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The influence of guided inquiry learning models on science process skills and student learning outcomes on chemical equilibrium material

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ABSTRACT

This study aims to determine the effect of the guided inquiry model on improving science process skills and learning outcomes of its correlation in chemistry. This research was conducted at SMA Negeri 1 Siantar Narumonda. The sample in this study consisted of two classes, each of which consisted of 30 students who were taught using guided and conventional inquiry learning models. The instruments used were multiple choice tests (Learning Outcomes), essay tests (Science Process Skills), student worksheets, and observation sheets on the implementation of science process skills. The results of the analysis obtained that the average gain of student learning outcomes who were taught using the guided inquiry learning model (0.789) was different from the conventional model (0.698) and the average gain of science process skills using the guided inquiry model (0.858) was different from the use of conventional learning models (0.789). Hypothesis testing using a two-party t-test for student learning outcomes and science process skills was obtained at 4.465 > 2.00172 and 7.051 > 2.0172. Thus, it was found that there was an influence of the guided inquiry learning model on student learning outcomes and science process skills. The correlation test showed that there was a correlation between learning outcomes and students' science process skills with an r count of 0.525 > 0.361 with a contribution of 27%.

1. Introduction

The purpose of education is to improve human resources (Asmaningrum, 2018). To achieve these educational goals, the government seeks to improve the quality of education in Indonesia by making changes to the curriculum following the times. The 2013 curriculum is a new paradigm that is expected to provide a more learner-centered education. This means that students play an active role in learning activities and the teacher only acts as a facilitator and mediator. The 2013 curriculum learning activities include several activities, namely observing, asking questions, gathering information, associating, and communicating (Nisa et al. 2022).

Chemistry is a science that seeks answers to the what, why, and how of natural phenomena related to the composition, structure and properties, changes, dynamics, and energetics of matter. There are two things related to chemistry that are inseparable, namely chemistry as a product of

scientists' findings, namely chemical knowledge in the form of facts, concepts, principles, laws, and theories, and process chemistry, namely scientific work (Priyambodo & Khaizuron, 2020).

Chemical equilibrium material is material delivered in class XI of odd semester high school with distinctive features microscopic (Juriyah, 2016). The chemical equilibrium material explains about reversible and irreversible reactions and factors affecting equilibrium. Changes that occur in the equilibrium state in a reaction are at the submicroscopic (molecular) making it difficult to observe with the naked eye (macroscopic level) (Hidayati & Yonata, 2019). In addition, this chemical equilibrium matter has a lot to do with everyday life. Thus, in chemistry learning, it is necessary to be trained in science process skills to solve problems, so that students can solve problems in daily life creatively according to their abilities (Saputri & Nasruddin, 2018).

Science process skills (KPS) are the development of intellectual, social, and physical skills that come from basic abilities in students (Andromeda et al. 2019). According to Ngoh in Derilo (2019), every student is required to have adequate science process skills so that students complete scientific investigations. In improving students' science process skills, one of the effective learning models is the guided inquiry model. Inquiry learning is designed to bring students directly into the scientific process in a relatively short time (Juniar et al. 2017a). Schelenker's research results in Juniar (2017b) show that guided inquiry-based learning can increase scientific understanding, and be productive in creative thinking, students become skilled in obtaining and analyzing information. Guided inquiry learning provides more opportunities for students to learn directly. In addition, students have the opportunity to practice the process of developing scientific thinking skills, so this learning model can be a solution to improving science process skills and student learning outcomes with direct learning experiences (Jufri, 2013).

This study aims to (1) determine the effect of the guided inquiry model on improving students' science process skills on chemical equilibrium material, (2) determine the effect of the guided inquiry model on improving student learning outcomes on chemical equilibrium material, and (3) determine the correlation of science process skills. Students with student learning outcomes using guided inquiry learning models on chemical equilibrium material.

2. Method

The population in this study were all students of class XI semester 1 of SMA Negeri 1 Siantar Narumonda T.P 2021-2022 which consisted of 60 people. Sampling used a cluster random sampling technique, namely XI MIPA 2 as a control class with a conventional model and XI MIPA 1 as an experimental class with a guided inquiry learning model. The research design used in this study was the Pretest-Postest Control Group Design. Valid test instruments were used to measure students' learning outcomes and science process skills by giving pretests before learning and posttest after learning. To test whether the hypothesis is accepted or rejected, the test used in this study is the two-party t-test and the Product Moment correlation test.

3. Results and Discussion

3.1. Learning Outcomes

In this study, there are two tests to get student learning outcomes, namely the test before learning and after learning. The following graph describes student learning outcomes for control and experimental classes can be seen in the Figure 1. The value of learning outcomes and science process skills analyzed is the gain value of the two classes obtained from the test results given after the end of treatment from both classes. In Figure 1 it can be seen that the average increase in

learning outcomes in the experimental class is 0.789 (very high) which is higher than the control class, which is 0.698 (high). After that, a two-party t-test was carried out with a significance level = 0.05 so that the t-count was 4.465 and the t-table was 2.0017.

