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**Problem Based Learning  
(PBL) and Guided Discovery  
Learning (GDL) Effects of  
Mathematical Reasoning  
Capability: Analysis for  
Gifted Students**

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**Abstract**

This article aims to compare better mathematical reasoning abilities between Problem Based Learning (PBL) models and Guided Discovery Learning (GDL) models. Based on the results of review the mathematical representation ability of students with Guided Discovery Learning (GDL) models is better than the mathematical reasoning ability of students with the Problem based Learning (PBL) model. This shows that the GDL model has more influence on students' mathematical reasoning abilities.

**Key words:**

guided discovery learning (GDL), problem based learning (PBL), mathematical reasoning ability, mathematically giftedness

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## INTRODUCTION

The education of mathematically gifted children is a very important issue. Mathematics is not an area where everyone can be talented. In this article, what mathematics is giftedness, what are the appropriate instructional strategies for mathematically gifted students, What is Mathematical Reasoning Capability?, What are the effective instructional models to improve this feature? And it will be discussed on effects of Problem Based Learning (PBL) and Guided Discovery Learning (GDL) teaching models on Mathematical Reasoning Capability

### **Mathematically Giftedness**

This is supported by the lowest percentage average achieved by Indonesian students in the cognitive domain at the reasoning level of 17% (Dwiningrum, Mardiyana, & Pramudya, 2017). Though reasoning ability becomes one of the goals in learning mathematics in schools, namely to train ways of thinking and reasoning by drawing conclusions, developing problem solving skills (Abdurrahman, Saregar, & Umam, 2018), and developing the ability to convey information or communicate ideas through oral, written, drawing, graph, map, diagram, etc (Rohana, 2015).

At present many learning models can be used to maximize learning objectives including PBL and GDL learning models. The PBL model requires students to learn independently, find independent information to carry in group discussions, so that there will be lots of different information in each group based on each understanding (Mente & Jazuli, 2017). The GDL model trains students to solve problems, students are required to be active in learning activities to find their own knowledge through the guidance of educators (Mente & Jazuli, 2017). Based on the 2013 curriculum, learning activities become student centers so students are required to be more active in learning. This is the reason for the need to apply the PBL and GDL models in learning (Anugraheni, 2018; Ririn Dwi Agustin, 2016; Wafroturrohmah Suyatmini, 2013; Zainal Mustofa, Herawati Susilo, & Mimien Heni Irawati Al Muhdhar, 2016).

### **Mathematically Reasoning Ability**

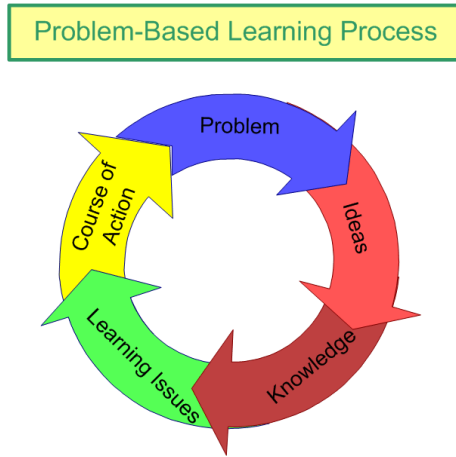
One of the mathematical abilities that students must develop and possess is the students' mathematical reasoning abilities. This is in line with the abilities targeted in the curriculum and the learning objectives of mathematics in elementary schools. One of the goals of learning mathematics is to use reasoning on patterns and traits, carry out mathematical manipulation in making generalizations, compiling evidence, or explaining mathematical ideas and statements (Nafiah, 2014). Reasoning can be used as one of the ways to solve problems that occur with evidence based on facts or sources that are really relevant so as to form a generalization (Dwiningrum et al., 2017). This is in line with the understanding of the ability of mathematical reasoning itself, namely the ability of mathematical

reasoning is the ability to know and analyze a mathematical argument that is true or not so that it can build a mathematical argument based on relevant evidence so that conclusions obtained and generalized become logical conclusion.

Mathematical reasoning has an important role in the learning process, namely to find out, work on, and solve all problems in mathematics. Mathematical reasoning ability can create students with the ability to analyze, understand, gather evidence and make conclusions so that they can solve problems correctly and relevantly. The ability of mathematical reasoning in this study is limited by indicators namely: drawing logical conclusions, using explanations using models, facts, properties and relationships, using patterns and relationships, to analyze mathematical situations, estimating answers and solution processes, compiling and testing conjectures, give opponents examples, follow rules of inference, check the validity of instruments, construct valid arguments, and arrange direct evidence. Since students' mathematical reasoning ability is one of the abilities targeted by the curriculum, the teacher has an important role in designing appropriate learning processes to improve these abilities (Rerung, Sinon, & Widyaningsih, 2017).

