Guided Inquiry: Science Learning Techniques in Improving Elementary School Students' Process Skills and Concept Mastery

ABSTRACT

This study aims to improve the science process skills and scientific attitudes of grade 3 elementary school students in Nurul Ilmi Jambi. The approach used in this study is quantitative with a quasi-experimental design. The population used in the study was grade 3 students of Nurul Ilmi Integrated Islamic Elementary School, with a total of 203 people from seven locations. The samples used were from two locations taken randomly, with a total sample of 58 people. Data were collected using test techniques for both process skill variables and concept mastery, namely using multiple choice questions of 25 questions each. Data analysis was carried out using N-gain and T-test on pretest and posttest scores. The results of the study showed that guided inquiry had a positive impact on the development of students' science process skills and concept mastery. Based on the N-gain test, SPS and concept mastery increased on average with the "moderate" category. Based on the T-test, it is known that each variable has a significant mean difference between the pretest and posttest tests. Therefore, at the end of this study, Guided Inquiry could be an alternative for teachers in an effort to Improve Elementary School Students' Process Skills and Concept Mastery in science subjects.

Keywords: Guided Inquiry, Science Learning, Science Process Skills, Science Concept Mastery.

1. INTRODUCTION

Indonesia, as one of the world's developing countries, continues to strive to improve the quality of education at all levels. One real effort to improve the quality of education is through curriculum development and implementation of student-oriented learning. The implementation of student-oriented learning, for example, is related to process skills. However, concept mastery remains the main target, especially in learning science. Therefore, various efforts are made to improve process skills and concept mastery in each subject taught in schools.

Science process skills (SPS) are a very important part for someone in learning science to become a scientist. Darmayanti (2022) stated that KPS is the ability of students to practice scientific principles to know correctly, obtain and develop knowledge. Astalini et al., (2023), Ngazizah et al. (2023), and Koomson et al. (2024) explained that science process skills are a collection of directed skills used to build and form knowledge concepts from an event or natural phenomenon through observation skills, interpreting, predicting, experimenting, and providing explanations or conclusions from the results of the proof experiments. The same thing was also conveyed by Syafiqah et al. (2024), who stated that process skills need to be trained or developed in science learning because process skills play an important role in obtaining and creating knowledge.

The results of research by Isticharoh (2019), Ischak et al. (2020), Roa & Fajardo (2022), and Gidele (2023) show that students who have good SPS scores tend to have good academic achievements as well. Handayani et al. (2018) and Azizah, Sukarno & Hartoyo (2023), in their research, said that someone with good SPS tends to have good scientific literacy as well. In addition, SPS is also very important for someone to support their success in real life (Izzuddin et al., 2019; Khairunnisa et al., 2020; Koomson et al., 2024). Therefore, SPS is one of the main targets in science learning. Theoretically, SPS

is divided into two groups, namely basic SPS and integrated SPS (Sukarno et al., 2019). Basic science process skills include the ability to observe, classify, measure, collect data, ask questions, analyze data, and communicate scientifically (Duda et al., 2019; Roa & Fajardo, 2022). “Meanwhile, integrated science process skills include the ability to compile operational definitions of variables, determine hypotheses, control variables, experiment, and interpret experimental data” (Syafi et al., 2022; Sarıoğlu, 2023). In science learning, both groups of skills are very important and mutually supportive. However, this study focuses on basic SPS skills, which include the ability to observe, classify, collect, analyze, and communicate. This is done based on considerations of the condition of the sample and the subject matter, as well as the learning model used. So, in addition to SPS, mastery of scientific concepts is also the main target of learning science.

