

# The Effect of Guided Inquiry Learning Model and Critical Thinking Skills on Learning Outcomes

Yusri Asdedi Rambe<sup>1\*</sup>, Albinus Silalahi<sup>2</sup>, Ajat Sudrajat<sup>3</sup>

<sup>1,2,3</sup>Department of Chemistry Education, State University of Medan, Medan, Indonesia

\*Corresponding author. Email: [yusriasdedi9@gmail.com](mailto:yusriasdedi9@gmail.com)

## ABSTRACT

Guided Inquiry is a series of learning that emphasizes the process of thinking critically and analytically to search and find out the answers of problems questioned. This study aims to show the effect of the Guided Inquiry learning model and critical thinking skills on student learning outcomes. The data analysis technique used the N Gain Score Test, Paired Sample t-test (not independent), and Linear Regression Analysis. The sample in this study was taken by purposive sampling. The results of this study indicate that: The value of N Gain is 0.494, so that the category is moderate or good. It can be concluded that the use or application of guided inquiry models is effective in improving student learning outcomes. With the t-test at a significance level of 0.05, it can be concluded that there are differences in students' critical thinking skills before and after being given a guided inquiry learning model. With Linear Regression Analysis at a significance level of 0.05, it can be concluded that the higher the students' critical thinking skills, the higher the learning outcomes will be. Based on these three conclusions, it can be stated that the Guided Inquiry learning model and critical thinking skills have a significant effect on student learning outcomes.

**Keywords:** Guided Inquiry, Critical Thinking Skills, Learning Outcomes

## 1. INTRODUCTION

Education is one way of cultivating the will, abilities, talents, and self-potential of students. With education, students can become more aware and responsive to the direction of change and development of science and technology [1]. Chemistry is a part of Natural Science that is obtained and developed based on experiments to find answers to the what, why, and how questions about natural phenomena, especially those related to the composition, structure, properties, transformation, dynamics, and energetics of substances. In addition to its role in understanding various natural phenomena, chemistry is also very helpful and contributes to the mastery of other basic sciences, such as biology, astronomy, geology, and applied sciences such as mining, agriculture, health, fisheries, and technology. In the 2013 Curriculum, Chemistry learning at the high school level is directed at owning the dimensions of knowledge and dimensions of cognitive processes. The knowledge dimension includes factual, conceptual, procedural, and metacognitive knowledge. The cognitive process dimensions include remembering, understanding, applying, analyzing, evaluating, and creating [2].

Based on the fact that the implementation of the learning process of teaching chemistry in the field shows that teachers in teaching chemical concepts and theories through teacher-centered activities, students are not actively involved in activities and do not provide opportunities to develop students' thinking processes. The facts found during interviews and observations with students showed that chemistry was a difficult subject because many concepts were abstract and the learning model used by the teacher was less attractive. The teacher has not linked the material taught with facts, examples, and experiences in everyday life. Students are only asked to study material that has not been taught by doing the questions themselves without being guided by the teacher. Also, there are still student learning outcomes under the KKM for four consecutive academic years. There is also a problem with chemistry teachers who are less able to explain material appropriately and use helpful models [3].

Chemistry learning should be carried out by scientific inquiry (scientific inquiry) to foster the ability to think, work and have a scientific attitude and communicate it as an important aspect of life skills. In chemistry learning, many real problems exist around students that can be related to the material being studied

in scientific disciplines. [4]. In the guided inquiry, the teacher directs students to a problem, while students try to solve the problem with teacher guidance. Furthermore, students will also be more confident in investigating and making conclusions, so that the process of mastery of subject matter can be improved [5]. Students need adequate guidance and teacher intervention in the inquiry learning process, which can help to gain deep understanding. With guided inquiry, students can certainly concentrate more on building new knowledge so that they get the understanding and skills needed. The inquiry model is applied in learning by encouraging students to be able to identify a problem related to learning material, solve problems by designing activities in groups, carrying out experiments, and the results in the form of reports on students' scientific work [6].

The use of guided inquiry learning models can improve student learning outcomes and student learning activities compared to conventional learning [7]. The various findings analyzed show positive and clear trends that support inquiry-based learning practices, particularly instruction that emphasizes students who actively think and draw conclusions from data [8]. Using the learning model of the level of inquiry can train students' skills with the maximum ability to sharpen their skills and skills to reach that level to achieve better or higher criteria. This is very necessary so that students are accustomed to exploring the potential in high-level thinking because with accustomed to high-level thinking, students will have high cognitive skills and independence in student learning [9].

