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## **The Influence of Guided Discovery Learning Assisted by Fractional Wheels and Learning Motivation on Improving The Critical Thinking Skills of Grade V Students at SD Negeri 1 Dagan Purbalingga**

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### **ABSTRACT**

The purpose of this research is to examine how employing Guided Discovery Learning tools alongside fractional wheels, as well as enhancing learning motivation, impacts the enhancement of critical thinking abilities among elementary school students. Essential 21st-century skills include critical thinking, digital literacy, information literacy, media literacy, and proficiency in information and communication technology. The goal of mathematics education is for students to develop logical, critical, analytical, meticulous, and responsible abilities. Mathematics and critical thinking are intrinsically linked, as mathematics is understood through critical thinking, and critical thinking is trained through mathematics. Students with strong critical thinking skills can solve problems effectively, preparing them to face real-world challenges and global competition in the 21st century. The research method used is quantitative descriptive research with a correlational approach. Data analysis involved statistical methods, including multiple regression analysis and partial tests (t-tests). The regression analysis F-test indicates that Guided Discovery Learning and learning motivation simultaneously have a significant effect on students' critical thinking. The first partial t-test shows that Guided Discovery Learning impacts critical thinking, and the second t-test indicates that learning motivation influences critical thinking. Based on these results, the Guided Discovery Learning method supported by fractional wheels and enhanced learning motivation significantly improves students' critical thinking patterns.

**Keywords:** Guided Discovery Learning, Critical Thinking Skills, Fractional Wheel Media, Learning Motivation.

### **INTRODUCTION**

Critical thinking is one of the important aspects of the learning process, but this ability cannot be developed optimally. The Programme for International Student Assessment study's findings show Indonesia's PISA standing in the field of mathematics, Indonesia in 2022 rose 5 positions from the ranking in 2018, for 2022 PISA was attended by 81 countries consisting of 37 OECD countries and 44 partner countries. According to (Gokhale, 1995) the cause of low critical thinking of students is the lack of learning resources in the form of books, and the dominance of teachers

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who use lecture and assignment methods. Generally, in such a learning process will only demand curriculum achievement while developing students' abilities is ignored (Rahayu et al., 2023). Critical thinking skills can be provided through mathematics subjects. This is in accordance with Permendiknas Number 21 of 2016 concerning Content Standards.

The purpose of learning mathematics is for students to have logical, critical, analytical, meticulous and meticulous abilities, responsible. Related to critical thinking skills according to (Rahayuningdewi & Faradillah, 2020) mathematics and critical thinking skills are two things that cannot be separated, because mathematics is understood through critical thinking and critical thinking is trained through mathematics. If students have good critical thinking skills, they will be able to solve problems well so that students can solve problems in the real world and are able to face global competition in the 21st century. This paper was made to examine quantitative evidence of the effectiveness of the effect of fractional wheel-assisted Guided Discovery Learning and learning motivation on improving the critical thinking ability of grade V students at SD Negeri 1 Dagan Purbalingga.

To reveal how the history of critical thinking emerged, it is rather difficult, since when began to develop critical thinking. But at the very least, the intellectual roots of critical thinking can be etymologically traced to the last of Socrates' vision of practice in teaching it in 2500 BC. He has invented a learning method known as "Socratic Questioning" In this method, he established the importance of seeking rigorous evidence to test thoughts and assumptions, analyze basic concepts, and convey outward implications that are not only of what is said, but of what is implemented (Foundation for Critical Thinking, 1998). Reed, Jenny (1998).

The concept of critical thinking has evolved over time. The philosophical view on the concept of critical thinking is important to know because it is related to the abstraction of the thinking process and the difference in definitions of the concept of critical thinking itself until it developed into what it is now. By understanding from a philosophical point of view, we will gain a holistic understanding of critical thinking. In the present time, One of the 21st century skills that must be learned, along with teamwork, is critical thinking (critical thinking), communication (communication) and creativity and innovation (creativity and innovation). In the world of education in Indonesia today, critical thinking skills are also known as Higher Order Thinking Skills (HOTS) which are starting to be considered for the advancement of education.