“In learning science, mastery of scientific concepts is one of the main indicators that determine whether someone is successful in learning science” (Wijaya et al., 2020; Zuhdi & Makhrus, 2020). “Good mastery of science concepts indicates a student's success in learning science, and vice versa; low mastery of concepts suggests that a student must repeat or remedial in learning science” (Mufidah et al., 2020). Thus, “mastery is the main point and fundamental for a teacher to teach students. In the Nurul Ilmi Integrated Islamic Elementary School (SDIT) in grade 3, in general, the level of science process skills and concept mastery still needs to be higher. Several practical test results show that, in general, the level of science process skills is still far from the target; for example, in terms of making observations, in general, the ability in these skills still needs to be improved. In addition, data collection and data analysis activities also show that this section still needs to be stronger. As for communication skills, in general, students also still need help conveying ideas and reading reports on their work results” (Roa& Fajardo, 2022). Thus, serious attention is required in order to improve the SPS of students in grade 3 of SDIT Nurul Ilmi Jambi. As for the variable of science concept mastery ability, the interim test results also show that, in general, students' mastery of science concepts still needs to be improved. Around 68% of grade 3 students in the school still need help mastering the concepts presented in the teaching materials (students' main books) and the teacher's explanations in class. This situation motivates researchers to take appropriate actions to improve students' mastery of science concepts.

According to several previous research reports, it is known that the guided inquiry learning model has a positive impact on student's learning outcomes, for example, their metacognitive abilities (Widodo et al., 2019; Jannah & Supardi, 2020) improving students' scientific attitudes and self-esteem (Dewi et al., 2023), improving critical thinking and elaboration skills (Sarifah & Nurita, 2023). In addition, guided inquiry can also be used as an alternative to enhancing students' SPS (Budiyono & Hartini, 2016; Dijaya et al., 2018; Mursali et al., 2024) and students' mastery of science concepts (Darmayanti, 2016). However, is this model also suitable for grade 3 students of SDIT Nurul Imi Jambi? This is because previous studies involved students at junior high and high school levels and have not involved elementary school students, especially grade 3, with different and unique characteristics. Unfortunately, there has been no research that accurately provides information related to this, so more systematic research needs to be conducted.

Theoretically, the guided inquiry learning model is a learning model that emphasizes or prioritizes the process in learning activities. This is based on the syntax of guided inquiry learning itself. According to Dewi et al. (2023) and Nurastuti et al. (2024), guided inquiry learning has a sequential syntax, namely Orientation, formulating problems, proposing hypotheses, designing experiments/trials, collecting and processing data, concluding and reflecting. According to Putri & Suharto (2019) and Yunita & Nurita (2023), the guided inquiry learning model involves students' abilities to investigate something through experimental activities so that students can find their knowledge. Therefore, the guided inquiry learning model needs to be applied at SDIT Nurul Ilmi Jambi in order to answer the problem of the still low SPS and students' mastery of science.

2. METHODOLOGY

The approach used in this study is quantitative, with a quasi-experimental design with a single pre-treatment and a post-treatment group design with two pre-treatment measurements (Hastjarjo, 2019). The population used in the study were 203 students of grade 3 of Nurul Ilmi Integrated Islamic Elementary School in seven locations. The samples used were from two locations taken randomly, with a total sample of 58 people. Data were collected using test techniques for both process skills and concept mastery variables, namely using multiple choice questions, each with 25 questions. Data analysis was carried out using the N-gain and T-test on pretest and posttest scores. The N-gain test was carried out to determine the effectiveness of the treatment on the sample (Wahab et al., 2021) or to determine the increase in the sample's ability in each variable measured (Sukarelawan et al., 2024). In this study, the N-gain test was carried out using Microsoft Excel software. In theory, the calculation of the N-gain test is carried out using the formula:

$$N = \frac{\text{Score obtained}}{\text{Maximum score}}\ x\ 100\%$$

Furthermore, to find out in which category the effectiveness or improvement of students' abilities on the measured variables is, categorization is carried out with the following levels:

Table 1. N-gain Classification

N-Gain	Classification of Improvement
g > 0,70	High
0,30 < g ≤ 0,70	Medium
g ≤ 0,30	Low

In addition, the collected data was also analyzed using the T-test. The test was conducted to determine whether there was a significant difference between the pretest value group and the posttest value group, which were conducted in pairs. In this study, the T-test was conducted using SPSS 25 software.