Critical thinking is thinking rationally about something and then gathering as much information as possible about that something before making a decision or taking an action [4]. HOTS is a skill that does not only to remember but also to understand and apply. HOTS in the cognitive domain (based on the latest Bloom Taxonomy) includes analysis, evaluation, and creation. So students are not just remembering a formula, then understand it and apply the formula to a problem. However, the student can analyze (solve the problem into several parts, then determine the parts that relate to each other and the whole), evaluate (assess which includes checking and criticizing), and creation (making something from the existing) [10]. As current literature suggests, all students at all academic levels will benefit from curricula steeped in critical thinking strategies and practice. Students who master the ability to think critically and insightfully will perform better academically in their current high school setting, and will also be better prepared for the rigors and enhanced academic expectations in college [11]. To improve students' higher-order thinking skills, it is necessary to make various efforts, because students need to have higher-order thinking skills. The right teaching strategy

and a good learning environment facilitate growth such as student persistence, self-monitoring, open-mindedness, and flexibility. Teachers recognize the importance of having students who can develop higher skills, but often do not assess the progress of their students, so what happens is students' low-order thinking skills [12].

Based on some relevant research, it can be concluded that there is an influence of guided inquiry learning models and critical thinking skills on learning outcomes [13][14][15].

## 2. METHOD

This research was conducted at SMA Negeri 1 Rantau Selatan, Rantau Selatan District, Labuhanbatu Regency, which uses the 2013 curriculum. When the research was carried out in the odd semester which lasted from October to December 2019. The population in this study were all high school class XI students who used the curriculum 2013 academic year 2019/2020. Due to the wide range, limited manpower, time, and cost, the sampling in this study was carried out by purposive sampling, which consisted of two classes of high school class XI students in one school only (each class of 34 students), namely at SMA Negeri 1 Rantau Selatan. The research design can be seen in Table 1.

Data collection instruments, namely learning outcomes tests and tests to measure students' critical thinking skills. The instrument to measure student learning outcomes used multiple-choice tests (multiple choice) of 25 questions. Each correct answer is given a score of 1 (one), while the wrong answer is given a score of 0 (zero). This test is used to measure students' cognitive abilities (C1-C3). The test of critical thinking skills is measured using a test that was developed by the researcher with a description of the test as many as 10 aspects of the criteria C4, C5, and C6.

Hypothesis testing was carried out using SPSS version 21. Hypothesis testing used the N-Gain Score, Paired Sample t-Test (not independent), and Linear Regression Analysis. The N-Gain Score test is used to see the effect of the Guided Inquiry learning model on student learning outcomes. A paired sample t-test (not independent) was used to see if the Guided Inquiry learning model affected students' critical thinking skills. Linear regression analysis is used to see the effect of critical thinking skills on student learning outcomes.

**Table 1.** Research Design

Group	Pretest	Treatment (X)	Posttest
Experiment	O1	X	O2

### 3. RESULT AND DISCUSSION

#### 3.1. Result

##### 3.1.1. The Effect of Guided Inquiry Learning Model on Student Learning Outcomes

Hypothesis testing of the effect of the Guided Inquiry learning model on student learning outcomes on chemical equilibrium material in class XI SMA curriculum 2013 can be seen in table 2.

**Table 2.** Result of N-Gain Calculations

Test	Mean	Standard Deviation	N-gain
Pretest	55.058	77.294	0.4947
Posttest	14.474	12.714	

Based on table 2 it can be seen that the gain score is 0.4947. Based on the gain score distribution table, that if the value of 0.3 g 0.7 is moderate or good. It can be concluded that the use or application of guided inquiry models is effective in improving learning outcomes.

##### 3.1.2. The Effect of Guided Inquiry Learning Model on Critical Thinking Skills

Testing the research hypothesis, the effect of the Guided Inquiry learning model on students' critical thinking skills on chemical equilibrium material in class XI SMA curriculum 2013 was analyzed using paired sample t-test (not independent). The results of the t-test can be seen in Table 3.

**Table 3.** T test of Critical Thinking Skills

	Paired Differences			t	df	Sig. (2 tailed)
	Mean	Std. Deviation	Std. Error Mean			
KBK before Inquiry—KBK after Inquiry	4.765	2.425	0.416	11.45	33	0.00

Based on table 3 the obtained difference in Mean = 4.765, which means the difference in scores of students' critical thinking skills between after and before being treated with the inquiry learning model. The positive value means that after being treated with the inquiry learning model is higher than before being treated with the inquiry learning model. Furthermore, in this table, the mean std error is also obtained which shows the number of standard errors for the average difference. The statistical price  $t = 11.45$  with  $df = 33$  and the number sig or p-value =  $0.000 < 0.05$  or  $H_0$  is rejected. Thus it is concluded that there are significant differences in students' critical thinking skills between

after and before being treated with the inquiry learning model.