The ability to think critically will certainly have an impact on students' cognitive development and students' adaptability. Therefore, low critical thinking skills in students in Indonesia become an important problem and must be addressed immediately. The learning model used by teachers is not suitable, causing students' critical thinking skills in Indonesia to be low (Dari & Ahmad, 2020). The learning model has a great impact on the mindset of students. The learning model helps students to train their cognitive development, especially critical thinking skills. So that with a learning model that is not suitable will cause students' cognitive development

to be less than optimal. To overcome this problem, Sartono in (Dari & Ahmad, 2020) said that by applying the right learning model and according to learning material can improve students' thinking skills. With the right learning model, the sense of pleasure in students towards learning will grow and eventually encourage students to think critically and produce maximum learning results.

According to (Hallatu et al., 2018), a good learning model is a student-centered learning model so that students will have direct experience in learning. One learning model that can be used to improve students' critical thinking skills is discovery learning. According to Setianingrum and Wardani (2018) in (Dari & Ahmad, 2020) the discovery learning model is a learning model where students learn actively, students search and find their own learning material concepts. This way the student will more easily capture the material into his memory. The discovery learning model reinforces self-concept and encourages student engagement in learning so that students can use their abilities to find end results (Dari & Ahmad, 2020).

Encouraging students to be motivated is one way to help them become more capable and open to learning (Nagashibaevna, 2019). Linking student motivation and the learning process is a sensible strategy for encouraging pupils to learn. The teacher as a person who teaches students is very interested in this problem. In order to strive for high student learning motivation, a teacher according to (Kolisiyanta, 2022) should always pay attention to the following: a) A teacher should be able to optimize the application of learning principles, in principle must view that the presence of students in class is a learning motivation that comes from students. b) Teachers should be able to maximize the dynamic aspects of learning because several issues can occasionally hinder a student's progress in their studies. This can be caused by physical or mental fatigue of students, so a teacher must try to revive students' desire to learn. In the context of fractional material learning, critical thinking skills are essential in helping students understand various concepts, both abstract and concrete. Students can have an interactive and meaningful learning experience using effective learning methods and high motivation. Additionally, it can support kids in honing their critical thinking abilities and preparing them for the difficulties of an increasingly complicated environment (Tabiin, 2020).

The aim of this study is to determine the effectiveness of applying the discovery learning model, assisted by fractional wheels and enhanced by learning motivation, in improving the critical thinking skills of students at SD Negeri 1 Dagan. Given the critical impact of appropriate learning models on students' cognitive development and adaptability, this research seeks to address the issue of low critical thinking skills among Indonesian students by examining whether a student-centered approach, specifically discovery learning, can foster better engagement, motivation, and critical thinking outcomes in the context of fractional material learning.

## **RESEARCH METHOD**

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To conduct a systematic review of the literature, we followed an approach similar to that discussed by (Nurlaela, 2017), (Candiasa & Sukajaya, 2018) and (Rulita et al., 2021). In our approach, we (1) develop search strategy criteria, (2) search for articles that meet our criteria, (3) screen articles to ensure they meet the criteria for inclusion, and (4) extract detailed reports of specific aspects of the study. This gives us the opportunity to develop a reproducible and structured review.

(Nurlaela, 2017) in her research entitled " Learning Motivation and Learning Media's Effect on Students' Critical Thinking Capabilities" concluded that: (1) The critical thinking ability of students who use documentary film media is higher than image media, (2) there is an interaction between documentary film media and learning motivation on students' critical thinking skills, (3) students' critical thinking skills in groups of students who take part in documentary film learning and have high learning motivation higher than students who take part in image media learning and have low learning motivation, (4) Students' capacity for critical thought after watching documentaries and have low learning motivation lower than students who follow image media learning and have low learning motivation, (5).

(Candiasa & Sukajaya, 2018) in his research entitled "Guided Discovery Learning Method on Student Critical Thinking Level Seen from Learning Motivation" concluded that the guided discovery learning method can improve students' critical thinking skills, the increase is more effective when compared to conventional learning methods. In the learning process using the guided discovery learning method, motivation is able to moderate it in increasing the level of students' critical thinking, so that there is interaction between the two in increasing the level of students' critical thinking skills.

