



## Improving Student's Logical Thinking Abilities And Learning Outcomes Through Guided Inquiry Model

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Received: January 2022; Revised: March 2022; Published: April 2022

### Abstract

Learning outcomes are closely related to the abilities possessed by students. One of them is the ability to think logically. this ability can improve students' understanding of knowledge, which in turn affects their learning outcomes. This study aims to determine students' learning outcomes and logical thinking skills in science subjects through a guided inquiry learning model. This study was included in a quasi-experimental design with a non-equivalent pretest-posttest control group design. All students of seventh grade in Madrasah Tsanawiyah Miftahul Islah Mataram became the population, while 39 students became the sample, which was carried out through the cluster random sampling technique. The subjective test and the rubric of logical thinking ability were instruments used. The data were analyzed using Mancova, while the prerequisite test included normality and homogeneity tests. The findings of this study are that there is a significant effect between guided inquiry learning on learning outcomes and students' logical thinking ability (sig = 0.000). The corrected mean score of students' logical thinking skills in guided inquiry learning is higher than in conventional learning, as well as their learning outcomes. The ability to think logically is 71% higher while learning outcomes are 95% higher.

**Keywords:** Guided Inquiry; Learning Outcomes; Logical Thinking Ability

**How to Cite:** Yuliana, N., Purwati, N., & Hanapi, H. (2022). Improving Student's Logical Thinking Abilities And Learning Outcomes Through Guided Inquiry Model. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, 10(2), 345-351. doi:<https://doi.org/10.33394/j-ps.v10i2.4822>



<https://doi.org/10.33394/j-ps.v10i2.4822>

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## INTRODUCTION

Related to the quality human resources preparation to respond to 21st-century challenges, the education system of Indonesia is faced with greatly complex problems (Hutagalung & Simarmata, 2015). The quality of human resources will determine the quality of the personal, community, and nation life in overcoming the problems and challenges faced today and in the future. The low quality of education, especially primary and secondary education, is one of the important problems faced (Udiani et al., 2017). One of the efforts to overcome these problems is to realize quality learning. This is related to efforts to empower the potential of students to grow and develop better (Widodo, 2016).

Learning outcomes are an indicator to measure the success of learning, both in the cognitive, affective, and psychomotor domains (Maisaroh & Rostrieningasih, 2010). Learning outcomes show students' abilities after carrying out the learning process. Based on these learning outcomes, the teacher can find out the development of students' abilities and understanding, to then become one of the references in determining the strategies to be applied in the next lesson (Purwanto, 2012; Purwati et al., 2018).

In a learning process, students are required to be fully involved, both in physical and emotional activities. This involvement will encourage students to develop their knowledge, skills, and capabilities. In this case, the experience and thinking skills of students become more empowered so that learning becomes more meaningful for students. Meaningful

learning means that a learning process carried out can facilitate students to learn better by discovering and developing their knowledge of a certain concept through real experience (Purwati et al., 2018).

Natural science as a science that includes products and processes, provides a huge opportunity to achieve more meaningful learning. In science learning, students learn knowledge in the form of facts, concepts, principles, and procedural knowledge. These forms of knowledge can be achieved through practical activities that involved students in thinking and physical abilities. Learning science, assist students to recognize, respond the science and technology, drill to thinking critically, be scientific, creative, and independent. According to Sumarni et al., (2017), these abilities and skills are needed by students to solve problems found in everyday life.

Students' ability to find and solve problems is influenced by their thinking ability (Zubaidah, 2018). Thinking ability is a process by which students develop ideas, finding knowledge, and solving the problems in their lives (Irwansyah & Lubis, 2016; Suhirman & Yusuf, 2019). Concerning science learning, students need thinking skills to understand the problems encountered in the environment, understand the processes that occur, and try to solve problems that arise. The orientation of 21st-century science education that focuses on empowering students' thinking abilities and skills is expected to equip students to solve the problems of their time. 21st-century science education which focuses on empowering students' thinking skills is expected to equip students in solving problems (Hidayatika et al., 2020; Nugraha et al., 2017).

