# The Effect of Guided Inquiry Learning Model on Student Learning Outcome on Chemical Equilibrium Material on High School XI Grade

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**Abstract**
This study aims to determine the effect of guided inquiry learning model on student learning out comes in hydrocarbon material classXI. This type of research is a quasi-experiment. The population in this study was the entire class XI MAN South Tapanuli. Sampling was done by random sampling. Class XI MIA 1 using guided inquiry learning model and class XI MIA 2 using conventional learning model. . The instrument used is a test of learning outcomes in the form ofmultiple choice consisting of 20 items. Obtained post-test results with an average of 71.71 experimental class and 61.43 control class. Based on the t-test obtained $t_h > t_t$ which is 3.969>1.997. Indicates the influence due to differences in student learning outcomes using guided inquiry learning models better than conventional learning models on the subject matter of chemical equilibrium class XI.

## 1. Introduction

Education is an educational effort to develop skills, not knowing by mastering something. According to KBBI, the process of changing attitudes and behaviour of a person or group is a mature direction through education and training. Law Number 20 of 2003 concerning the National Education System (Ashari, 2023). According to education, people are also trained to survive according to further developments in the era of rapid growth in technology and technology. Collaboration with the government, teachers, parents, students and various other parties is needed, so if the various parties have good cooperation, the goals of national education can be achieved with certainty.

Learning is more meaningful when students are allowed to be taught by teachers and to learn from the environment, and the concept of existing phenomena in the environment. According to Piaget, one of them is at the formal operational level. This means that children can think logically with formal theoretical thinking based on statements and hypotheses. To achieve these goals, teachers need to play a role when learning**.**

With the age of various fields, the implementation of education in all countries, especially Indonesia, must always be improved. Efforts to improve the quality of education in Indonesia are to optimise the implementation of the learning process. In schools, learning activities are one of the activities that cannot be separated from the role of teachers as intermediaries when providing materials to students. In developing students with various skills, teacher professionalism is needed to create an efficient and effective atmosphere in the teaching and learning process (Sarumaha & Harefa, 2022)

Chemistry is a subject taught in high school (Andini & Azizah, 2021). Chemistry emphasises that students learn concepts in a coherent, structured, and detailed manner. Chemistry covers various concepts, facts, and theories related to chemical calculations and reactions. This is very difficult for students to understand. Specifically, chemistry is in several main areas: analytical chemistry, organic chemistry, inorganic chemistry, physical chemistry, and biochemistry. Chemistry examines the properties of a substance and specifically examines the reactions that change a substance into a different substance. Chemistry includes guidelines for adapting the properties of existing materials, covering some special needs and applications, and creating entirely new materials designed from scratch to have specific desired properties. Through all these successes, chemistry has made tremendous contributions to improving agricultural products, controlling the spread of disease, increasing energy production, and reducing environmental pollution. Chemistry is part of the natural sciences (Asni et al., 2020).

Chemical equilibrium is a substance can react with other substances to create new substances. Reactions are generally referred to as chemical reactions that persist until the end. Chemical reactions can be maintained (irreversible) and can be described as reversible in both directions. Equilibrium reactions are written with alternating arrows. The concepts taught in chemical equilibrium materials include dynamic equilibrium, non-uniform and uniform equilibrium, equilibrium values, factors that affect movement towards equilibrium, quantitative relationships of equilibrium components in the industrial sector, and chemical equilibrium (Asmiyunda et al., 2018). The guided exam learning model is a learning model that motivates students. This learning model is a guided exam model, a learning approach that provides a framework, planning and implementation of thinking through student development and access to sources. effectively to build knowledge (Nahak & Bulu, 2020). This model is carefully planned, fully controlled, and instructional, and the teacher guides students through in-depth material. Guided exams are learning models that allow students to improve their learning outcomes by designing and finding material stored in their students' memories (Ulimaz, 2021). "Students play a role in guided surveys more dominant and students are more dominant while the teacher directs and guides students towards the right/correct direction. The purpose of this study was to determine the effect of the guided inquiry learning model on student learning outcomes in class XI.