(Rulita et al., 2021) and Akhmad Jazuli in their research entitled "The Impact of Fraction Wheel-Assisted Guided Discovery Learning on Students' Critical Thinking" concluded as follows: mathematics learning with guided discovery models is better than conventional learning models in improving students' critical thinking skills. Based on the study findings, the researchers suggest implementing a guided discovery learning approach to enhance students' critical thinking skills. This approach allows students, with the guidance of teachers, to uncover concepts independently, thereby fostering more meaningful learning experiences (Rulita, Eni, et al. 2021).

## **RESULTS AND DISCUSSION**

Constructivist learning is learning that emphasizes knowledge as an active construction of students. Constructivism learning provides methods that can make it easier for students to learn lessons. One of the discovery-based learning models is discovery learning. A figure who introduced the learning model known as discovery learning was Jerome Seymour Bruner. American psychologist Bruner was born on October 1, 1915, and he made significant contributions

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to the development of cognitive psychology and cognitive learning theory in the field of educational psychology, history, and general educational philosophy.

According to Burner, discovery learning is a learning process in which teachers must create problematic learning situations, stimulate students with questions, encourage students to seek answers on their own, and conduct experiments. Therefore, learning discovery in the end can improve the ability to think freely and train students' cognitive skills by finding and solving those encountered with the knowledge they already have and knowledge problems that are truly meaningful to them, (Maula, 2019).

Discovery learning is a learning strategy that tends to ask students to make observations, experiments, or scientific actions to get conclusions from the results of these scientific actions (Saifuddin, 2014). Meanwhile, according to Cahyo, the discovery learning model is a discovery of concepts with a series of data or information obtained through observation or experiment (Mulyani, 2021).

The determination of learning with e-Learning-based Guided Discovery Learning can also train students' critical thinking skills through discoveries made so that students are able to build their own knowledge, are able to find concepts from the subject matter and memory is more durable, which ultimately affects the improvement of students' critical thinking skills, (Priadi & Riyanda, 2021).

Guided discovery learning develops students' understanding of concepts because the knowledge or theory is sought by itself so that the concept or formula sticks in the student's brain in the long run. The advantage of the guided discovery learning model is to train and strengthen memory because knowledge is obtained by independent discovery so that students' understanding of concepts will increase, (Dafira, 2021).

Guided discovery learning is a way of teaching that involves students in the process of mental activities through exchanging opinions, with discussions, seminars, reading alone and trying themselves so that students can learn on their own". A teacher must have a lot of sense to make learning varied, create fun learning, (Romayati, 2022).

Learning media is everything that is used to channel messages and can stimulate students' thoughts, feelings, attention and willingness so that it can encourage a deliberate, purposeful and controlled learning process, (Suryani Nunuk, 2019).

The theoretical foundation of educational media is an object that can be sensed, especially vision and hearing (teaching aids) both inside and outside the classroom, which is used as a liaison tool (communication medium) in the process of teaching and learning interaction to improve the effectiveness of student learning outcomes. Drajat in (Suryani Nunuk, 2019).

Fractional Wheel is a prop that can be used to solve problems or problems on fractional material of value, by rotating the wheel circle with a colorful design so that it can attract and stimulate students to enjoy learning mathematics. This teaching tool can make abstract

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mathematical material into something concrete, and can help students to hone and practice mathematical problem solving skills, in accordance with the development of grade V elementary school students who are in a period of concrete operational development (Murniati et al., 2022).

A person can get motivated on their own, but sometimes motivation needs to be fueled by the objectives they want to accomplish. Learning motivation is the attempt to alter one's behavior in order to attain a result in learning activities (Khairani et al., 2020). In the meantime, there are two types of learning motivation: extrinsic motivation and intrinsic motivation, according to (Emda, 2018). Extrinsic motivation refers to external factors that also motivate an individual to engage in a learning activity, whereas intrinsic motivation is a component that originates from within, (Emda, 2017). In this study, learning motivation may be measured using four indicators: the desire and effort to perform well in classes, perseverance and tenacity in doing tasks, pleasure in solving problems in doing tasks, and appreciation or reward in learning.

Indicators of motivation in the learning process according to (Sardiman, 2019) are: (1) Diligent in facing tasks, (2) Tenacious in facing difficulties, not quickly discouraged (3) showing interest in various problems, (4) prefer to work independently, (5) get bored quickly on routine tasks, (6) can defend their opinions, (7) not easily let go of what is believed, (8) likes to find and solve problems.