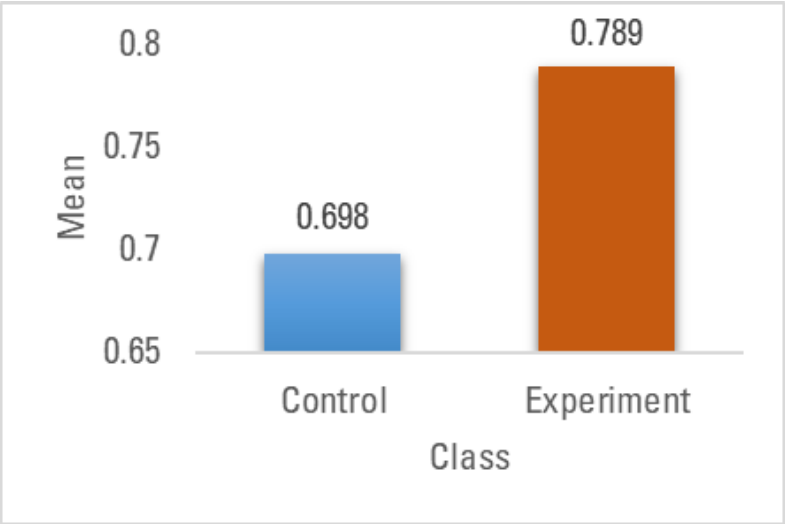

Figure 1. Graph of Average Student Learning Outcomes

The guided inquiry learning model can develop student learning methods by investigating directly so that the results obtained will be long-lasting in memory (Asni et al. 2020). The high gain value of experimental class students who were given the guided inquiry learning model because students were allowed to think for themselves, be active, and help each other to improve their learning outcomes. Students become more active in learning because learning is student-centered (Juniar et al. 2019a; Asni et al. 2020). Students are allowed to find and collect basic concepts through practical activities so that students can formulate answers based on the problems given and prove them through experimental activities carried out (Juniar & Fardilah, 2019; Pakpahan et al. 2021; Silaen & Silaban, 2022; Mawaddah & Silaban, 2022).

3.2. Science Process Skills

In this study, there are 2 tests to get students' science process skills, namely the test before learning and after learning. The following graph describes student learning outcomes for control and experimental classes can be seen in Figure 2.

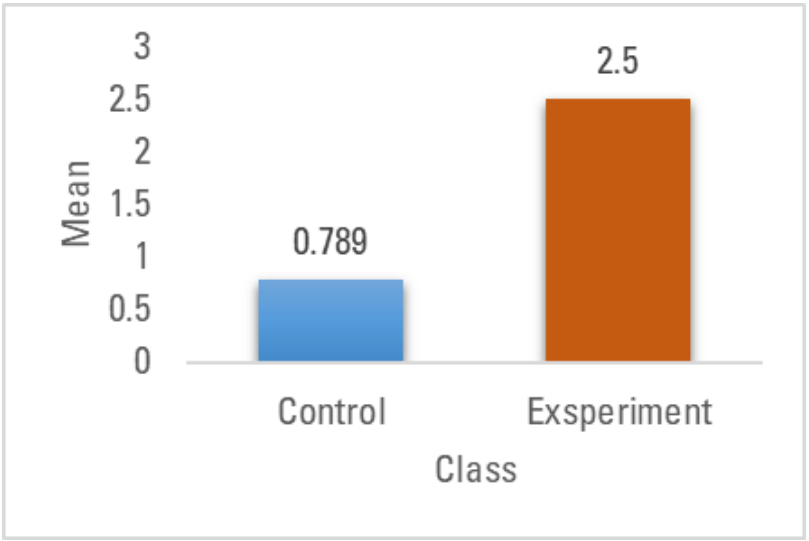

Figure 2. Graph of Science Process Skills

From Figure 2, the average increase in science process skills in the experimental class is 0.858 (very high) which is higher than the control class of 0.789 (very high). The high average value of students' science process skills in the experimental class is because students are allowed to gain hands-on learning experiences, as well as train students in solving problems and making decisions. Students are allowed to work together in groups so that it is easy to collaborate during practicum which can provide benefits in improving students' science process skills (Juniar et al. 2020). The results of this study were also reinforced by Emda (2017) who said that conducting experiments or practicums could increase learning motivation, and encourage curiosity so that it would encourage for students to find knowledge through exploration. The science process skills of students taught by the Guided Inquiry model are better than the direct learning model with practicum-based treatment (Abungu et al. 2014).

