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Implementation of the Lesson Study for Learning Community-Based GDL Model on Student Learning Outcomes

Andromeda[1*], Leli Astuti[1], Yerimadesi[1], Yulia Asri Warlinda[1]

[1] Program Studi Pascasarjana Pendidikan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Padang, Indonesia.

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Corresponding Author:
Andromeda
andromeda@fmipa.unp.ac.id

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Abstract: The purpose of the study was to analyze the effect of the LSLC-based GDL learning model on the reaction rate material on student learning outcomes at SMAN 1 Linggabayu. This type of research used quasi-experimental research design, namely pretest-posttest control group design. The population consists of students of class XI MIPA at SMAN 1 Linggabayu in the academic year 2021/2022. The sample was selected using random sampling technique, and the sample classes were XI MIPA 1 and XI MIPA 4. The instrument used in this study was a test instrument in the form of multiple-choice questions consisting of 20 questions with 5 answer choices. The data analysis technique used the n-gain test, normality test, F test and hypothesis testing (t test). The average learning outcomes of experimental and control class students were 81 and 72, respectively. From the results of the study, the n-gain value in the experimental class was 0.74 in the high category while the control class was 0.61 in the medium category. At a significance level of 0.05, the value of tcount > ttable. So, the application of the guided discovery learning model based on lesson study for the learning community has an influence on improving student learning outcomes.

Keywords: Learning outcomes; Lesson study for learning community; Model guided discovery learning

Introduction

The demands of the 21st century education curriculum is able to produce students who have the skills: (1) Critical Thinking and Problem Solving; (2) Creativity and Innovation; (3) Communications; (4) Collaboration (Saavedra & Opfer, 2012). This 21st century or 4C skill is an effort to create a Knowledge Based Society (KBS). Chemistry is one of the subjects in the education curriculum in SMA/MA which has an important role in improving KBS. But in reality, students still have difficulty in finding concepts from certain chemical problems such as solubility, electrolysis, redox reactions, hydrocarbons, chemical equilibrium and volumetric analysis (Tunde et al, 2010; Alabi & Nureni, 2016). To carry out quality learning, teachers must choose pedagogical competencies, so that they are able to choose the right approach and learning model. The approach suggested in the 2013 curriculum is scientific and one of the suggested learning models is guided discovery learning (GDL).

The GDL model can be recommended and is effective in improving learning outcomes and critical thinking and problem-solving skills (21st century skills) (Andromeda, 2018; Yerimadesi, 2019). The GDL model has a learning syntax that is able to facilitate students to improve 21st century skills and student learning outcomes. This is supported by the results of research that has been carried out that the application of the GDL model can improve critical thinking skills which is one of the 21st century criteria and learning outcomes (Andromeda et al, 2018; Yerimadesi et al, 2019; Iryani et al, 2016).

21st century learning in the 4.0 revolution era is learning based on the development of science and technology. The integration of technology and information in the learning process also plays an important role in developing students' thinking skills

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(Darimi, 2017). Learning that can improve 21st century skills and student learning outcomes starts from professional teachers. Professional teachers have personality, social, professional and pedagogical competencies. Pedagogical competence is a competency where teachers are able to understand students, plan, implement and evaluate learning well. However, the results of the UKG test scores show that the pedagogical competence of chemistry teachers is still not satisfactory. There are still many teachers who have not been able to implement learning models according to their syntax and reflect to improve the quality of their learning

One way to improve the quality of learning is through a learning community called Lesson study for Learning Community (LSLC). LSLC is a professional development process that emphasizes on improving students' learning difficulties. LSLC has several advantages, including in the implementation of LSLC considering the development of students in achieving learning objectives. Student development is observed through observation of student learning activities in class. The results of the observations are then reflected in depth and become guidelines in planning the next lesson. In addition, the implementation of LSLC can improve the collegiality relationship between teachers in a community (Rustono, 2008).

The results of previous studies concluded that applying LSLC could improve the pedagogical competence of chemistry teachers to master the characteristics of students during the learning process so as to improve 4C skills (Erna, 2019). The application of the LSLC-based GDL model is expected to be able to improve 21st century or 4C skills and student learning outcomes (Prayekti & Rasyimah, 2012; Sutowijoyo, 2016; Marta & Nurlizawati, 2019).