Logical thinking ability is one of the thinking skills needed in the learning of science. According to Septiati (2016), thinking logically refers to the thinking ability to use certain logical principles to solve problems. Logical thinking can be interpreted as a student's ability to obtain knowledge and draw a conclusion about one matter (Surat, 2016). While Andriawan (2014), stated that logical thinking is the coherence of thinking, the ability to argue, and the ability to determine the truth about information are some indicators of logical thinking.

Empowerment of students' logical thinking skills is an important concern for natural science teachers in the process of learning. Implementation of various models of learning that enhance students' logical thinking skills and learning outcomes can be an alternative. Based on the previous study, the learning models that are reported can play this aim are Guided Inquiry Learning (Artayasa et al., 2017; Dewi et al., 2013; and Zubaidah et al., 2017), Discovery Learning (Nuroso et al., 2016), Problem-Based Learning (Suhirman & Yusuf, 2019; Sulastri et al., 2015), Direct Instruction (Sidik NH. & Winata, 2016), and Active Learning (Maisaroh & Rostrieningsih, 2010)

The inquiry learning model is a model of learning that accommodates the essence of natural science as knowledge and process. In the inquiry learning process, students are active in proposing questions, submitting hypotheses, collecting and analyzing data of research, developing argumentation on findings, and communicating conclusions (Abdurrahman, 2017). Referring to the essence of this learning model, it can be trusted that in the learning process students are trained to develop their cognitive abilities through the process of finding answers and solving problems systematically and independently (Ariyanto, 2017; Della Setiasih et al., 2016; Masitoh & Udiani et al., 2017). Thus, the acquisition of meaningful and long-term knowledge and experience can be achieved better.

The inquiry learning model that is appropriate to be applied at the junior high school level is the guided inquiry model because it is in conformity with students' characteristics in junior high school who have started to think analytically but still need teacher guidance. This learning model is used for students who have not experienced learning using the model of inquiry. At the initial stage of inquiry learning, students are given guidance, and gradually the guidance is reduced. If the intellectual ability of students is higher, so the stages of inquiry used are higher too (Artayasa et al., 2017).

Referring to the explanation above, it is really important to conduct the study that aims to enhance logical thinking skills and students' learning outcomes through guided inquiry learning models

## METHOD

This study is a quasi-experimental research with a non-equivalent pretest-posttest control group design. The control group was taught by conventional learning and the experimental group was taught by guided inquiry model. Both groups were given a pretest and a posttest. The design of the research is shown in Table 1.

**Table 1.** Quasi Experiment with *Non-equivalent Pretest-Posttest Control Group Design*

Group	Pretest	Treatment	Posttest
Experiment	X1	T1	Y1
Control	X0	T0	Y0

X1 = Pretest scores of the experimental group

X0 = Pretest scores of the control group

T1 = Guided Inquiry Learning

T0 = Conventional Learning

Y1 = Posttest scores of the experimental group

Y0 = Posttest scores of the control group

The population in this study were all students of seventh grade of Madrasah Tsanawiyah Miftahul Ishlah in Mataram. The cluster random sampling was a technique used to determine the sample in this research. A total of 39 students were selected as a sample which were divided into the experimental group and the control group. The instrument used is a subjective test with 5 questions that have been validated first by testing the content validity of biology learning experts. The test results showed that the test instrument used is valid and in line with the learning objectives. The data in this study were analyzed using MANCOVA with the SPSS windows release 23. Before the MANCOVA test, prerequisite tests were first carried out, namely the Shapiro-Wilk test for normality test and the Levenes test for homogeneity test.

## RESULTS AND DISCUSSION

Normality and homogeneity tests of the data were carried out before Mancova's analysis. The test shows that the results are significant which means that the data variance is homogeneous and normally distributed. The complete results of the analysis are shown in Table 2 and Table 3.

