

EXAMINING THE DISCOVERY LEARNING METHOD IN BUILDING CRITICAL THINKING SKILLS IN ELEMENTARY SCHOOL STUDENTS: ANALYSIS OF DESCARTES' PHILOSOPHY OF RATIONALISM

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Abstract. One of the higher-order thinking skills needed in the development of 21st Century Skills is critical thinking. The critical thinking ability of Indonesian students is still relatively low due to the selection of inappropriate learning strategies. The ability to think critically, philosophically can be understood through the theory of rationalism philosophy. This study will examine how discovery learning can build the critical thinking skills of elementary/middle school students through the lens of Descartes' rationalism. This study uses a descriptive qualitative method with a library research approach. Data collection techniques through documentation. The data analysis technique uses content analysis. Content analysis is used to present the results of the data in a descriptive form and provide an understanding of the relationship between discovery learning and students' critical thinking and assess its relevance to the principles of Descartes' philosophy of rationalism. The results show that all stages in discovery learning have accommodated the critical thinking process. The discovery learning method has stages that are interconnected and intersect with the principles of Descartes' philosophy of rationalism. It can be concluded that Descartes' philosophy of rationalism underlies the discovery learning method in building students' critical thinking skills.

Keywords: Discovery Learning, Critical Thinking, Philosophy of Rationalism Descartes

INTRODUCTION

One of the higher-order thinking skills needed in the development of 21st Century Skills is critical thinking. These skills are needed by every individual to solve difficult problems and make important decisions in life (Rahardhian, 2022). Critical thinking should be honed from an early age and is the main foundation of every learning, because it is the key to understanding knowledge in depth (Sayangan et al., 2024).

The critical thinking skills of Indonesian students are still quite minimal, as shown by facts in the field. The students have not succeeded in solving a problem that requires critical thinking skills. They still make a lot of mistakes and face difficulties (Nuridayah et al., 2023). One of the factors for students' low thinking ability is due to the tendency of the learning process to be centered on the role of the teacher, so that there is a lack of opportunities for students to actively participate in learning (Maharani et al., 2024). Nevertheless, it is necessary to select a learning strategy that suits the needs of students by considering the suitability of the material. Learning needs to be transformed to be more student-centered, as the main focus of the independent curriculum, so that learning becomes a meaningful and quality experience (Indonesia, 2024).

One important approach in integrating the development of students' critical thinking skills is to adopt learning methods that prioritize active student involvement, both cognitively and emotionally. According to Facione (2011), critical thinking includes interpretation, analysis, evaluation, inference, explanation, and self-regulation, all of which require a learning environment that supports exploration and discussion. This type of environment allows students to practice using critical reasoning skills in a variety of contexts. In the learning context in elementary schools, the application of methods that encourage active student participation, such as discovery learning, provides

opportunities for students to build new knowledge through direct experience, ask critical questions, and reflect independently on their learning. Thus, synergy is needed between innovative learning strategies and philosophical principles that emphasize the importance of rationality, so that learning can become an effective means for developing students' critical thinking abilities.

Discovery learning is one of the learning methods developed by Jerome Bruner and is recommended to support 21st century learning in improving students' critical thinking skills (Ririn et al., 2021). This learning model prioritizes direct experience in the field, without always being driven by the theories in the learning manual. The study of Zohar & Ben-Ari (2022) identified that learning that adopts discovery learning supports the development of critical thinking, as seen from the involvement of students through active exploration so that they can monitor and evaluate their own thought processes. According to Prasetyo & Kristin (2020), the results obtained in discovery learning will be more lasting and memorable.

The ability to think critically, philosophically can be understood through the theory of rationalism philosophy. One of the 17th-century philosophers known as the father of modern rationalism was Rene Descartes who introduced the method of systematic reasoning to build a strong foundation of knowledge. Descartes argued that logical and critical reasoning is the key to obtaining truth in science (Ammarin et al., 2024). The method of discouraged learning in education resonates with the principles of Descartes' philosophy of rationalism, where students are required to think critically and find solutions through a logical and systematic process.