Critical thinking is a cognitive and intellectual skill that requires analyzing, evaluating, discovering, overcoming prejudices, formulating, presenting convincing reasons to support conclusions, making intelligent and reasoned choices about what to believe and what to do. (Zakiah & Lestari, 2019)

Problem-solving, critical thinking, and reasoning skills are important skills mastered by students to solve various problems that will be encountered in the future, in fact there are still many students with these abilities who are relatively low. To improve critical thinking skills, teachers can use learning strategies using learning media, (Adhalia & Susianna, 2021).

The aim of critical thinking is to strive for an impartial standpoint. Engaging in critical thinking involves assessing every aspect of an argument and analyzing both its strengths and weaknesses. So the most important thing about critical thinking is how the arguments we put forward are completely objective, according to Keynes, (Maula, 2019).

Mathematics is one of the general subjects and is the basis for the development of science and technology, (Puspitasari, 2018). Because mathematics is a mode of thinking that allows one to explore everything logically and methodically, mathematics as a subject in schools plays a significant part in developing quality students. As a result, raising the standard of mathematics instruction is imperative (Junaila, 2021) states that:

The objectives of learning mathematics include: "(1) understand mathematical concepts, explain relationships between concepts and apply algorithm concepts in flexible, accurate, efficient and fixed problem fragments. (2) patterns and properties, performing mathematical manipulations



in making generalizations, constructing proofs or explaining mathematical ideas and achievements. (3) solving problems which include the ability to understand problems, design mathematical models, solve problems and find solutions. (4) communicate mathematical ideas with symbols, diagrams or other media to clarify situations or problems. (5) have a respectful attitude.

Discoveries are made by students based on the instructions of the teacher (Junaila, 2021). The instructions given by the teacher can be in the form of guiding questions. Guiding questions will help students in solving math problems. Through effective and fun questioning skills, learning will be created because almost at every stage of learning, it must give questions. The quality of the questions asked by the teacher must also be considered because it will determine the quality of the answers given by students.

The fractional material to be described here is fractional matter in class V, KD 3.2 describes and performs addition and subtraction of two fractions with different denominators and KD 4.2 solves problems related to addition and subtraction of two fractions with different denominators.

Fraction or so-called fraction is a term in mathematics that has a form where  $b \neq 0$ . In this case  $a$  is the numerator and  $b$  is the denominator. The nature of transactions in fractional numbers is how to simplify the numerator and denominator. Simplification of numerators and denominators will facilitate operation arithmetic So it does not produce numbers that are too large but still have the same value.

### **Research Hypothesis**

1. There is a positive and significant influence between the guided discovery learning model assisted by fractional wheels on critical thinking skills in fractional material learning at SD Negeri 1 Dagan.
2. There is a positive and significant influence between learning motivation and critical thinking skills in fractional material learning at SD Negeri 1 Dagan.
3. There is a positive and significant influence between the guided discovery learning model assisted by fractional wheels and learning motivation on critical thinking skills in fractional material learning at SD Negeri 1 Dagan.

### **SPSS Test Results**

#### **1. Multiple Regression Analysis**

Based on the ANOVA output table above, it is known that the significance value (Sig.) in the F test is 0.000. Because Sig.  $0.000 < 0.05$ , then as the basis for decision making in test F it can be concluded that Guided Discovery Learning / GDL (X1) and Learning Motivation (X2) simultaneously (together) affect Student Critical Thinking (Y) or mean significant. Thus, the requirement for us to be able to assess the coefficient of determination in multiple linear regression analysis has been met.

#### **2. Partial Test (Test t**

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From the table coefficients above, we will conduct a test to find out whether the variables guided discovery learning (X1) and learning motivation (X2) partially affect the variable critical thinking (Y). The hypotheses proposed in this study are:

- a. H1 or the first hypothesis: there is an effect of guided discovery learning (X1) on critical thinking (Y).
- b. H2 or the second hypothesis: there is an influence of learning motivation (X2) on critical thinking (Y).

To test the research hypothesis above, you must first know the basis for decision making in the partial t test. In this case there are two references that can be used as a basis for decision making, first by looking at the significance value (Sig.), and second comparing the calculated t value with t table.