3. RESULT AND DISCUSSION

Based on the measurement results of each variable, namely SPS and mastery of science concepts. Then, the calculation (N-gain test) was carried out on each variable. Presentation of data in the form of a table, as follows:

Table 2. Percentage of SPS Improvement

Indicators	**Classification**	**Range of score**	**Frequency**	**Percentage**
Observation	High	76-100	18	31,03
	Medium	41-75	28	48,37
	Low	0-40	12	20,60
	Total		58	100
Classification	High	76-100	15	25,86
	Medium	41-75	29	50,00
	Low	0-40	14	24,14
	Total		58	100
Data Collection	High	76-100	21	36,20
	Medium	41-75	27	46,55
	Low	0-40	10	17,25
	Total		58	100
Data Analysis	High	76-100	12	26,70

	Medium	41-75	21	36,20
	Low	0-40	25	43,10
	Total		58	100
Communication Skill	High	76-100	12	26,70
	Medium	41-75	25	43,10
	Low	0-40	21	36,20
	Total		58	100

Based on Table 2 above, students' SPS abilities have increased in various ways. Each SPS indicator measured in this study has a different level of increase. In the observation indicator, there was an increase in the "high" category of 18 people, or around 31.03%. Meanwhile, students with an increase in the "moderate" category were 28 people or around 48.37%, and students who experienced an increase in the "low" category were 12 people or around 20.60%. This means that the average rise in SPS in the observation indicator in science learning using guided inquiry is "moderate."

Furthermore, based on Table 2 above, in general, SPS abilities in the classification indicator have increased in various ways. In the classification ability indicator, students who experienced an increase in the "high" category were 15 people or around 25.86%. There were 29 students with an increase in the "moderate" category, or around 50%, and 14 students, or around 24.14%, experienced a rise in their ability in the classification indicator with the "low" category. This means that the average increase in SPS in the science learning classification ability indicator using guided inquiry is "moderate."

As for the increase in SPS in the data collection ability indicator (Table 2), in general, there has been an increase in various ways. In the classification ability indicator, 21 students, or around 36.20%, experienced a rise in the "high" category. There were 27 students, or around 46.55%, who experienced an increase in their ability in the data collection indicator with the "low" category; there were ten students, or around 17.25%. This means that the average increase in SPS in the data collection ability indicator in science learning using guided inquiry is "moderate."

In addition, Table 2 above also shows that the data analysis indicator looks somewhat different from other indicators. Although the table shows that, in general, the SPS ability in the data analysis indicator has increased in various ways, the increase that occurred is relatively different from other indicators. In the data analysis ability indicator, students who experienced an increase in the "high" category were 12 people or around 26.70%. Meanwhile, students with an increase in the "moderate" category were 21 people or around 36.20%, and students who experienced an increase in the ability in the classification indicator with the "low" category were 25 people or around 43.10%. This means that the average rise in SPS in the science learning classification ability indicator using guided inquiry is "moderate" but tends to be low. This shows that the data analysis indicator is the most difficult part among the other indicators.

The last SPS indicator measured in this study is communication skills. Table 2 above also shows that the communication indicators are quite diverse. Table 2 shows that, in general, the SPS ability in the communication ability indicator looks similar to other indicators. In the data analysis ability indicator, students who experienced an increase in the "high" category were 12 people or around 26.70%. Meanwhile, students with an increase in the "moderate" category were 25 people or around 43.10%, and students who experienced an increase in the ability in the classification indicator with the "low" category were 21 people or around 36.20%. This means that the average rise in SPS in the science learning classification ability indicator using guided inquiry is "moderate" but tends to be low, as is the case with the data analysis indicator.