This study will examine how discovery learning can build the critical thinking skills of elementary/middle school students through the lens of Descartes' rationalism. The results of the research will contribute to enriching the study of educational theory based on a philosophical perspective. The main goal is to support and strengthen the effectiveness of the discovery learning method in building students' critical thinking skills. The philosophical approach of rationalism has not been widely used to study educational problems, especially the discovery learning method to build critical thinking skills, so this research will offer a new perspective in education.

RESEARCH METHOD

This study uses a descriptive qualitative method with a literature study approach. The main focus is to analyze the role of the discovery learning in building the critical thinking skills of elementary school students through the perspective of Descartes' rationalism. Data collection techniques through documentation. Documentation is carried out by collecting literature sources related to theory and application discovery learning as well as Descartes' philosophical concepts through various platforms, such as Google Scholar, ResearchGate, as well as digital libraries, with selection criteria that include topic relevance, source credibility, and recent publication year.

Once the data is collected, the analysis process begins by reading and understanding the content of each source. Content analysis was conducted to identify key themes, such as the steps to implement Discovery Learning, indicators of critical thinking in students, and the principles of Descartes' rationalism. The results of analysis from various sources were synthesized to build a conceptual framework that connects Discovery Learning with critical thinking skills within the framework of Descartes' philosophy. The validity of the data is maintained through source triangulation by comparing information from various literatures. The flow of data analysis can be seen in the figure.

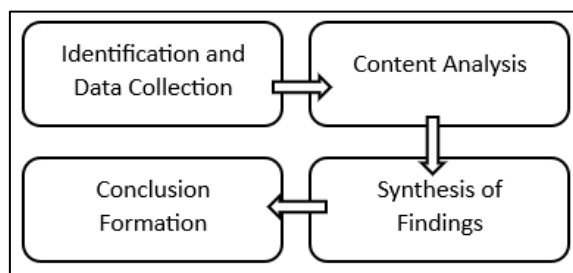


Fig. 1. Data Analysis Flow

RESULT AND ANALYSIS

1. Discovery Learning Methods in Learning

The Discovery Learning method is an active learning style developed by Jerome Bruner in the 1960 (Khasinah, 2021). This method emphasizes students as learning subjects who must be active and participatory, not just passively accepting knowledge. (Bruner, 1961) argues that the practice of self-discovery teaches people to obtain information in a way that can make the information more readily available in problem-solving. Bruner also considers that discovery learning corresponds to the active search for knowledge by humans and will automatically get the best results in such strategies. The discovery learning method creates active learning, where the material and content are not given by the teacher at the beginning of learning. During the lesson, students are asked to be able to find ways to solve a problem for themselves. The students will go through the process of understanding concepts, meanings and relationships through an intuitive process to finally find the right conclusion. Discovery learning is carried out through observation, classification, measurement, prediction, determination and inference activities (Khasinah, 2021).

Each method certainly has an implementation procedure (syntax), including the discovery learning method. The syntax of the application of discovery learning is explained in the following table (Daryanto, 2014).

Table 1. Syntax of the Discovery Learning Method

No	Syntax	Learning Activities
1	Stimulation	At this stage, the teacher provides stimulation to students by triggering students' thinking about a problem that has not been found to be solved. Teachers can start by providing problematic questions, directions to explore something such as books, the surrounding environment, or other learning activities that lead to the next step in identifying problems.
2	Problem statement	Students are given the opportunity to find as many problems as possible from the stimulus given, then choose one priority problem to be used as a hypothesis or temporary answer to the problem formulated
3	Data collection	Students collect data after focusing on the problem through exploration such as reading literature, observing objects, interviews, conducting experiments and so on.
4	Data processing	Students process previously obtained data or information to be analyzed and interpreted. All information obtained from readings (literature), observations, interviews, and so on is processed, classified, tabulated, even if needed to be calculated in a

		certain way and interpreted at a certain level of confidence.
5	Verification	Students try to verify carefully to test the hypothesis set by alternative discovery, linked to data processing. This stage will make students active, critical, and creative in solving problems.
6	Drawing conclusions	The last stage is to draw conclusions by paying attention to the results of verification. After drawing conclusions, students should pay attention to the generalization process that emphasizes mastery of the entire learning process including the meaning of the principles underlying one's experience.

