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The Effect of Guided Inquiry Learning Model in Improving Science Process Skills and Students' Learning Outcomes on Thermochemical Materials

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Abstract: The Effect of Guided Inquiry Learning Model in Improving Science Process Skills and Students Learning Outcomes on Thermochemical Materials. This research was conducted to determine the effect of the guided inquiry learning model in improving science process skills and student learning outcomes and the correlation between learning outcomes and students' science process skills using the guided inquiry learning model. This research was conducted at SMA Negeri 1 Pakkat, Humbang Hasundutan Regency in September-December 2021. This study consisted of an experimental class using the Guided Inquiry learning model and a control class using the Direct Instruction learning model. The data was processed descriptively and analyzed quantitatively using SPSS 20 for windows. The pretest data on learning outcomes in the experimental class was 29.28 and the control class was 29.71 and it was known that the average SPS value of the experimental students was 20.8 and the control class was 20.28. From the posttest data, the average value of the experimental class students' learning outcomes was 86.14 and the control class was 76. For the SPS, the experimental class students averaged 78.85 and the control class average was 71.64. Based on data analysis, it was found that the percentage of implementation of Science Process Skills with the Guided Inquiry learning model was "very good" because 85 Percentage of Science Process Skills < 100 and Direct Instruction model "good" because 70 Percentage of Science Process Skills < 85. It can be concluded that the learning model Guided inquiry is able to improve learning outcomes and Science Process Skills compared to the Direct Instruction model. Then from the Product Moment Correlation test with a significance level of 0.05, a correlation of 0.878 was obtained, so that there was a relationship between student learning outcomes and SPS. The contribution of learning outcomes to the increase in SPS is 75%.

Keywords: Guided Inquiry, Direct Instruction, Learning Outcomes, Science Process Skills

***Abstrak**: **Pengaruh Model Pembelajaran Inkuiri Terbimbing dalam Meningkatkan Keterampilan Proses Sains dan Hasil Belajar Siswa pada Materi Termokim.** Penelitian ini dilakukan untuk mengetahui pengaruh model pembelajaran inkuiri terbimbing dalam meningkatkan keterampilan proses sains dan hasil belajar siswa dan korelasi antara hasil belajar dan keterampilan proses sains siswa dengan menggunakan model pembelajaran inkuiri terbimbing. Penelitian ini dilaksanakan di SMA Negeri 1 Pakkat, Kabupaten Humbang Hasundutan bulan November-Desember Tahun 2021. Penelitian ini terdiri atas kelas eksperimen menggunakan model pembelajaran Inkuiri Terbimbing dan dan kelas kontrol menggunakan model pembelajaran Direct Instruction. Data diolah secara deskriptif dan dianalisis secara kuantitatif dengan menggunakan SPSS 20 for windows. Data pretest hasil belajar pada kelas eksperimen 29,28 dan kelas kontrol 29,71 dan diketahui rata-rata nilai KPS siswa eksperimen 20,8 dan kelas kontrol 20,28. Dari data posttest diperoleh rata-rata nilai hasil belajar siswa kelas eksperimen sebesar 86,14 dan kelas kontrol sebesar 76. Untuk KPS didapat rata-rata siswa kelas eksperimen sebesar 78,85 dan rata-rata kelas kontrol sebesar 71,64. Berdasarkan analisis data*

diperoleh bahwa persentase keterlaksanaan Keterampilan Proses Sains dengan model pembelajaran Inkuiri Terbimbing "sangat baik" karena 85 ≤ Persentase Keterampilan Proses Sains < 100 dan model Direct Instruction "baik" karena 70 ≤ Persentase Keterampilan Proses Sains < 85. Dapat disimpulkan bahwa model pembelajaran inkuiri terbimbing mampu meningkatkan hasil belajar dan Keterampilan Proses Sains dibandingkan dengan model Direct Instruction. Kemudian dari uji Korelasi Product Moment dengan taraf signifikansi 0,05 diperoleh korelasi sebesar 0,878, sehingga ada hubungan antara hasil belajar siswa dengan KPS. Kontribusi hasil belajar terhadap peningkatan KPS sebesar 75%.