Based on the problems described above, this study aims to reveal the effect of implementing the LSLC-based GDL model on Chemistry learning in SMA/MA to improve 21st century skills and student learning outcomes. This research is important to do to support the implementation of the 2013 curriculum and efforts to achieve 21st century learning goals and the 4.0 industrial revolution.

Method

The type of research used in this research is experimental research with a quantitative experimental design approach. The research design used a pretest-posttest control group design. This research was conducted at SMA Negeri 1 Linggabayu in the academic year 2021/2022. The population in this study were all students of class XI MIPA who studied chemistry. Then two classes were selected as the sample class, namely the experimental class and the control class using random sampling technique. The object of this research is the improvement of learning outcomes of XI MIPA SMAN 1 Linggabayu which is carried out through a guided discovery learning model based on lesson study for learning community. The instrument used for data collection is a test instrument in the form of multiple-choice questions consisting of 20 questions with five answer choices. The data in this study were analyzed using the n-gain test to see the difference between the pretest and posttest scores of the two sample classes. Then the Kolmogorov-Smirnov normality test, the F-test homogeneity test and hypothesis testing were carried out through the independent sample t-test. More clearly the research design can be seen in Table 1.

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Eksperiment	T1	X	T2
Control	T1	-	T2

Information:
T1 = Pretest learning result
T2 = Posttest learning outcomes
X = Experiencing the treatment of the GDL-LSLC model (Model Guided discovery learning based on Lesson study for learning community)

Result and Discussion

Result

Analysis of student learning outcomes material reaction rate in the experimental class obtained data in Table 1.

Table 1. Results of the n-gain test

Class	Pretest Average	Posttest Average	Average N-Gain	Category
Eksperment	73.2	91.8	0.69	Medium
Control	75	80	0.57	Medium

The data in Table 1 of the results of the n-gain test shows that the average posttest learning outcomes of experimental class students are greater than those of the control class, which are 91.8 and 80, respectively. The average value of n-gain in the experimental class is 0.69 in the medium category and the n-gain in the control class is 0.57 in the medium category. From the n-gain data, it can be seen that the n-gain of the experimental class is 0.12 greater than the control class. This shows that the average student learning outcomes using the guided discovery learning model based on lesson study for learning community in the experimental class is greater than the control class using guided discovery learning that is not based on lesson study for learning community.

Table 2. Results of the Pretest-Posttest Normality Test for the Sample Class

Class	N	A	Normality	Desc
Experiment	35	0.05	0.284	Normal
Control	35	0.05	0.173	Normal

The data in Table 2 shows the results of the normality test carried out using the Kolmogorov-Smirnov test. Based on Table 2, it can be seen that both the experimental class and the control class have a value greater than 0.05. This shows that the two sample classes are normally distributed.

Table 3. Result of Homogeneity Test of Final Test of Sample Class

Class	N	A	Homogeneity
Exp	35	0.05	0.91
Ctrl	35	0.05	

The data in Table 3 of the homogeneity test of the sample class can be seen that value greater than 0.05. This shows that the data has a homogeneous variance.

Table 4. Hypothesis test results for the sample class final test

α	Sig (2-tailed)	Decision
0.05	0.04	Different

Table 4 shows a sig value <0.05 which means H0 is rejected. Acceptance of H1 is obtained from the pretest and posttest scores. Based on these results it can be concluded that H0 is rejected and H1 is accepted. This means that student learning outcomes after applying the LSLC-based guided discovery learning model were significantly higher than student learning outcomes in classes that did not apply the LSLC-based guided discovery learning model to the reaction rate material in class XI MIPA SMAN 1 Lingga Bayu.

Discussion

The data description of the average pretest and posttest values for the sample class in Table 2. shows the learning outcomes of students before being given treatment have an average pretest value in the experimental class and control class of 73.2 and 75 respectively. The mean value of the pretest in the sample class shows that the sample class has a low initial ability. Pretest was conducted to find out how far the initial knowledge possessed by students on the reaction rate material. The importance of the initial knowledge that students already have can help teachers predict which part of the material should be taught more deeply, so that the time used during learning will be more effective (Gazali & Yusmaita, 2018).