As previously mentioned, in this study, another variable measured was students' mastery of science concepts. In the science concept mastery variable, the results of measuring this ability are shown in Table 3 below:

Table 3. Percentage of Increase in Mastery of Science Concepts

Variable	Classification of Improvement	Range of Score	Frequency	Percentage
Mastery of Science Concept	High	76-100	20	34,48
	Medium	41-75	26	44,82
	Low	0-40	12	26,70
	Total		58	100

Based on Table 3 above, in general, students' mastery of science concepts has increased in various ways. Students with an increase in the "high" category were 20 people or around 34.48%. Meanwhile, students with an increase in the "moderate" category were 26 people or around 44.82%, and students who experienced an increase in the "low" category were 12 people or around 26.70%. This means that the average increase in students' mastery of science concepts in science learning using guided inquiry is "moderate." Therefore, the guided inquiry learning model can be used as an alternative to improving the science mastery of elementary school students in grade 3 at Nurul Ilmi Jambi. Furthermore, to find out how significant the influence of the Guided Inquiry technique is, the existing data is tested using a T-test. The results of the test for both variables can be seen in Table 4 below:

Table 4. One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
SPS Pretest	11.062	30	.000	41.452	33.80	49.10
SPS Posttest	16.981	30	.000	57.581	50.66	64.51
MC Pretest	11.311	30	.000	41.935	34.36	49.51
MC Posttest	17.341	30	.000	63.903	56.38	71.43

Based on Table 4 above, it can be seen that the viable SPS and MC obtained a sig. (2-tailed) value of 0.000 <0.05. This means that there is an average difference between the pretest and posttest values for each variable. In other words, it can be said that the increase in students' SPS and MC after participating in learning with guided inquiry techniques is significant.

The results of this study, namely that guided inquiry learning techniques influence SPS and MC, prove that this technique can be used as an alternative in developing students' SPS and MC. In addition, the results of the study also demonstrate that the guided inquiry technique effectively plays a role in improving the SPS and MC of students, namely grade 3 students of SDIT Nurul Ilmi Jambi. Each syntax in the guided inquiry model is strongly suspected of contributing to the development or improvement of students' SPS and MC.

Referring to the data and test results that have been carried out, this study has proven that the guided inquiry model effectively plays a role in improving the SPS and MC of students, namely grade 3 students of SDIT Nurul Ilmi Jambi. Although the two variables measured in this study experienced different increases in each indicator, on average, both variables experienced an increase. Each syntax in the guided inquiry model is strongly suspected of contributing to the development or improvement of students' SPS and MC. The results of this study are in line with previous studies that state that the guided inquiry learning model has the potential to improve students' SPS. Several previous studies that are in

line with this study include those conducted by Budiyono & Hartini (2016), Dijaya et al. (2018), Putri & Suharto (2019), that the guided inquiry model can improve the SPS abilities of high school students. In addition, other studies also show that the guided inquiry model can be used as an alternative to enhancing student learning outcomes, namely in the form of concept mastery (Hosnah et al., 2017; Wahid, 2023; Vii & Ambalau, 2023).

In addition, the results of this study also prove that the guided inquiry learning model can be applied to students in grade 3 of elementary school (not only students in high school and junior high school). Therefore, from another perspective, this study provides a solution for improving SPS and mastery of science concepts in elementary school students who are generally in the beginner category. Thus, these results prove that the guided inquiry learning model with its syntax can effectively improve SPS and mastery of science concepts in grade 3 students at SDIT Nurul Ilmi Jambi. On the other hand, the results of this study open up a new discourse that SPS can be taught and trained to beginner students (elementary school). This shows that there is potential for SPS development to be carried out early on. The process of developing SPS from an early age provides a great opportunity for improving general mastery of science.

The improvement of general mastery of science (process skills and concept mastery) can also be interpreted as an effort to protect the world from damage. This is based on the opinion of experts that people who have good scientific literacy skills (SPS and concept mastery) have the potential to actively contribute to preserving the environment (Suhartinah et al., 2019; Hanifha, 2023; Kartini et al., 2024). At the end of the study, it was recommended that elementary school teachers consider using a guided inquiry model in implementing science learning. The use of this model in a planned and systematic manner allows for an earlier and better increase in SPS and mastery of science concepts as a real effort to improve the quality of education in Indonesia. In addition, the use of a guided inquiry learning model also allows for the creation of environmental balance and sustainability in general.