Kata Kunci: Inkuiri Terbimbing, Pengajaran Langsung, Hasil Belajar, Keterampilan Proses Sains

▪ INTRODUCTION

Education in Indonesia when compared to other countries around it is still of low quality. One of the efforts made to improve the quality of education in Indonesia is to continue to reform the education system, namely by reforming and updating the curriculum on an ongoing basis starting from the 1968 curriculum to the 2013 curriculum (Muliawati et al., 2016). The 2013 curriculum is a curriculum that prioritizes understanding, skills, and character education, students are required to understand the material, be active in discussions and presentations and have high disciplinary manners (Aqdwirida, 2016).

Chemistry is a compulsory subject for MIA classes in high school. One of the chemicals in class XI is thermochemistry (Erna et al., 2018). Thermochemistry is the study of energy changes in a chemical reaction (Limatahu et al., 2019). This material contains concepts and calculations that require students' understanding in solving problems (Erna et al., 2018). Students tend to only calculate problems and use formulations without understanding thermochemistry and connecting these concepts to real life. This causes the low quality of chemistry learning. One way to improve the quality of chemistry learning that can be realized is through the success of students in obtaining good learning outcomes. In addition, chemistry learning is currently still prioritizing the product, not the process. In fact, the point is, mastering a good process will produce a good product. Good mastery can be realized through science process skills (Juniar & Fardilah, 2019).

Science process skills (SPS) are the development of physical and mental skills that originate from a person's basic abilities. Process skills are ideal to be developed in chemistry learning, this is because process skills reflect the nature of science, namely as a process and a product. However, very few teachers develop these science process skills. These science process skills take a longer time than learning that is oriented to the cognitive domain only, which is one of the reasons why teachers ignore these science process skills (Sihaloho et al., 2021). Science process skills include cognitive or intellectual skills, procedural, social and communicative competencies. Meanwhile, the skills developed in integrated skills are observing, classifying, interpreting, predicting, asking questions, hypothesizing, planning experiments, using tools/materials, applying concepts and communicating (Juniar et al., 2018).

The guided inquiry learning model is relevant to the psychology of elementary and middle school students, because in the process of finding their own concepts, students still receive guidance and guidance from teachers through key questions at the stage of concept formation during the learning process (Sutiani & Fayaddah, 2021). Guided inquiry learning is applied to students in such a way that they are independent in

developing the concepts they learn, not only as recorded and memorized material. In addition, the Guided Inquiry model can improve conceptual understanding and learning motivation because students are actively involved in conducting investigations. This investigation has learning stages that can be used to train science process skills (Juniar & Fardilah, 2019). (Limatahu et al., 2019)

Research on the guided inquiry learning model has been widely carried out which states that there is a significant effect between the use of the guided inquiry model on improving student learning outcomes and SPS (Fitriyani, 2017;Limatahu et al., 2019; Juniar & Fardilah, 2019; Malau & Juniar, 2020; Sukarni et al., 2019), there are differences in students' science process skills taught using a guided inquiry learning model with a structured inquiry learning model on thermochemical material.

This study aims to: (1) determine the effect of the guided inquiry learning model in improving students' science process skills. (2) knowing the effect of guided inquiry learning model in improving student learning outcomes. (3) knowing the correlation between learning outcomes using the guided inquiry learning model with Science Process Skills on Thermochemical material.

▪ METHOD

This research was conducted on all students of class XI IPA SMA Negeri 1 Pakkat for the Academic Year 2021/2022 as many as 2 classes, each class consisting of 35 students. The first class is used as an experimental class which will be taught using a guided inquiry model and the second class is used as a control class which will be taught using *direct instruction.*

The instruments used in this study consisted of test and non-test instruments. The test instrument was to measure student learning outcomes and science process skills, while the non-test instrument was an observation sheet for students' science process skills during practicum. The instrument used has gone through a validation test. The instrument validation test includes validity test, reliability test, differentiating power of test items and test difficulty level of the test. Analysis of the data used in this study were descriptive statistical analysis (mean, median, mode, standard deviation, variance) and inferential statistics (prerequisite test and hypothesis testing). The prerequisite tests carried out were the normality test of the data distribution and the homogeneity of variance test. The normality test of data distribution was carried out to find out whether the data came from a normally distributed population or not by using the SPSS 20 *for windows* (Nuryadi. et al., 2017).

