EFFECTIVENESS OF DIAGRAM I IN GUIDED INQUIRY ON STUDENTS' SCIENTIFIC LITERACY IN SALT HYDROLYSIS MATERIAL

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Abstract

The purpose of this study is to determine the differences of science literacy that taught using guided inquiry model with I diagram and guided inquiry on the subject salt hydrolysis. Quasy experiment post-test only control group design was selected in this study. The science literacy on the subject of salt hydrolysis was measured using a test. The test is multiple choice which has 9 questions. The results show that there are differences in science literacy on the subject of salt hydrolysis which is taught using a guided inquiry learning model with I diagram and guided inquiry. This difference was shown by the average score of science literacy. The score of the experimental group students at 53.47 higher than the control group of 44.16.

Keywords: *I Diagram, Guided Inquiry, Science Literacy, Salt Hydrolysis.*

مستخلص البحث

هدف هذا البحث هو تحديد الفروقات في القدرة على محو الأمية العلمية لدى الطلاب الذين يتم تدريسهم باستخدام نموذج الاستقصاء الموجه مع مخطط I مقارنة بالاستقصاء الموجه فقط في موضوع تحليل الملح المائي. تم اختيار تصميم التجربة شبه التجريبية باستخدام اختبار تحصيلي بعدي فقط لمجموعة التحكم في هذا البحث. تم قياس محو الأمية العلمية في موضوع تحليل الملح المائي باستخدام اختبار متعدد الخيارات مكون من ٩ أسئلة. أظهرت النتائج أن هناك فروقا في محو الأمية العلمية في موضوع تحليل الملح المائي بين الطلاب الذين تم تدريسهم باستخدام نموذج الاستقصاء الموجه مع مخطط I وأولئك الذين تم تدريسهم باستخدام الاستقصاء الموجه فقط. تم إثبات هذا الفرق من خلال متوسط درجات محو الأمية العلمية، حيث حصل طلاب المجموعة التجريبية على درجة ٥٣,٤٧ ، وهي أعلى من درجة المجموعة الضابطة البالغة ٤٤,١٦ .

الكلمات المفتاحية: *مخطط I والاستقصاء الموجه ومحو الأمية العلمية وتحليل الملح المائي.*

INTRODUCTION

Chemistry can be said to be knowledge about the composition, properties, and changes in matter that are usually obtained through experiments. The experimental results are then analyzed

to produce conclusions.[1] Learning using the 5M approach (observe, question, collect data, associate, and conclude) is very compatible with learning that uses experiments. One of the learning models that is often used in the 5M learning method is guided inquiry. Learning inquiry learning that uses experimental activities is highly recommended to use a variety of tools so that students can more easily connect concepts with practical activities.[2] One of them is the use of diagram I. Diagram I requires students to follow steps such as logical arguments, hypotheses, variables, procedures, data collection, data transformation, and results. The sequence of steps aims to answer the questions in the experiment. Thus, it is easier for students to connect practicum activities with theory.

Science literacy is considered a key to the development of science and technology today. It shows that high science literacy is owned by developed countries. Learning using the guided inquiry model makes students' science literacy increase. Yuliana's research shows that students who are taught with guided inquiry are able to increase their science literacy.[3] Almuntasheri's research shows that the results of the Organization for Economic Cooperation and Development (OECD) analysis in various countries show that students who have guided inquiry experience, their science literacy skills are higher than students with teacher center learning experiences and open-ended approaches.[4]

METHOD

Quasi experiment post-test only control group design was chosen in this study as the research design. There were two groups in this study, namely, experimental and control. The population of this study were students of class XI MIA in one of the MA in Mojokerto Regency. This study used students from two classes that have almost the same ability as the sample. The sample selection used random sampling technique. Science literacy of students on salt hydrolysis material can be known by using instruments in the form of multipel choice objective tests. Multiple choice tests were chosen to make it easier to score and the sample of material measured became wider. This test amounted to 9 items.

[1] Brady, *et al, Chemisty the Molecular Nature of Matter Sixth Edition,* (USA: Courier, 2012) p. 2-3 Kendallville.

[2] Akkuzu & Uyulgan, "Step by Step Learning Using the I Diagram in the Systematic Qualitative Analyses of Cations within a Guided Inquiry Learning Approach", *Chemistry Education Research and Practice*, 18 (May.), 2017, pp. 643. Available at: DOI: 10.1039/c7rp00050b.

[3] Yuliana, Perbedaan Hasil Belajar dan Literasi Kimia Siswa Kelas XI SMAN 4 Malang yang dibelajarkan dengan Model Inkuiri Terbimbing Pendekatan Intertekstual dengan Inkuiri Terbimbing pada Materi Kesetimbangan Kimia Ditinjau dari Kemampuan Awal. 2015. Skripsi UM.