To find out the correlation between student learning outcomes and students' science process skills with the guided inquiry learning model using a correlation test, which means there is a correlation between science process skills and student learning outcomes using the guided inquiry learning model on chemical equilibrium material with a contribution of 27%. This is reinforced by research by Rialdi & Juniar (2020) which states that there is a correlation between student learning outcomes and students' science process skills taught by the guided inquiry learning model with the contribution of learning outcomes to science process skills by 65%. Saidaturrahmi et al. (2019) said that the relationship between science process skills and learning outcomes is influenced by a guided inquiry learning model because students in the learning process work independently so that the science process skills that exist in students can develop the potential that exists in them.

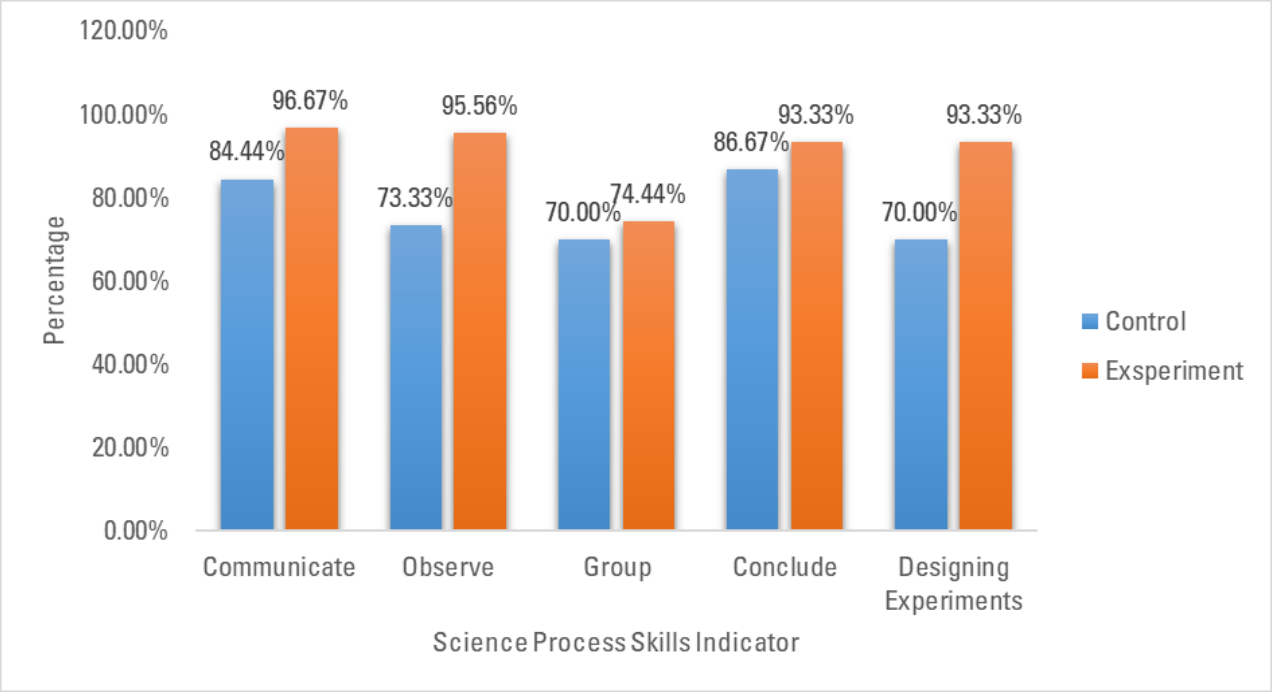

Figure 3. Differences in the Percentage of Science Process Skills from the Aspect

In Figure 3, it can be seen that the percentage of science process skills using the guided inquiry learning model is 90.7% with excellent criteria because 85 KPS are 100 percent, while the conventional model is 76.9 with good criteria because 70 KPS are 85 percent. Technically, fostering students' intentions and desires to learn through the implementation of the practicum is a guided inquiry learning model because the syntax of the two models is different to provide different learning experiences. The results of this study are strengthened by research conducted by Juniar et al. (2021),

namely the high improvement of student skills in classes taught by a guided inquiry learning model because students work together in groups so that student skills are trained during practicum.

4. Conclusion

The conclusion obtained in this study is: There is an effect of the guided inquiry model on improving students' science process skills on chemical equilibrium material with t table > t arithmetic obtained by 7.051 > 2.00172. There is an effect of the guided inquiry model on improving students' student learning outcomes on chemical equilibrium material with t table > t arithmetic obtained 4,465 > 2,0172. There is a correlation between science process skills and student learning outcomes using the guided inquiry learning model on chemical equilibrium material with r arithmetic of 0.525 with a contribution of 27%.

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