2. Critical Thinking in Learning

According to Ennis (2011), critical thinking is reasonable and reflective thinking focused on deciding what to believe or do, which means that critical thinking is a reflective thinking process that focuses on deciding what to believe and do (Ennis, 1984). Critical thinking skills according to Redecker include the ability to access, analyze, synthesize information that can be learned, trained and mastered (Linda & Lestari, 2019).

Another definition states that, "critical thinking includes the component skills of analyzing arguments, making inferences using inductive or deductive reasoning, judging or evaluating, and making decisions or solving problems" (Emily R. Lai: 2011). Another definition means that critical thinking includes components of the skill of analyzing arguments, making conclusions using inductive and deductive reasoning, assessment and evaluation, and making decisions and solving problems (Lai, 2011). While Bailin stated, "defines critical thinking as thinking of a particular quality essentially good thinking that meets specified criteria or standards of adequacy and accuracy" (Bailin: 2002), which defines critical thinking as thinking with good quality and meeting the criteria or standards of adequacy and accuracy (S, 2002).

It can be concluded that critical thinking in learning is the process of students finding and analyzing information in depth, considering based on a rational viewpoint before arriving at the right and accurate conclusion.

The goal of critical thinking is to try to maintain an "objective" position by being aware of any prejudices that may be present, perhaps leaning towards the way of thinking about an argument. For example, when reading, a person has the opportunity to check their understanding and return to the part that is unsure of the meaning. To find out how the critical thinking process is, there are three steps that can be taken, as follows; (Linda & Lestari, 2019)

a. Identifying the truth of information

First, identify the general beliefs of an argument with the information being read. At this stage, it is necessary to simply define and realize the subject matter, then claim an evidence or event that is used to reach a conclusion.

b. Analyze the material

As you read, think about whether the material is relevant to your needs. Some questions that can help with analysis include; a) whether the information is reasonable in relation to the teori and other research; b) whether the material is clear enough or still requires additional information to aid understanding; c) whether the argument presents a balanced view or the author ignores some topics to make a particular argument.

c. Compare and apply information

Assignment questions in critical thinking will often ask to apply a theory, principle, or formula to a situation. The process of experimenting with what has been learned can help build an understanding of the subject matter.

3. Discovery Learning Practices in Critical Thinking Development

The practice of the discovery learning method in learning has been widely carried out. This method has been proven to have an influence on improving the critical thinking skills of elementary school

students based on various research results. Meta-analysis of 40 articles for the period 2013-2022 on the contribution of discovery learning methods to students' critical thinking skills in mathematics learning has an influence of 2.10 based on the uiji effect size. This shows that the discovery learning method has a significant impact on critical thinking skill (Handayani, 2023). Based on an experiment conducted Azmy & Yustitia (2023) through a test to determine the influence of the discovery learning method on critical thinking skills in one of the mathematics subject matter, the results showed that there was an influence of the matode on the critical thinking ability of students of SDN Kebondalem Mojosari. This is shown from the average critical thinking ability of the experimental class is better than that of the control class.