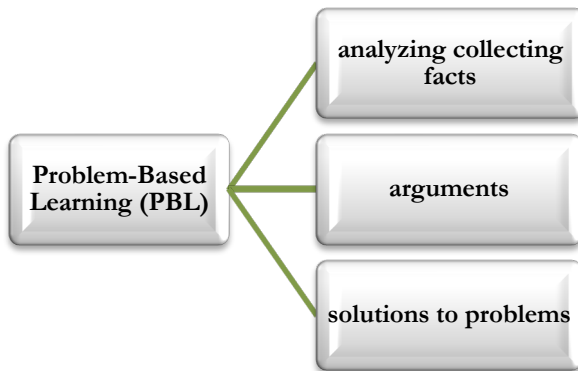
### **Problem Based Learning (PBL) Model and Gifted Education**

In this regard, the teacher has an important role in designing the right learning process. Designed learning is learning that can awaken students' potential in using their thinking skills to solve problems (Yanti, Wakidi, & Basri, 2017). One of the approaches that can be used in learning is Problem-Based Learning (PBL). Problem-Based Learning (PBL) is an approach that in the learning process can awaken students' potential in using their thinking skills to solve problems. In implementing this learning process, the teacher acts as a facilitator and students play an active role in the learning process activities (Amin, 2017). The teacher as a facilitator, where the teacher provides facilities that can provide convenience for students in carrying out learning activities. While students will be directly involved in observing, analyzing collecting facts, arguments, and concluding solutions to problems (Intan Saputri, Ely Susanti, & Nyimas aisyah, 2017).



**Figure 1.**  
*Problem-Based Learning (PBL)*

In the problem-based learning model, the problem finding stage takes place at the beginning of the instruction (Fig.). Maker (2004) describes gifted individuals as the best problem-solving individuals. In the Discovery problem matrix model, Maker listed the problem types according to the difficulty level. Problem-based instruction needs to be designed in the education of gifted students. In this respect, the PBL model can be said to be one of the most effective strategies in the education of gifted children



**Figure 2.**  
*In Implementing This Learning Process of Problem-Based Learning (PBL)*

Problem-Based Learning (PBL) has several shortcomings, one of which is when the division of tasks during learning, one of them has different and diverse abilities to understand, and complete the given task or problem. In this regard, the application of Problem-Based Learning (PBL) requires an appropriate learning

strategy so that it can help reduce the impact of one of the shortcomings of Problem-Based Learning (PBL). The reason for choosing active learning will emphasize the learning approach by activating students in the learning process where the learning is carried out with learning strategies. It takes a lot of consideration to choose a learning strategy, one of which is to consider what factors can inhibit the implementation of the strategy during the learning process and student responses to the learning process (Suarni, 2017). By knowing what factors can inhibit the implementation of the learning process by implementing these strategies, the teacher can anticipate and prepare alternatives that can overcome these inhibiting factors. In addition, by knowing students' responses, the teacher can see how much enthusiasm and motivation students have in participating in each class of learning process (Sari Dewi, Sumarmi, & Ach. Amirudin, 2016).

### **Guided Discovery Learning Model and Gifted Education**

Several studies have been conducted to measure the effect of Problem Based Learning and Guided Discovery Learning models on critical thinking skills and learning outcomes, learning achievement, motivation to learn, creative thinking and critical thinking, mathematical spatial abilities, social skills, and understanding concepts and critical thinking skills (Sugiarni, Alghifari, & Ifanda, 2018; Okky Riswandha Imawan, 2015; Moh. Fikri Bungel, 2014; Mega Kusuma Listyotami, dkk., 2018; Samsul Maarif, 2016; Meryem Cildir, 2017). The renewal in this study lies in the analysis of mathematical reasoning abilities in PBL and GDL models. The purpose of this study is to compare PBL and GDL models to mathematical reasoning abilities.

### **CONCLUSION**

This is in accordance with previous studies which stated that the GDL learning model had more influence on mastery of concepts compared to conventional learning models, GDL learning model with the help of learning media has more influence on the ability to understand concepts and problem solving abilities compared to direct learning models. In making comparisons between the two models makes no sense especially if the two models do not have the same characteristics. Both models have the same characteristics because the same makes students active in the teaching and learning process. which can be seen in research is the effectiveness of each model in influencing students' abilities, so the teacher can determine which learning model is appropriate for him to use in the teaching and learning process.

In the case of Gifted student and mathaetics, the description above it can be concluded that from the review of only one aspect, namely the aspect of the role

of the teacher in the development of mathematical gifted children, it appears that the development of talent from mathematical gifted children requires great work and cooperation of many parties. Not to mention if we review other aspects such as the curriculum, government policies that should support the development of these talents, and other aspects which certainly open our eyes that the gift of talent that we find in our children raises a very big responsibility to develop it.

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