The learning process in both classes is assisted by the e-module reaction rate based on guided discovery learning which was developed by Wildayati (2021) and has been tested for its validity, practicality and effectiveness. The e-module based on guided discovery learning on the reaction rate material can attract students' interest in the learning process, because the e-module can be accessed by students practically using cellphones and the e-module has been equipped with practicum videos, submicroscopic pictures and questions asked lead students to find the concept of learning independently. In this case, students can observe and analyze models in the form of pictures, videos, and observations to answer questions that encourage students to think critically and find concepts. With the existence of an e-module based on guided discovery, it can help model teachers in applying the guided discovery learning model to be more effective. The application of the guided discovery learning model can increase students' learning motivation because the child will be guided in finding problems and the child will be given reinforcement in the form of encouragement and support by the teacher until the child is motivated (Smitha, 2012).

Furthermore, the two sample classes were given a posttest to see learning outcomes in the cognitive domain of students. Based on the table attachment, the description of the results of the pretest and posttest for the sample class, the average posttest value in the experimental class was 91.8 and the control class was 80. These data indicate that there are differences in learning outcomes in the two sample classes caused by different treatments. In the learning experiment class using the guided discovery learning model based on lesson study for the learning community, it gives a better effect on the learning process. Research conducted by Yunita (2017) that using the guided discovery learning model has a positive effect on increasing students' science learning outcomes. Another study conducted by Dariyatun (2020) stated that there was an increase in chemistry learning outcomes for students with lesson study-based learning. To see how influential the application of the guided discovery learning learning model based on lesson study for learning community on student learning outcomes on the reaction rate material, N-gain data analysis will be carried out on student cognitive learning outcomes.

Based on Table 2. the description of N-gain in the sample class shows the average N-gain in the experimental class is 0.69 in the high category while the control class is 0.57 in the medium category. The difference in the N-gain value of 0.12 shows that there are differences in learning outcomes in the experimental class that applies the guided discovery learning model based on lesson study for learning community. The data obtained is in accordance with previous research which revealed that the results of the n-gain test in the sample class were 0.6 and 0.5 in the medium category (Kristalia, 2021). So, it can be concluded that the application of

guided discovery learning based on lesson study for learning community has an effect on improving student learning outcomes. To see that there are significant differences in learning outcomes and the effect of applying the guided discovery learning model based on LSLC, it is necessary to perform statistical tests (hypothesis testing).

Before conducting a hypothesis test, a prerequisite test is first carried out. The normality and homogeneity of the variance of a data can be used as a condition for determining the statistical test that will be carried out next (Sundayana, 2018). The data analysis test was carried out at the significance level or confidence level α = 0.05. This is done to get the confidence level of research data by 95%. Based on the table of normality test results for the sample class, it shows that the normality test values of the experimental class and control class data processing are 0.284 and 0.173. The data normality test for the two sample classes shows that the value at α 0.05 indicates that the two sample classes are normally distributed. In the sample class test results table it was found to be greater than 0.05 which indicates that the two sample classes have a homogeneous variance. Samples that have a homogeneous variance indicate that students have almost the same abilities (Sundayana, 2018). This data indicates that the two samples come from a normal and homogeneous distribution of data, so to test the hypothesis parametric statistical tests can be carried out by conducting the t test (independent sample t-test).

Based on the results of the analysis, it shows a sig value <0.05, which means H0 is rejected. Acceptance of H1 is obtained from the pretest and posttest scores. Based on these results it can be concluded that H0 is rejected and H1 is accepted. This means that student learning outcomes after applying the LSLC-based guided discovery learning model were significantly higher than student learning outcomes in classes that did not apply the LSLC-based guided discovery learning model to the reaction rate material in class XI MIPA SMAN 1 Lingga Bayu.

The increase in student learning outcomes is caused by the treatment that has been given. The treatment given was the application of a guided discovery learning model based on lesson study for the learning community. The learning process was carried out for 3 meetings and the LSLC cycle was carried out for 3 cycles, besides that learning was also supported by teaching materials in the form of reaction rate e-modules based on guided discovery learning. By applying the guided discovery learning model to chemistry learning, it can improve learning activities and student achievement (Suryaningrum, 2019). Through lesson study activities, effective and efficient learning tools are produced to be used in learning and can improve the quality of learning (Hefni, 2020).