The research Mulyanto et al. (2022) tries to measure students' critical thinking skills through the discovery learning method on one of the science materials. Through the quasi-experiment method, the results were obtained that the method had an effect on the critical thinking skills of students of SDN Dr. Sutomo V Surabaya. Testing the discovery learning method in science subjects to improve critical thinking skills is also carried out through Class Action Research. The results of the study showed an increase in learning outcomes using discovery learning in cycle 1 by 72% to 88% in cycle II (Luthfi & Rosmi, 2024). The research is in line with Sayangan et al. (2024), namely using the method in testing the discovey learning method in social science learning. The results of the study show that this method is effective in improving the critical thinking skills of SDI Rutosoro students in social science learning. The discovery learning method in improving critical thinking skills has also been researched in Indonesian subjects through the rotary experimental design method with a Posttest-Only Control design, with the results of hypothesis testing showing that students' critical thinking skills using the Discovery Learning method are better than conventional classes (Eriansyah & Baadilla, 2023).

4. Philosophy of Rationalism in Education

Rationalism, etymologically derived from the root word "ratio" in English which means reason. Rationalism is a school that adheres to the philosophical understanding that reason is a very important tool for acquiring and testing knowledge. This school emphasizes that reason (ratio) is the main source of knowledge. The condition for all knowledge to be considered scientific must be obtained through reason. This school believes that reason does not require experience. The intellect can derive the truth from itself. Experience is only used as a reinforcement of knowledge obtained through reason (Adnan, 2021).

The 17th century became the beginning of correct philosophical thinking. Over time, humans increasingly believe and put their hopes in the ability of reason. Through reason, they can explain, understand, and solve all human problems. This belief in rationality is evident in the field of philosophy, in the form of the development of a priori or a very rational system of decisions at a very high level (Adnan, 2021).

People who adhere to rationalism are called rationalists. The rationalist movement demands proof, logic, and analysis based on the facts of a truth. In the view of rationalists, God is the creator of a universe full of calculation and consideration. The results of his invention can be calculated and explained logically and proven by scientific and scientific research.

One of the philosophical figures of rationalism was Rene Descartes (1598-1650). He is the founder of modern philosophy and is famous for his argument cogito ergo sum (I think, then I exist). The meaning of the statement is that "I am plagued by doubt indicates that I am thinking, and because I am thinking I am". By doubting many things, we will continue to search, and when we get it, we will believe with all our hearts.

Descartes paid great attention to the question of method, as well as his goal to build a philosophical system free from doubt. A method must be applied in such a way that it can help to discern knowledge whose truth is very certain and undoubted. Descartes' attention was expressed in his work entitled Discourse on the Method and Rules for the Direction of the Mind.

In his "Rules for the Direction of the Mind", Descartes defined a method as a set of rules that can be applied easily. If people apply the method correctly, they will avoid mistakes in understanding something that is right or expanding the error (Rene, 1985).

An explanation of the exact procedure for applying the method, Descartes explained in the second part of his paper entitled, Discourse on the Method , namely that there are four principles, including. (Rene, 2006)

First, Doubt Everything, which is doubting everything that cannot be believed with certainty. Not taking everything that does not have a clear knowledge of its truth. Be very careful of conclusions and prejudices and only accept the truth that is absolutely obvious.

Second, Divide and Conquer, that is, after reaching a clear understanding of doubt, Descartes advocates dividing complex problems into smaller parts that are easier to understand. By breaking it down into small steps, one can analyze and understand each piece in detail.

Third, Synthesis (Build from simple to complex), that is, after understanding the simpler parts, the next step is to rearrange them from the easiest to the most complex, This helps to arrange thoughts logically and structurally so as to achieve a deeper and more thorough understanding.

Fourth, Enumeration and Review Thoroughly, which is to review all previous steps to ensure that nothing is missed, so that the reasoning and logical steps used are consistent and correct.

Methodologically, the four principles can be concretized into two related methods, namely the intuition and deduction methods. In Descartes' conception, intuition is not the direct sensory experiences as it is commonly understood, or knowledge based on the imagination of certain objects. According to him, intuition is a concept of something that is clear and definite in the mind, so that there is not the slightest doubt about the truth of understanding the conception. An example of intuition according to Descartes is the knowledge of triangles formed from three lines (Sitorus, 2016).