## 2. Methods

This type of research is a quasi-experiment, which is research intended to determine whether or not there is an effect of something that is imposed on research subjects, namely students (Turrusda, 2023). Quasi-experimental research tries to examine whether or not there is a causal relationship. The method is to compare one or more experimental groups that are given treatment by comparing one or more comparison groups that are not given treatment (Satria & Basir, 2020).

This research was conducted at MAN South Tapanuli, which is located in Sipange village, Sayurmatinggi sub-district, South Tapanuli district, North Sumatra province, and the

implementation time was in semester on 2023/2024 semester with chemical equilibrium material. The population in this study was all grade XI students of MAN South Tapanuli, with a total of 200 students. The sampling technique was carried out by random sampling of as many as 2 classes (Zaman & Bulut, 2023). The first class, as the experimental class, applied the guided inquiry learning model, namely class XI MIA 1 and the second class, as the control class, applied the conventional learning model, namely class XI MIA 2. The analysis technique uses the t-test method to see the results of its influence.

## 3. Results and Discussions

Data on pretest results obtained from experimental and control classes can be seen in Table 1 for experimental class and Table 1 for control class and to see in detail the frequency distribution of pretest data of experimental and control class students can be visualised in a bar chart of pretest results of experimental and control class students (Figure 1. and Table 1).

**Table 1.** *Experimental Class Pretest Data*

| No. | Value | Frequency |
|---|---|---|
| 1 | 10 | 1 |
| 2 | 15 | 3 |
| 3 | 20 | 4 |
| 4 | 25 | 8 |
| 5 | 30 | 7 |
| 6 | 35 | 5 |
| 7 | 40 | 3 |
| 8 | 45 | 3 |
| 9 | 50 | 1 |
| Frequency Count | | 35 |
| Average | | 29,29 |
| Standard Deviation | | 9,64 |