In the plan activities, the things discussed are related to document plans, lesson plans, and teaching materials and learning media. The LSLC document plan consists of chapter design, future mapping, and lesson design. The model teacher first explained about the draft document plan and teaching tools used, then followed by other community members (observers) providing suggestions and input. Furthermore, the results of the discussion of the plan stage are applied to the implementation stage (do).

At the implementation stage (do) of LSLC the model teacher will teach in the classroom by applying the guided discovery learning model, and the observer teacher is also present in the class to observe student activities during the learning process. It is at this stage that the syntax of the GDL learning model is applied. The use of the GDL model in the classroom is assisted by teaching materials in the form of GDL-based e-modules which are carried out by dividing students into small groups and working together to find and get an understanding of concepts in the reaction rate material and the observer has the task of observing how the group discussion is going. students do. The scenario when learning is divided into three stages of learning, namely the preliminary, core, and closing stages. It is at this core stage that the guided discovery learning model is applied. The explanations for the activities of teachers and students during the practice of the GDL syntax are: 1) motivation and problem presentation, in this phase the teacher model guides students to identify problems and provide questions that can stimulate students to think critically and solve problems and the teacher guides students to formulate problems and make hypotheses. In this phase, students observe, listen, do reading activities to identify problems obtained from the questions given by the teacher and develop hypotheses related to the problem. 2) Data collection, in this phase the teacher guides and facilitates students to find related concepts. with problems, meanwhile students collect information in various ways, such as reading e-modules, observing and listening to experimental videos and reading other sources to prove hypotheses. 3) data processing, in this phase the teacher guides students in understanding concepts and answering questions and solving problems, while students discuss with each other to answer questions and solve problems, and find concepts from the material being studied. 4) verification, in this phase students prove whether the hypotheses that have been prepared previously are correct, meanwhile the teacher guides students to compare the hypotheses that have been made by students at the problem identification stage with the conclusions drawn after students collect and process data. 5) closure, in this phase the students with the guidance of the teacher conclude the subject matter.

The results of the teacher observer observations during the implementation stage of the learning process were discussed in the next LSLC activity, namely the reflection stage (see). Reflection activities in the form of community discussions are carried out to find solutions to the problems and obstacles that occur at the do stage, so that the learning process at the next meeting can be improved to make it more efficient. Reflection activities are carried out through zoom meetings. The model teacher first conveys the teaching experience gained after the do stage, then other community members present arguments by providing suggestions and input for the improvement of the next learning process.

The study showed that at the 1st meeting, many students were still passive and rigid in the discussion, this was because students were not familiar with their group observers/observers, so they looked careful and not much community was seen in the discussion, this was clearly seen in the group. morning class, namely X MIPA 1. At the 2nd meeting the students have started to adapt to the conditions, on average each group has started to actively discuss. This can be seen from the increase in the number of students who are actively discussing in each group when compared to the previous meeting. At the third meeting, the number of students who actively participated in group discussions continued to grow, and only a small number of students did not participate in groups, namely seven out of 35 students. At this meeting the discussion had gone well and it was seen that students had been able to collaborate and communicate within group members and between groups.

Besides being able to improve student learning outcomes, lesson study has a positive influence on the quality of learning. The role of lesson study in the learning process using the guided discovery learning model is to be able to improve the quality of learning through observational data, with the observation of student activities being able to have a positive impact on students' activities and communication in conducting discussions so that learning based on concept discovery independently by students can do better. This is in accordance with research conducted by Erna (2021) that the implementation of a lesson study-based discovery learning model can improve mathematical communication for class X SMA. Research conducted by Asari (2018) states that lesson study activities have a significant effect on increasing teacher pedagogic competence and also increasing students' cognitive competence. Other research reveals that lesson study activities give meaning to the learning process in the form of increasing teacher competence so that it can improve the quality of student learning (Sahal, 2019).

Conclusion

Based on the results of research and data analysis that has been carried out, it can be concluded that there is an effect of applying the guided discovery learning model based on lesson study for learning community to improving students' cognitive learning outcomes on the reaction rate material at SMAN 1 Linggabayu. By obtaining the average final score of the experimental and control classes 81.43 and 72.29, respectively, and the n-gain average of 0.74 and 0.61.

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