While deduction is the drawing of conclusions or definite consequences of something that is clearly known (intuition). Thus, the starting point of deduction is intuition. In Descartes' concept, intuition does not produce knowledge, but true and definite knowledge arises only through the deduction of careful and careful intuition, step by step, by not allowing anything dubious to enter reasoning.

21st century education emphasizes the development of critical and creative thinking skills, information literacy and the ability to solve complex problems. The modern curriculum is designed to encourage students to think logically and independently, in line with the principles of rationalism. The application of the Descartes' rationalist method in education helps students develop critical analytical skills in an era of rapid scientific and technological advancement (Fauzan, 2023). Not only that, the use of Descartes' thinking can help students make wise decisions in everyday life (Salsabila et al., 2023).

The principles of rationalism can be implemented in the educational cuticulum through a variety of learning strategies as an approach that encourages students to actively participate in learning, ask critical questions, and develop logical and coherent arguments (Ammarin et al., 2024). In line with its benefits, implementing the principles of Descartes' rationalism has practical challenges. Part of these challenges is the resistance to changes in traditional teaching methodologies and the difficulty in measuring teaching outcomes based on critical and analytical thinking. Proper evaluation is needed to measure and ensure the effectiveness of this approach in improving students' thinking skills (Fikri, 2018).

5. The Relationship of Discovery Learning in Building Students' Critical Thinking Skills According to the Analysis of Descartes' Philosophy of Rationalism

After studying the method of Descartes' philosophy of rationalism and the method of discovery learning, it can be seen that there are differences in the stages of the method. The Descartes method includes four main stages, namely 1) methodical doubt, 2) analysis, 3) synthesis, 4) enumeration and rechecking. The syntax of the discovery learning method consists of six stages, including 1) providing stimulation, 2) identifying problems, 3) data collection, 4) data processing, 5) proofing and 6) drawing conclusions.

Based on the difference in steps, it turns out that there is an intersecting relationship between the stages of the method which concludes that there is a similarity between the two methods. The following describes the relationship between methods through images.

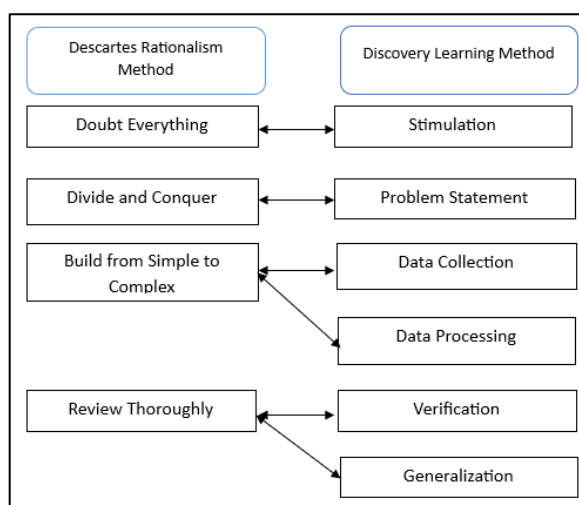


Fig. 2. Relationship between Discovery Learning Methods with Descartes' Method of Rationalism

The figure indicates that the first stage of the method of Descartes' philosophy of rationalism, namely "methodical doubt" is equivalent to "giving stimulus" in the discovery learning method. This shows that methodical doubt and stimulation have equal or commensurate value, meaning and function. The function in question is the same in terms of the principle to spark someone's doubts about a concept, material, observation, event and so on. At this stage, the stimulus provided by the teacher in learning will contribute greatly to the students to find problems that will be tested for correctness. The second stage of Descartes' philosophy of rationalism is "analysis" showing an equivalent line with two stages in the discovery learning method, namely "problem identification" and "data collection". According to Descartes, analysis is the process of dividing complex problems into smaller parts to make them easier to understand, in line with problem identification and data collection activities. In the process of identifying problems, students will specify the problem into smaller scopes and collect data from the selected problem focus.