[4] Almuntasheri *et al.* "The Effectiveness of a Guided Inquirybased, Teachers' Professional Development Program on Saudi Students' Understanding of Density". *Science Education International*, 27 (Jan.), 2016, p. 19.

The stages for collecting research data start from preparation; then implementation; and then the end. The preparation stage starts from preliminary studies, preparation of research proposals, preparation of instruments, validating instruments, revising instruments, arranging data collection schedules. The implementation stage, namely distributing teaching material manuscripts, LKS and Diagram I; conducting learning on the subject of the nature of salt solution acidity; giving science literacy test questions. In the final stage, namely data collection then analyzing data, discussing the results of science literacy tests and providing conclusions. Data on student science literacy results were analyzed using normality, homogeneity and hypothesis tests.

RESULTS AND DISCUSSION

Results

Summarizes the data of science literacy results on salt hydrolysis material

Table 1. Data on Science Literacy Results on Salt Hydrolysis Material of Experimental and Control Groups

Test	Average Score	
	Experiment Class	Control Class
Science Literacy	53,47	44,16

Data on student science literacy results were then subjected to prerequisite test analysis. This prerequisite test is to determine normality and homogeneity. The normality test used Kolmogorov Smirnov and homogeneity using Levene Statistic. The normality test showed that the students' science literacy data was 0.088 for the control group and 0.086 for the experimental group. The value of students' science literacy shows that both data are normally distributed. The homogeneity test shows that the diversity of the data is the same. The proof is the significance value of 0.881. After knowing that students' science literacy data is normally distributed and the diversity of the data is the same, then hypothesis testing can be done.

Table 2. Hypothesis Test on Student Science Literacy Data

Group	Average Science Literacy	Significance Value (two parties)	Conclusion
Control	44,16	0,000	There are differences in students' science literacy
Experiment	53,47		

Table 2 shows that there is a difference in the science literacy of control and experimental group students because the significance value is 0.000.

Discussion

Presenting the data that has been interpreted and analyzed by a specific technique and has been processed by the specific theory (also from the researcher's idea).

Table 1 summarizes the students' science literacy results on salt hydrolysis. The mean score was 44.16 for the control group and 53.47 for the experiment. This shows the effect of different learning models on students' science literacy. Table 2 shows that students who use guided inquiry with Diagram I and guided inquiry as their learning model have different science literacy results. The result is that the experimental group students have higher science literacy skills than the control class. Different learning processes make the results of science literacy on salt hydrolysis material also different.

The application of guided inquiry model can help students to improve science literacy skills. The steps of the inquiry model that are in accordance with science literacy competencies are conceptualization, which includes the formulation of problems and hypotheses by explaining scientific phenomena; investigation, which includes data collection by evaluating and designing scientific research; and investigation (analyzing data) and conclusions by interpreting data and scientific evidence.[5]

Diagram I applied in the guided inquiry learning model allows students to optimize their thinking skills. Just like the guided inquiry learning model, the guided inquiry model with Diagram I trains students' science literacy skills. Diagram I answer experimental questions with steps such as logical arguments, hypotheses, variables, procedures, data collection, data transformation, and results. The steps in Diagram I make students bring out all their thinking models such as brainstorming, reasoning, proof and critical thinking. So that students are able to connect practicum activities with theory more easily. The stages of Diagram I have been arranged in such a way that the pre-practicum and practicum processes have a relationship with each other. For example, pre-practicum activities such as hypotheses, predictions and data collection procedures are linked to new knowledge, conclusions and results in practicum activities.[6]

In guided inquiry learning, students also work on pre-practicum activities and practicum results, but are not given a clear relationship between these activities. This difference makes the thinking process of students who use the guided inquiry learning model less developed than students who use Diagram I in their learning activities. This difference makes students' science literacy after the learning process using guided inquiry lower than guided inquiry with Diagram I.

[5] Nahdiah, "Pengaruh Model Pembelajaran Peer Led Guided Inquiry (PLGI) terhadap Literasi Sains dan Hasil Belajar Siswa pada Materi Hidrolisis Garam Siswa Kelas XI PMIA SMAN 3 Banjarmasin", Journal of Chemistry and Education, Vol. 1, No. 1 (2017), p. 78.

[6] Phillips, K., A., & Germain, P., J. "The Inquiry "I": A Tool for Learning Scientific Inquiry", *The American Biology Teacher*, 64(7): 512-520. http://dx.doi.org/10.1662/0002-7685(2002)064[0512:TIIATF]2.0.CO;2

CONCLUSION

The conclusion obtained from this research is that there are differences in the science literacy of students who are taught the guided inquiry model with Diagram I and guided inquiry on the subject of salt hydrolysis.

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