4. CONCLUSION

Based on the data and test results that have been carried out, each variable has a significant mean difference between the pretest and posttest tests. Therefore, at the end of this study, it was concluded that Guided Inquiry can be used as an alternative for teachers in an effort to Improve Elementary School Students' Process Skills and Concept Mastery in science subjects. The use of the guided inquiry learning model in grade 3 of elementary school must pay attention to the characteristics and abilities of students. It must be carried out in a planned manner.

The study provides practical implications for teachers in implementing science learning in the classroom. The use of the guided inquiry learning model has the potential to improve students' basic SPS. Thus, teachers, especially at the Nurul Ilmi Jambi Integrated Islamic Elementary School and elementary school teachers in other schools, need to consider this learning model so that its positive impact can be felt more widely. In addition, the use of this model also needs to be expanded by applying it to other learning topics.

Disclaimer (Artificial intelligence)

Author(s) at this moment declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

REFERENCES

1. Astalini, Darmaji, Kurniawan, D. A., Wirayuda, R. P., Putri, W. A., Rini, E. F. S., Ginting, A. A. B., & Ratnawati, T. (2023). Impact of Science Process Skills on Thinking Skills in Rural and Urban Schools. International Journal of Instruction, 16(2), 803–822. https://doi.org/10.29333/iji.2023.16242a
2. Azizah H., Sukarno. S, & Hartoyo, Z. (2023). Correlation Between Science Process Skills and Science Literacy of Students of State Junior High Schools in Jambi City. Physics and Science Education Journal (PSEJ), 3(April), 1–9.
3. Budiyono, A., & Hartini, H. (2016). The Effect of Guided Inquiry Learning Model on Science Process Skills of High School Students. Didactic Discourse. https://doi.org/10.31102/wacanadidaktika.4.2.141-149
4. 1. Darmayanti. Analysis of Science Process Skills of Grade VI Students at SD N 1 Cempaga. Indonesian Journal of Science Education and Learning (JPPSI). 2022; 5(2): 119–127. https://doi.org/10.23887/jppsi.v5i2.52638
5. Darmayanti, D. (2016). The Effect of Guided Inquiry Learning Strategy with Laboratory Activities to Improve Conceptual Understanding of Grade XI Students of SMAN I Srandakan on Static Fluid Topic. Journal of Physics Education Research and Study. https://doi.org/10.12928/jrkpf.v3i1.4544
6. Dewi, L. G. D. P., Dantes, N., & Suastra, I. W. (2023). Improving Students' Scientific Attitudes and Self-esteem Through STEAM-Oriented Guided Inquiry Learning Model in Elementary School Science Learning. Jurnal Imiah Pendidikan Dan Pembelajaran, 7(2), 335–345. https://doi.org/10.23887/jipp.v7i2.61744
7. Dijaya, A. O., Pitasari, R., & Kurniasih, S. (2018). Application of Guided Inquiry Learning Model to Improve Students' Science Process Skills on the Concept of Electrolyte and Non-electrolyte Solutions. JTK (Jurnal Tadris Kimiya). https://doi.org/10.15575/jtk.v3i2.3597
8. Duda, H. J., Susilo, H., & Newcombe, P. (2019). Enhancing different ethnicity science process skills: Problem-based learning through practicum and authentic assessment. International Journal of Instruction, 12(1), 1207–1222. https://doi.org/10.29333/iji.2019.12177a
9. Gidele. (2023). Improving Science Process Skills of Students: A Review of. Science Education International, 34(3), 216–224.
10. Handayani, G., Indrayanti, R., & Biologi, Magister Pendidikan, Universitas Negeri Jakarta, U. N. (2018). The Relationship of Integrated Science Process Skills and Reading Comprehension Ability to Scientific Literacy in Prospective Biology Teacher Students. Biosfer: Jurnal Pendidikan Biologi.
11. Hanifha, et al. (2023). Student Worksheets On Scientific Literacy And Environmental Awareness. Jurnal Pendidikan IPA Indonesia, 12(4), 504–513. https://doi.org/10.15294/jpii.v12i4.45817
12. Hastjarjo, T. D. (2019). Quasi-Experimental Design. Psychology Bulletin, 27(2), 187. https://doi.org/10.22146/psikologi.38619