The third stage explained by Descartes is synthesis which has an equivalent line with data processing in the discovery learning method. The principle of synthesis that seeks to rearrange the results of data discovery to obtain a complex understanding, has the same meaning and urgency as the data processing stage of the discovery learning method. At this stage, students will begin to process all the data that has been collected to be measured, calculated, and interpreted.

The fourth stage of Descartes' theory is enumeration and re-checking are equivalent to the stage of proving and drawing conclusions on the discovery learning method. Enumeration and re-checking are needed to ensure that the steps taken are correct so that they get the correct, consistent and logical conclusions. The urgency is the same as the process of proving and drawing conclusions in the discovery learning method, where students will verify the data carefully to test the hypothesis before drawing conclusions.

Bruner as the formulator of the discovery learning method revealed that the learning method is carried out through an intuitive process to finally find the right conclusion. This idea is the same as the principle that Descartes explained in building the philosophy of rationalism, namely through the two main methods of intuition and deduction. The two methods are a simplification or generalization of the four methods that he has compiled previously. From this analysis, it can be seen that the discovery learning method uses the same philosophical principles as the philosophy of rationalism, especially those developed by Rene Descartes.

The contribution of the discovery learning method to students' thinking ability can be tested based on whether or not there are stages of the critical thinking process in the concept of discovery learning. To make it easier and clearer, the following image is presented.

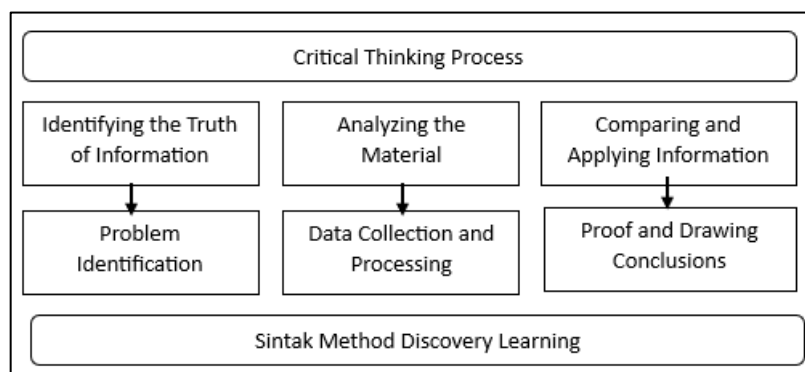


Fig. 3. Critical Thinking Process in the Discovery Learning Method

The image shows a critical thinking process that is characterized by three things, namely 1) identifying the truth of information, 2) analyzing material and comparing and 3) applying information. These three processes have been carried out during the discovery learning process through the stages of problem identification, data collection and processing, as well as proof and conclusion drawn. All stages in discovery learning have accommodated the critical thinking process. Thus, from a conceptual point of view, through discovery learning-based learning methods, students can build critical thinking skills.

CONCLUSION

It was found that the relationship intersected with each other between the stages of the method which concluded that there was a similarity between the method of philosophy of Descartes' rationalism and the method of discovery learning. The first stage of the method of Descartes' philosophy of rationalism, namely "methodical doubt" is equivalent to "giving stimulation" in the method of discovery learning. The second stage of Descartes' philosophy of rationalism "analysis" shows an equivalent line with two stages in the discovery learning method, namely "problem identification and data collection". The third stage, "synthesis" has a line equivalent to "data processing" in the discovery learning method. The fourth stage of Descartes' theory is that "enumeration and rechecking" is equivalent to the stage of "proof and conclusion drawn" in the discovery learning method. The contribution of the discovery learning method to students' thinking ability can be tested based on whether or not there are stages of the critical thinking process in the concept of discovery learning. All stages in discovery learning have accommodated the critical thinking process, in the form of identifying the truth of information, analyzing the material, and comparing and applying information. Thus, from a conceptual point of view, through a proven discovery learning-based learning method, it can build critical thinking skills in students based on the principles of philosophy of rationalism.

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