##### 3.1.3. The Effect of Critical Thinking Skills on Student Learning Outcomes

Hypothesis testing of the effect of critical thinking skills on student learning outcomes on chemical equilibrium material in class XI SMA curriculum 2013 was analyzed using Linear Regression analysis. The results of the linear regression analysis can be seen in Table 4.

**Table 4.** Result of LinearRegression Analysis

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df 1	df 2	Sig. F Change
0.956 <sup>a</sup>	0.419	0.911	3.792	0.914	338.953	1	32	0.001

Based on table 4 obtained a correlation coefficient  $(r_{xy}) = 0.956$  and  $F_{hit} (F_{change}) = 338.953$ , with a p-value =  $0.001 < 0.05$ . This means that  $H_0$  is rejected. Thus, the correlation coefficients X and Y are meaningful or significant. While the coefficient of determination from the table above is shown in the second column, namely R Square 0.419 which means that 41.90% of the variation in learning outcomes variables can be influenced by critical thinking skills.

#### 3.2. Discussion

The results of this study indicate that choosing the right learning model in schools is one of the factors that can affect learning outcomes. In general, the learning model can be an activity that is chosen to provide facilities or assistance to students towards achieving learning objectives. In chemistry learning, students are required to be able to construct their knowledge concepts, so that the implementation of learning with the concept of student-centered learning is created. The application of learning that demands an active role of students is highly recommended in learning, so that what students learn can be understood, applied, and even evaluated.

It is concluded that the guided inquiry learning model has a high influence on student learning outcomes. The results of this study are in line with [13] where the Guided Inquiry method gave a significant influence on student learning outcomes. The guided inquiry method requires students to be more active, able to seek and explore various information beyond the teacher's submission and make a new and complete concept of knowledge. Besides [16] also argues that there is a positive effect of guided inquiry learning based on scientific literacy on learning outcomes of the

subject matter of the buffer solution. The resulting positive influence can be caused by several factors that strengthen the learning process through the application of literacy-based guided inquiry models. The first factor, student learning activities. The second factor is the development of students' thinking skills in this case analytical thinking. The third factor is the use of various learning resources. Then [17] concluded that the guided inquiry learning model can improve student learning outcomes; the Science process skills of students who are taught using the guided inquiry learning model have better achievement than students who are taught using the problem-solving model. Another opinion of [18] also states that the guided inquiry green chemistry practicum guide is very feasible to use as a practicum guidebook, in which the result of the analysis to four practical guiding components is in the average value of 4.78.

The Guided Inquiry learning model is a model that can be constructive (building) for students to encourage students to investigate problems and find information about problems in the learning process. Therefore, learning equilibrium material with the Guided Inquiry model can improve students' critical thinking skills. The result of this study is in line with [14] who concluded that learning chemistry using an inquiry model on the subject of buffer solutions can improve students' mastery of concepts and students' critical thinking skills. There is a significant positive relationship between critical thinking skills and students' mastery of concepts in learning that applies the inquiry learning model. Also [19] concluded that Students' science process skills during disaggregated inquiry learning are grouped into good criteria and students' critical thinking skills after learning physics using the inquiry model are better than students' critical thinking skills after learning physics using the usual model in high school. Then [20] suggested that the Guided inquiry learning model in physics learning has a significant effect on students' critical thinking skills. Learning that involves student activities in problem-solving through posing problems, presenting hypotheses with experimental or experimental activities, and analyzing data can train students' critical thinking skills besides that the guided inquiry learning model can train intellectual skills, critical thinking, and be able to solve problems scientifically. The problem-solving process is associated with everyday problems so that students have the opportunity to learn to solve problems they face in everyday life and problems that come from real phenomena that result in students being involved in critical thinking behavior. This proves that learning using the Guided Inquiry model has a positive impact on mental development and student learning.

Thinking is a psychic activity that is intentional on a matter or problem and continues to try to solve it by connecting one problem to another, to get a solution. So,

by thinking critically, students will find it easier to solve a problem related to the learning material presented. The form of thinking process that is carried out by everyone in solving problems does not have to be the same but is adjusted to the problem at hand. This is in line with the result of research [15] which states that critical thinking skills with learning outcomes show a positive relationship. This means that if the value of critical thinking skills of students increases, it will be accompanied by an increase in the value of student learning outcomes. This is because critical thinking skills are related to higher-order cognitive abilities such as analytical, evaluation, and synthesis skills [21-22]. Furthermore [23] showed that there is an impact of the interaction between the use of learning models and student's critical thinking skills on the learning outcomes of Indonesian History subject. The selection of a suitable model becomes one of the most important things in the learning process to improve and optimize the ability that will affect student learning outcomes.

#### **4. CONCLUSION**

Based on the research results, it can be concluded that there is an effect of the guided inquiry learning model and critical thinking skills on student learning outcomes.

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