13. Hosnah, W., Subiki, S., & Sudarti, S. (2017). The Effect of Guided Inquiry Learning Model on Physics Learning Outcomes in High School. Journal of Physics Learning, University of Jember. https://doi.org/10.19184/jpf.v6i2.5020
14. Ischak, N. I., Odja, E. A., La Kilo, J., & La Kilo, A. (2020). The Effect of Science Process Skills Through Guided Inquiry Model on Student Learning Outcomes in Acid Base Solution Material. Hydrogen: Journal of Chemical Education, 8(2), 58. https://doi.org/10.33394/hjkk.v8i2.2748
15. Isticharoh, I. (2019). The Influence of Science Process Skills and Scientific Attitudes on Academic Achievement (Survey of Private Junior High Schools in South Jakarta). Alfarisi: Journal of Mathematics and Natural Sciences Education, 2(2), 153–158.
16. Izzuddin, A., Palapa, S., & Lombok, N. (2019). Science and Its Learning in Early Childhood. Journal of Education and Science, 1(3), 353–365. https://ejournal.stitpn.ac.id/index.php/bintang
17. Jannah, M., & Supardi, Z. A. I. (2020). Guided Inquiry Model with the REACT Strategy Learning Materials to Improve the Students' Learning Achievement. IJORER: International Journal of Recent Educational Education, 1(2), 156–168.
18. Kartini, D., Nailul, S., & Aljamaliah, M. (2024). Implementation of Science Literacy to Foster Environmental Care Character Using PjBL Model in Elementary School. Journal of Elementary Education Research (JRPD), 5, 83–92. https://doi.org/10.30595/jrpd.v5i1.17583
19. Khairunnisa, K., Ita, I., & Istiqamah, I. (2020). Science Process Skills (KPS) of Biology Education Students in General Biology Courses. BIO-INOVED: Journal of Biology-Educational Innovation. https://doi.org/10.20527/binov.v1i2.7858
20. Koomson, A., Kwaah, C. Y., & Adu-Yeboah, C. (2024). Effect of science process skills and entry grades on academic scores of student teachers. Journal of Turkish Science Education, 21(1), 118–133. https://doi.org/10.36681/tused.2024.007
21. Mufidah, J., Parno, P., & Diantoro, M. (2020). Students' Concept Mastery in Argument-Driven Inquiry Based on Phenomena Accompanied by Formative Assessment. Brilliant: Journal of Research and Conceptual, 5(4), 749. https://doi.org/10.28926/briliant.v5i4.516
22. Mursali, S., Sri Hastuti, U., Zubaidah, S., & Rohman, F. (2024). Guided inquiry with Moodle to improve students' science process skills and conceptual understanding. International Journal of Evaluation and Research in Education, 13(3), 1875–1884. https://doi.org/10.11591/ijere.v13i3.27617
23. Ngazizah, N., Yulianty, R., Septiana, D., Suwardi, D., Sholihah, A., & Muhammadiyah Purworejo, U. (2023). Analysis of Science Process Skills of Fifth Grade Students of Muhammadiyah Elementary Schools in Purworejo Regency. Pendas: Scientific Journal of Elementary Education, 08, 2477–2143.
24. Nurastuti, G. Y., Ibrohim, I., & Listyorini, D. (2024). The Effect of Guided Inquiry Assisted by Google Classroom on the Scientific Literacy at SMA Negeri 1 Kwanyar. Jurnal Ilmiah Mandala Education, 10(1), 278. https://doi.org/10.58258/jime.v10i1.6696