**Table 2.** Homogeneity Test

	F	df1	df2	Sig.
Learning Outcomes (LO)	1.339	1	37	.255
Logical Thinking (LT)	.342	1	37	.562

**Table 3.** Normality Test

	Learning Model	Shapiro-Wilk		
		Statistic	df	Sig.
Pretest LO	Conventional	.926	19	.149
	Guided inquiry	.938	20	.221
Pretest_LT	Conventional	.921	19	.116
	Guided inquiry	.929	20	.145
Posttest_LO	Conventional	.982	19	.967
	Guided inquiry	.925	20	.124
Posttest_LT	Conventional	.915	19	.090
	Guided inquiry	.914	20	.077

MANCOVA analysis showed that the significance value of the learning model is 0.000. That is the implementation of the guided inquiry has a significant effect on learning outcomes and students' logical thinking ability. The results of the analysis are revealed in Table 4.

**Tabel 4.** Analysis of Mancova

<b>Effect</b>	<b>Value</b>	<b>F</b>	<b>Sig.</b>
Intercept	.720	44.999	.000
Pretes	.666	34.956	.000
Treatment	.360	9.863	.000

In addition to the Mancova analysis, descriptively the corrected mean score of logical thinking ability and learning outcomes were calculated. The corrected mean score of the learning outcomes of the students taught using by guided inquiry learning model was 95% higher than the students learning outcomes taught by conventional learning. The corrected mean score of students' logical thinking ability in the guided inquiry learning model was 71% higher than the students in conventional learning.

The guided inquiry model encourages students to be actively involved in developing their knowledge and thinking skills so that they become more active, independent, and skilled in problem-solving (Iswatun et al., 2017). This is supported by the results of the study which showed that the learning outcomes and logical thinking skills of students taught by the guided inquiry were higher than students taught by conventional methods.

The difference in the corrected mean scores of students in learning with guided inquiry model and students in conventional learning is caused in the conventional model, learning is dominated by the teacher, which tends to result in one-way communication so that practical problem-solving activities and other activities become teacher-centered (Margunayasa et al., 2019). In this study, students' analytical abilities are not stimulated through various questions that allow students to find their own understanding. They are given direct explanations of the material, and as a result, students become more silent by only listening to the teacher's explanation (Amijaya et al., 2018). In other words, students do not get the facilities to develop their abilities, especially their ability to think. This is because conventional learning arranges more emphasis on mastery of learning material than thinking ability (Sutama et al., 2014). On the other hand, in classes with guided inquiry learning, students have the chance to be embroiled more actively than the teacher in the process of learning, so enhancing students' motivation and eventually improving their learning results (Dewi et al., 2013).

The exploration and development of students' knowledge and thinking skills are the main objectives of guided inquiry learning. To achieve this goal, in this learning model students are required to solve problems both together in groups and individually. In this case, the guided inquiry learning model is based on the philosophy of constructivism (Anggareni et al., 2013). This learning model allows students to solve problems with the guidance of the teacher. As a stimulus, the teacher asks questions about the material being studied and then guides students in group discussions. This activity encourages students to build their knowledge. According to Masitoh & Ariyanto (2017), through guided inquiry learning, students can be conditioned to think logically. Through observation activities, students are directed to be able to draw conclusions and find scientific concepts of knowledge. Thus, the knowledge acquired will last longer, because in the acquisition process, students involved directly.

According to Jayadinata & Gusrayani (2016), the learning syntax of guided inquiry, in general, can improve students' abilities, so that it can be an alternative learning model that can be applied to science subjects. Furthermore, Udiani et al., (2017) added that the guided inquiry learning model has the advantage of increasing students' thinking power, especially through finding and solving problems independently. This activity helps students understand the subject matter more easily and is stored in their memory longer (stored in long-term memory). Marheni et al., (2014) reported that the student's learning achievement increased

significantly in guided inquiry learning. Likewise, students' logical thinking ability (Purwanto, 2012). According to Suwanto et al (2017), students' logical thinking ability in guided inquiry learning are much better than students in conventional learning.

## CONCLUSION

The ability to think logically and student learning outcomes increased significantly through guided inquiry learning. The corrected mean score of students' logical thinking skills in guided inquiry learning is higher than in conventional learning, as well as their learning outcomes. The ability to think logically is 71% higher while learning outcomes are 95% higher.

## RECOMMENDATION

It is recommended that further research be carried out for other variables, especially related to the skills needed in the 4.0 industrial era, as well as in other subjects.

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