend to have difficulty following the concept discovery process, especially in the data processing and generalization stages. This means that teachers need to provide additional assistance so that all students can achieve the learning objectives.

The third challenge relates to students' learning habits. Some students are still accustomed to teacher-centered learning and waiting for direct explanations from the teacher. This paradigm shift in learning shows that student-centered learning requires a significant amount of time to adapt.

3. Impact of Implementation on Learning

The application of Guided Discovery Learning has a positive impact on the process and results of mathematics learning. This impact can be seen from the increased activity of students in group discussions, their courage in asking questions or expressing their opinions, and their ability to solve mathematical problems independently.

In addition, students demonstrated a deeper understanding of concepts, as these were acquired through a process of exploration and discovery. Learning became more meaningful, so that students did not just memorize formulas, but were able to understand the reasons behind the use of these concepts. These results show that Guided Discovery Learning is able to support the achievement of mathematics learning objectives in the Merdeka Curriculum.

The results of this study indicate that Guided Discovery Learning can be effectively implemented in mathematics learning for 10th grade students under the Merdeka Curriculum. This success is inseparable from the compatibility of the Guided Discovery Learning model with constructivist learning principles that place students at the center of the learning process. Discovery-based learning allows students to construct knowledge through direct experience, resulting in more lasting understanding (Karan, 2023). The findings of this study support this view, especially in the stimulation and problem statement stages, which are able to increase student engagement in the learning process.

The positive impact of Guided Discovery Learning on student activity and conceptual understanding is also in line with the constructivist theory proposed by Piaget and Vygotsky, which emphasizes the importance of interaction and learning experiences in constructing knowledge (Endramawati, 2021). Through discussion and exploration, students are trained to think critically, reason, and solve mathematical problems.

The findings of this study are also supported by recent research results showing that Guided Discovery and Guided Inquiry-based learning are effective in strengthening meaningful learning in mathematics education (Utaminingsih, 2022). Through a structured discovery process accompanied by teacher guidance, students can integrate new knowledge with their existing cognitive schemas, resulting in a deeper and more lasting understanding of concepts. This approach has also been proven to reduce students' cognitive load and facilitate the transfer of knowledge to different problem-solving situations (Becker et al., 2020). Thus, Guided Discovery Learning plays an important role in developing higher-order thinking skills, such as reasoning and mathematical problem solving, which are essential in 21st-century learning (Nursyahidah et al., 2025).

However, findings regarding students' difficulties in the generalization stage indicate that the application of Guided Discovery Learning requires appropriate scaffolding. According

to Vygotsky, teacher assistance is needed so that students can move from the zone of actual development to the zone of proximal development (Yousif, 2025). Therefore, teachers need to design guiding questions and reflective activities so that students are able to formulate generalizations independently.

In addition, the challenges of time constraints and differences in students' initial abilities indicate that the implementation of Guided Discovery Learning must be accompanied by very careful lesson planning. Teachers need to adjust the worksheets, strategies, and grouping of students, as well as the allocation of time so that the concept discovery process can run optimally. Thus, Guided Discovery Learning can be an effective alternative learning model to support student-centered mathematics learning in accordance with the Merdeka Curriculum.

CONCLUSION

This study shows that the Guided Discovery Learning model can be implemented well in mathematics learning for 10th grade students under the Merdeka Curriculum. Teachers are able to carry out the entire learning syntax, which includes the stages of stimulation, problem statement, data collection, data processing, verification, and generalization. The stimulation and problem statement stages are carried out optimally and are able to increase student active engagement from the beginning of learning, while the generalization stage still needs to be strengthened through the provision of more structured scaffolding.

Challenges in implementing Guided Discovery Learning include limited learning time, differences in students' initial abilities, and students' learning habits that still depend on direct explanations from teachers. These challenges show that discovery-based learning requires careful planning, effective time management, and mentoring strategies tailored to student characteristics so that all stages of learning can run optimally.

In terms of learning impact, the application of Guided Discovery Learning has a positive effect on the process and results of mathematics learning. Students show increased activity in group discussions, courage in expressing opinions, and the ability to solve mathematical problems independently. In addition, students gain a more meaningful understanding of concepts because these concepts are constructed through a process of exploration and discovery.

Overall, the results of this study confirm that Guided Discovery Learning is a learning model that is relevant to the principles of the Merdeka Curriculum, which is oriented towards student-centered learning. With systematic learning planning and appropriate scaffolding, Guided Discovery Learning has the potential to be an effective alternative learning model in supporting the development of students' conceptual understanding and higher-order thinking skills in mathematics learning.

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