- a. The first t-test to determine if there is an effect of GDL (X1) on critical thinking (Y)
- b. Based on the table coefficients Sig. value of  $0.000 < 0.05$ , then H1 is accepted (there is an effect of GDL (X1) on critical thinking (Y))
- c. Based on the table coefficients T count  $4.847 > 2.069$ , then H1 is accepted (there is an effect of GDL (X1) on critical thinking (Y)).
- d. The second t test to determine if there is an effect of learning motivation (X2) on critical thinking (Y)
- e. Based on the table coefficients Sig. value of  $0.002 < 0.05$ , H2 is accepted (there is an influence of learning motivation (X2) on critical thinking (Y))
- f. Based on the table coefficients T count  $3.824 > 2.069$ , then H2 is accepted (there is an influence of learning motivation (X2) on critical thinking (Y)).

Given the importance of critical thinking skills that students must have, researchers consider this research very relevant to current conditions. And of course, researchers hope that there will be other similar studies and perfect this research. Broadly speaking, this research was carried out by analyzing data obtained from the interview process, filling out questionnaires and tests.

The data used were taken from post tests conducted in experimental classes through measuring critical thinking question scores in students using guided discovery learning models assisted by fractional wheels and learning motivation. This assessment is conducted to ascertain how the guided discovery learning model supported by fraction wheels and learning motivation influences the critical thinking abilities of students by conducting different tests in experimental classes before and after using the fraction wheel assisted guided discovery learning learning model and learning motivation.

The stage that researchers do before carrying out research is to coordinate with the Head of SD Negeri 1 Dagan and class V teachers as an experimental class which will later be used as a place for research. Furthermore, it records the number of students and the names of 26 students.



The agreement taken for the implementation of the research is on April 31, 2023 at SD Negeri 1 Dagan for class data and sample collection at the first meeting using a guided discovery learning model assisted by fractional wheels and learning motivation. Then on June 2, 2023, in the same class, data and samples were taken for the second meeting using a guided discovery learning model assisted by fractional wheels and learning motivation.

No	Nama	Pre Test	Gdl	Motivasi	Post Tes
1	Aiman Razan	40	99	100	100
2	Aprilia Sifa Hanafi	53	95	77	80
3	Arvin	33	100	95	93
4	Bimo Adi Pratama	40	92	92	80
5	Cendikia Erlan Diaspora	33	92	89	87
6	Charisa Amelia Nur Hasanah	66	97	98	93
7	Danis Wara Ak	33	95	78	87
8	Dika Prayogi	47	100	100	100
9	Dini Setianingrum	33	99	99	100
10	Dwi Aji Saputra	53	100	99	100
11	Dwi Ayu Ningsih	No	Name	Pre Test	Gdl
Motivation	Post Test	1	Aiman Razan	40	99
100	100	2	Aprilia Sifa Hanafi	53	95
77	80	3	Arvin	33	100
95	93	4	Bimo Adi Pratama	40	92
92	80	5	Scholar Erlan Diaspora	33	92
89	87	6	Charisa Amelia	66	97

			Nur Hasanah		
98	93	7	Danis Wara Ak	33	95
78	87	8	Dika Prayogi	47	100
100	100	9	Dini Setianin grum	33	99
99	100	10	Dwi Aji Saputra	53	100
99	100	11	Dwi Ayu Ningsih	40	100
100	100	12	Fatah Nur Rizki	33	95
78	87	13	Husna Nur Hanifah	40	99
99	100	14	Imam Safi'i	33	97
99	100	15	Inayah Hanin Lutfia	40	97

## CONCLUSION

Based on the results of the study above, the study demonstrates that the guided discovery learning method, supplemented by fractional wheels, significantly enhances students' critical thinking skills, particularly when coupled with strong learning motivation. To sustain and further this educational advancement, strategic efforts are necessary. These include developing a comprehensive plan aligned with the school's vision and mission, continuously motivating students, and fostering a collaborative environment among all educational stakeholders. Moreover, the study supports the theoretical framework suggesting that motivated, well-structured learning interventions are crucial for improving critical thinking. Therefore, schools should persist in implementing innovative programs and actively seek collaboration with external entities, such as

the community and parents, to ensure continued support and enrichment of the educational process. Additionally, principals should engage with educational institutions to secure ongoing professional development for teachers, ensuring the consistent application of effective learning models in the classroom.

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