The experimental class pretest score data in the bar chart can be shown in Figure.1
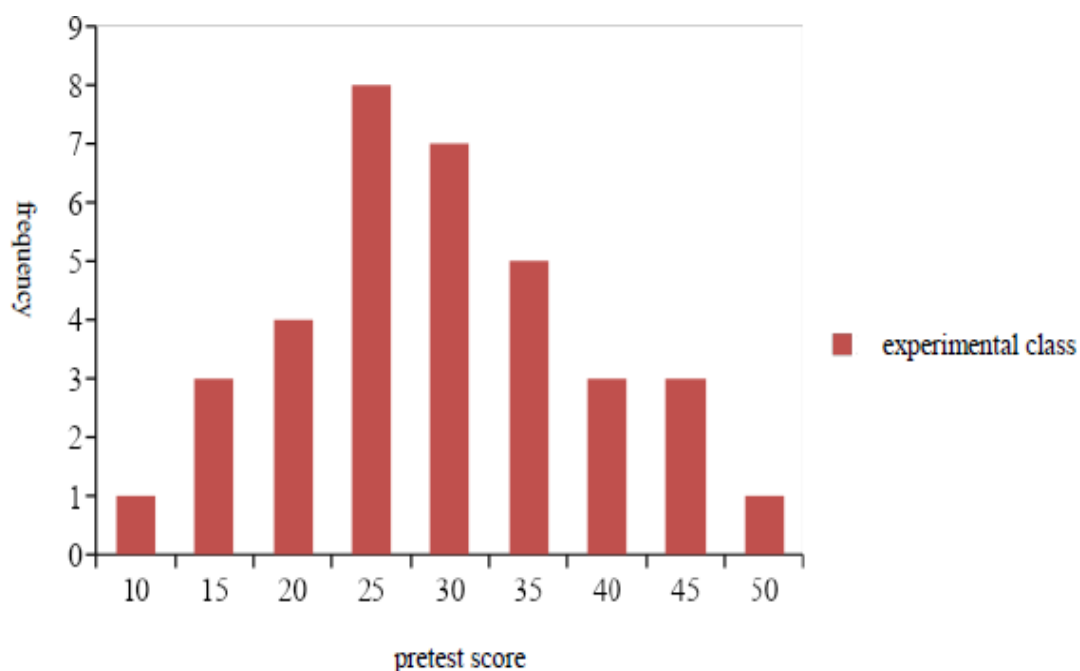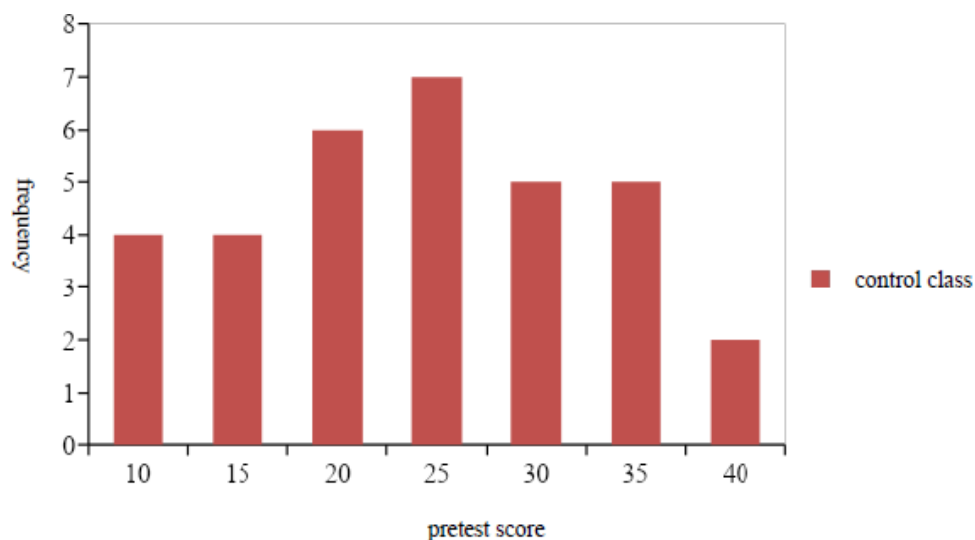


**Figure1.** Experimental pretest score

The control class pretest data obtained is then arranged in the form of tables and diagrams, as in Table 2 below.

**Table 2.** *Control Class Pretest Data*

| No. | Value | Frequency |
|-----|-------|-----------|
| 1 | 10 | 4 |
| 2 | 15 | 4 |
| 3 | 20 | 6 |
| 4 | 25 | 7 |
| 5 | 30 | 5 |
| 6 | 35 | 5 |
| 7 | 40 | 2 |
| 8 | 50 | 2 |
| Frequency Count | | 35 |
| Average | | 25,71 |
| Standard Deviation | | 10,51 |

The experimental class's pretest score data in the bar chart can be shown in Figure 2.

**Figure 2.** *Control pretest score*

Data on post-test results obtained from experimental and control classes can be seen in Table 3 for experiments and Table 3 for controls. and to see in detail the frequency distribution of post-test data of experimental and control class students can be visualised in a bar chart of post-test results of experimental and control class students.

**Table 3.** Experimental Class Postest Data

| No. | Value | Frequency |
|---|---|---|
| 1 | 45 | 1 |
| 2 | 50 | 1 |
| 3 | 55 | 2 |
| 4 | 60 | 4 |
| 5 | 65 | 4 |
| 6 | 70 | 5 |
| 7 | 75 | 6 |
| 8 | 80 | 5 |
| 9 | 85 | 5 |
| 10 | 90 | 2 |
| | Frequency Count | 35 |
| | Average | 71,71 |
| | Standard Deviation | 11,43 |