▪ RESULT AND DISCUSSION

The average difference between the pretest and posttest scores of the experimental class and the control class is depicted in Figure 1 below

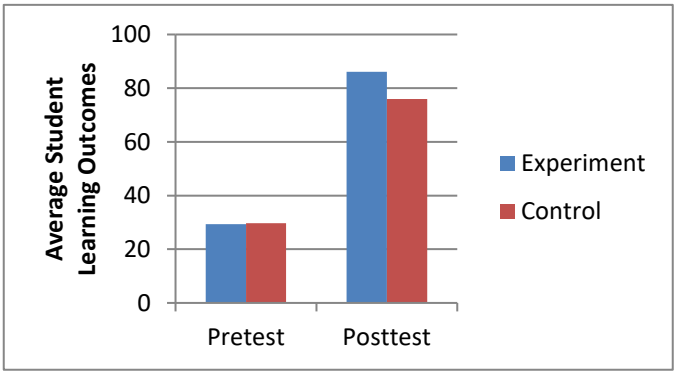


Figure 1. Graph of Average Student Learning Outcomes

Pretest in the experimental class (in the guided inquiry model) it is known that the average learning outcome is 29.28 and the control class is 29.71 and it is known that the average SPS value of the experimental students is 20.8 and the control class is 20.28. Pretest results show that both classes have the same ability before being given treatment. From the posttest data, the average value of the experimental class students' learning outcomes was 86.14 and the control class was 76. For the SPS, the experimental class students averaged 78.85 and the control class average was 71.64.

The experimental class has a higher gain than the control class because the experimental class uses a guided inquiry learning model, while the control class uses a *direct instruction*. The use of the guided inquiry model provides opportunities for students to think, be active and help each other with other students to exchange ideas and develop their understanding (Sayani & Sutiani, 2020). Teachers must be able to help understand the nature of science and scientific literacy by using various methods in the classroom such as the inquiry model (Priyasmika & Yuliana, 2019). This provides good benefits for improving student learning outcomes. Previous research conducted by (Juniar, Silalahi, & Suyanti, 2020), stated that the learning outcomes taught by the application of the guided inquiry model increased from the pretest and posttest scores. This shows that the guided inquiry model is very influential in improving student learning outcomes.

The difference in the percentage of the average *gain* the experimental and control classes can be illustrated in Figure 2 below

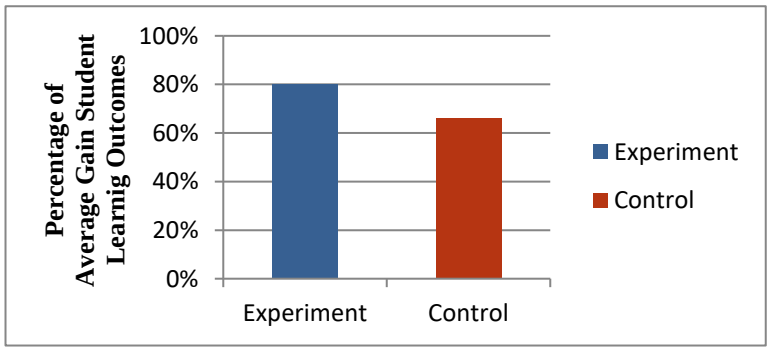


Figure 2. Graph of Average Gain Student Learning Outcomes

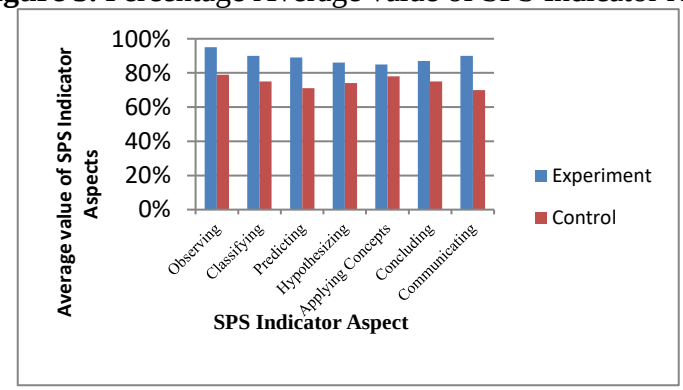
From the data *gain* results In learning, the average *gain* of experimental class students is 0.80 in the high category while the control class is 0.66 in the medium category and the *Sig (2-tailed)* 0.000 (0.000 < 0.05) so that Ho is rejected and Ha is accepted. which means that there is a significant influence between the guided inquiry learning model on improving student learning outcomes.