25. Putri, R. F., & Suharto, B. (2019). Application of the Colloid Guided Inquiry Learning Model. Journal of Chemistry And Education, 3(2), 47–54.
26. Roa, G. R., & Fajardo, M. T. M. (2022). Science Process Skills Survey as Input to Instructional Materials Development. American Journal of Educational Research, 10(12), 697–701. https://doi.org/10.12691/education-10-12-6
27. Sarifah, F., & Nurita, T. (2023). Implementation of Guided Inquiry Learning Model to Improve Critical Thinking and Collaboration Skills. Science Education, 11(1), 22–31.
28. Sarıoğlu, S. (2023). Development of Online science process skills test for 8th-grade pupils. Journal of Turkish Science Education, 20(3), 418–432.
29. Suhartinah, S., Hidayati, Y., Qomaria, N., & Hadi, W. P. (2019). Correlation Study between Environmental Attitude and Junior High School Students' Science Literacy Skills on Ecosystem Material. Natural Science Education Research.
30. Sukarelawan, M. I., Indratno, T. K., & Ayu, S. M. (2024). N-Gain vs Stacking.
31. Sukarno, S., Rosadi, K. I., & Samsudin, A. (2019). School Environment Exploration Activity to Enhance Science Process Skill. https://doi.org/10.2991/aes-18.2019.1
32. Syafi, R., Laili, A. M., & Veronixa, N. (2022). Analysis of Science Process Skills Components in Science Textbooks for Grade IX. Lensa (Lentera Sains): Journal of Science Education, 12, 87–96. https://doi.org/10.24929/lensa.v12i2.230
33. Syafiqah, I. W., Arsyad, A. A., & Ramlawati. (2024). Analysis of Science Process Skills of Grade VIII Students of A-Accredited Junior High Schools in Rappocini District. Journal of Education and Learning, 4(1), 1–8. https://doi.org/10.62388/jpdp.v4i1.408
34. Vii, K., & Ambalau, S. (2023). Activity Model and Student Learning Outcomes on the Material of Characteristics of Living Things. Journal of Education and Teaching Review, 6(2), 356–365.
35. Wahab, A., Junaedi, J., & Azhar, M. (2021). The Effectiveness of Educational Statistics Learning Using the N-Gain Improvement Test in PGMI. Basicedu Journal, 5(2), 1039–1045. https://doi.org/10.31004/basicedu.v5i2.845
36. Wahid, S. (2023). The Influence of Guided Inquiry Learning Model on Physics Learning Outcomes Reviewed from the Learning Interests of Class XI Students of SMAN 9 Makassar. Jurnal Ilmiah Ecosystem, 23(1), 774–785.
37. Widodo, F. S. L. W., Sofya, E., & Efkar, T. (2019). The Effectiveness of Guided Inquiry to Improve Students' Metacognitive Skills in Electrolyte and Non-Electrolyte Solution Materials. Journal of Chemistry Education and Learning.
38. Wijaya, L. T. T., Jamaluddin, J., & Hadiprayitno, G. (2020). Mastery of Science Concepts of Junior High School Students Based on Cognitive Process Dimensions and Knowledge Dimensions. Jurnal Pijar Mipa, 15(4), 357–361. https://doi.org/10.29303/jpm.v15i4.1912
39. Yunita, N., & Nurita, T. (2021). Analysis of Students' Science Process Skills in Online Learning. Pensa E-Journal: Online Science Education, 9(3), 378–385.

40. Zuhdi, M., & Makhrus, M. (2020). Improving Mastery of Basic Physics Concepts of Temperature and Heat Material Through a Cognitive Conflict Approach. Kappa Journal, 4(1), 37–41. https://doi.org/10.29408/kpj.v4i1.2009