The results of the experimental class posttest score data in a bar chart can be shown in Figure3.
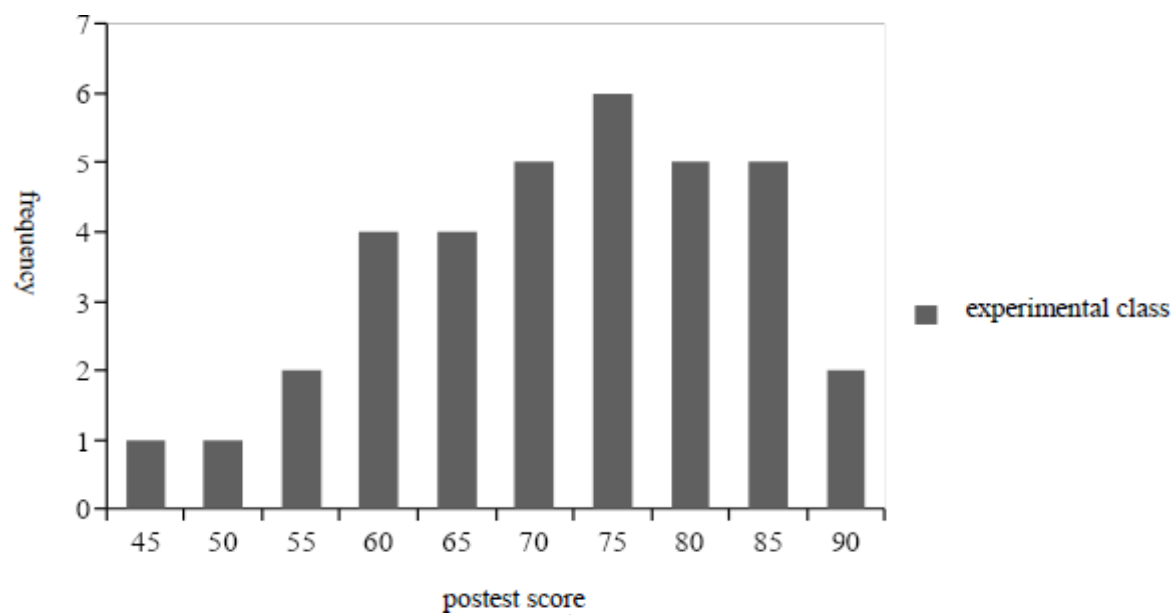


**Figure 3.** Experiment Class Posttest score

The control class posttest data were obtained the arranged in the form of a table and diagram in Table 4.

**Table 4.** Experimental Class Postest Data

| No. | Value | Frequency |
|-----|-------|-----------|
| 1 | 45 | 3 |
| 2 | 50 | 4 |
| 3 | 55 | 6 |
| 4 | 60 | 7 |
| 5 | 65 | 5 |
| 6 | 70 | 5 |
| 7 | 75 | 3 |
| 8 | 80 | 1 |
| 9 | 85 | 1 |
| Frequency Count | | 35 |
| Average | | 61,43 |
| Standard Deviation | | 10,11 |