Based on the results of the research hypothesis testing conducted (Saidaturrahmi et al., 2019), it was found that the guided inquiry learning model had an effect on students' thermochemistry SPS. This study shows the differences in the data *gain* SPS obtained in the class that is taught by guided inquiry with the class using the *Direct Instruction*, the average data *gain* of the experimental class students is 0.73 in the high category and the control class is 0.64 in the medium category. and the *Sig (2-tailed)* of 0.000 (0.000 < 0.05) so that there is a significant influence between guided inquiry learning on the improvement of students' science process skills.

SPS needs to be developed with direct experience, as a learning experience, and based on when the activity is in progress (Solikin et al., 2020). Someone will appreciate the activities that are carried out directly rather than just listening to verbal explanations without directly practicing them. However, when someone just does it without understanding what is being done, the results are less than satisfactory and it takes time to understand it. In accordance with Fitriyani research (2017), stating that a learning approach that involves students directly in the learning process and interacts with their environment makes learning more meaningful for students and involves students in practicing their abilities. By using the guided inquiry learning model, it can improve understanding of concepts well and motivation to learn (Juniar, Silalahi, & Dwi Suyanti, 2020).

The results of observing students' science process skills based on the indicators are shown in Figure 3 below

Figure 3. Percentage Average value of SPS Indicator Aspects



Of the seven aspects of science process skills indicators, the lowest percentage value is 70%, namely aspects communicated and contained in the control class, this is because in the *Direct Instruction* the center of attention is the teacher, where the teacher acts as an information center completely making students less in terms of communicating the results obtained properly. While the highest percentage is the observing indicator, namely the experimental class is 95% and the control class is 79%. So from the data on the implementation of Science Process Skills (SPS) it can be seen that learning with the guided inquiry model has the criteria of "very good". SPS with the guided inquiry learning

model is able to train students to solve problems independently by being active in laboratory activities (Fitriyani, 2017; Juniar et al., 2021). In the application of the guided inquiry learning model, students are more active than the *direct instruction*. These two models have different syntax, so that in practice they also make students experience different learning experiences. The application of the Guided Inquiry model is able to improve student learning outcomes compared to the Direct Instruction model (Juniar & Fardilah, 2019).

Based on data analysis, it was found that the percentage of the implementation of Science Process Skills when averaged on the Guided Inquiry learning model was "very good" because 85 Percentage of Science Process Skills < 100 and the conventional model "good" because 70 Percentage of Science Process Skills < 85. In Juniar's research , et al (2021) in the guided inquiry model there are "very good" criteria in measuring aspects of learning activities, namely learning readiness, skills in using tools, giving opinions, discussing and making conclusions, so that the use of the Guided Inquiry model is more successful than using the conventional model. meet the "good" criteria in the analysis of the measurement data of aspects of learning activities.

The correlation of learning outcomes with students SPS is obtained by calculating the correlation coefficient with the *Product Moment* through the *SPSS 20 for windows* (Nuryadi. et al., 2017). There is a correlation between student learning outcomes using the Guided Inquiry learning model and SPS. The contribution of learning outcomes to the increase in SPS is 75%.

• CONCLUSION

Based on the research that has been carried out and data analysis, the researchers obtained the following conclusions: There is an influence of the Guided Inquiry learning model on improving learning outcomes in Thermochemistry material with *sig. (2-tailed*) = 0.000 where *sig.* (*2-tailed*) < 0.05. There is an influence of the Guided Inquiry learning model on the improvement of science process skills in Thermochemical material with *sig. (2-tailed*) = 0.000 where *sig.* (*2-tailed*) < 0.05. There is a correlation between the learning outcomes taught by the Guided Inquiry learning model and the students' Science Process Skills. The contribution of learning outcomes to the ups and downs of Science Process Skills is 75%.

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