The results of the control class pos- test data in a bar chart can be shown in Figure 4.
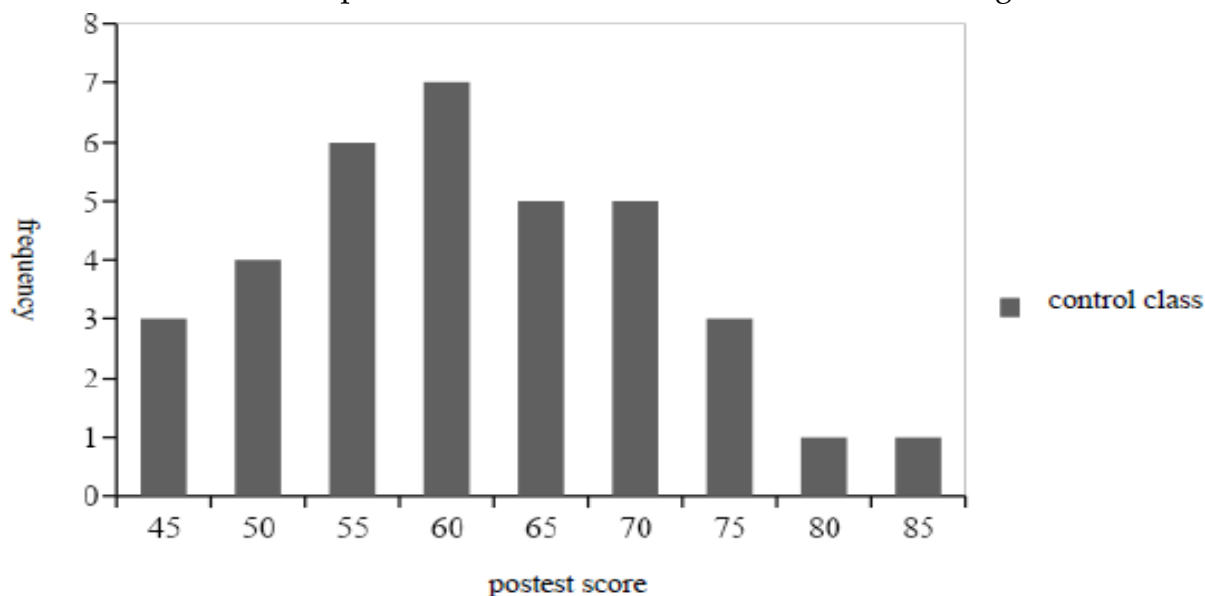


**Figure 4.** Control Class Posttest score

This is based on the results showing differences in the application of the guided test learning model compiled by potential teachers to learn to improve student learning outcomes on the topic of chemical equilibrium. This is enhanced by the difference in learning outcomes between the test

and control classes. The average student in the test class - the planned score is 29.29, with an average posttest of 71.71, while the average student's protest score in the control class is 25.71. The average light for students before the test is 25.71, and the average after the test is 61.43. The posttest value of the experimental class is 77.3, and the control class is 63.2, while the current researcher obtained an average posttest value of the experimental class of 71.71 and the control class of 61.43. The average value of learning outcomes obtained by previous researchers is higher than the current study because previous researchers used Macromedia Flash media as a learning support in the classroom.

This is based on the results showing differences in the application of the guided test learning model compiled by potential teachers to learn to improve student learning outcomes on the topic of chemical balance. This is enhanced by the difference in learning outcomes between the test and control classes. The average student in the test class - the planned score is 29.29, with a posttest average of 71.71, while the average student's protest score in the control class is 25.71. The average light for students before the test is 25.71, and the average after the test is 61.43. The posttest value for the test class is 77.3 and the control class 63.2, but the current researchers control the average letter grade and class 61.43 for the experimental class 71.71. The average learning outcomes achieved by previous researchers are higher than this study. This is because the former researcher uses Macromedia Flash media to support learning in the classroom. The role of the teacher is very closely related to the success of student learning. Low creativity of teachers in learning is specifically achieved through affected actions and only doing tasks. Direct impact on students' educational quality and achievement.

The Inquiry Learning Model is a learning model that includes student skills directly in the learning process, with learning activities that are completely designed for students. In other words, the exam model places students as learning targets. One of the learning models used to activate students is the inquiry model. The Inquiry Learning Model is a discovery learning model that aims to improve students' analytical, critical and intellectual skills to reduce students' dependence on teachers (Firayanti et al., 2023). The Guided Inquiry Learning Model is a learning model with a problem to be solved by students. Then students are guided to find the best way to solve the problems that have been given (Rasid et al, 2020).

Based on the learning activities that support this research, where the explanation is there. Students cannot create inductive concepts 32.35%, cannot identify data on 38.24% important concepts, and cannot extract 32.35%.

Chemistry is part of the natural sciences taught in high school. Chemical equilibrium is a chemical that is taught in Grade XI. Also, because it is a complex and abstract material, students find it difficult to learn and experience misunderstandings with the concept of equilibrium. In addition, it is difficult for teachers to convey the concept of equilibrium response (Bernal-Ballen et al., 2019). The chemical equilibrium lesson includes facts, concepts, and procedural knowledge that students must learn to include the concept of irreversible and reversible reactions which are the basis for students to understand dynamic equilibrium responses (Safarina et al., 2022). Asking for a learning model is one form of student learning. Inquiry learning can improve the quality of the learning process, student learning outcomes, and critical thinking. The advantages of the guided exam model 11 include the first. Students as subjects of study. In the learning process, students not only act as recipients of lessons through the teacher's verbal explanation, but also play a role in finding the core of the lesson topic itself. This is also in line with several studies that enhance research results that using learning models for guided exams can increase positive responses to teacher activities, student activities, science skills, learning outcomes, and student response rates. Guided question learning can give students direct experience with the material they have learned to study (Trisnowati, A., et al., 2020). The guided learning model for guided exams gives students the opportunity to actively participate, find and use learning resources, and

gain more meaningful experiences with what they learn in their heads (Neka, K., 2015). This has a positive effect on student learning outcomes. By studying, guided exams reduce the frequency of guidance. Thus, students can become good investigators and their scientific knowledge can be fulfilled.

From the results of research, student learning activities on the material can increase with the application of the guided inquiry model. A strengthening in their journal stated that using the guided inquiry learning model on chemical equilibrium material can improve teacher activity, activity, scientific attitudes, understanding of concepts and student responses. Students are allowed to solve problems faced individually or in groups to exchange information. Guided inquiry is a learning model in which the teacher provides extensive guidance or instructions to students. To gain experience from the concepts and principles of the students themselves (Agustinus Elath et al, 2022) and (Suparmi, 2019).

The Inquiry-Based Learning model influences student learning outcomes in the subjects of rotational dynamics and equilibrium of rigid bodies. The effect of the model also shows that the learning process becomes more active, and students play an important role during the learning process (Elbi, 2024). Some previous studies have shown that learning with the guided inquiry model provides better learning outcomes. The application of the guided inquiry learning model has a better effect than the conventional learning model on student chemistry learning outcomes (Asni, 2020; Azizah, 2023). The application of guided inquiry-based chemistry practicum can increase student motivation and learning outcomes because this method relies on the process of full involvement of students to find their concepts of the material that has been taught so that it can encourage students to be able to apply it in everyday life and can have an effect on improving student learning outcomes (Utami, 2024). Based on the results of this study, it can be concluded that using the guided inquiry learning model in chemistry subjects on the material of equalising redox reactions can improve the activities and learning outcomes of students of class XII MIPA. Based on the results of the questionnaire of students' responses to learning, this learning model can be applied in the next lesson but varied with other models or with the addition of media (Meriyenti, 2022). The inquiry learning model is one of the learning models where the teacher is a facilitator while students actively carry out activities in order to develop their curiosity. According to (Straits & Wilke, 2020) the model of guided inquiry learning is a learning model whose role is very important in building and improving the constructivistic learning paradigm that leads to active learning of students.

## 5. Conclusions

The conclusion of this research is based on the findings of the research data, and the systematic presentation is carried out by paying attention to the formulated research objectives. Student learning outcomes with the application of the guided inquiry learning model class XI MIA1 before being given treatment average pretest score 29.29 and after being given treatment average posttest score 71.71, passing the KKM limit. Student learning outcomes with the application of conventional learning models in class XI MIA 2, before being treated with an average pretest score of 25.71and after being treated with an average posttest score of 61.43, did not pass the KKM limit. Student learning outcomes with the application of guided inquiry learning models are better than conventional learning models in class IX. These results indicate the effect of applying the guided inquiry learning model on student learning outcomes.

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