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EFFECT OF GUIDED DISCOVERY LEARNING MODEL BASED ON LESSON STUDY LEARNING COMMUNITY ON THE CHEMISTRY OF MAIN GROUP ELEMENTS TOPICS

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Abstract: According to the students of senior high school SMAN 14 Padang, chemistry is one of the most challenging subjects. It causes the learning process in the classroom to be teacher-centered. Therefore, a suitable learning model is needed so that students are active in finding information to create student-centered learning. One of the appropriate learning models used is Guided Discovery learning with the lesson study learning community (LSLC) learning system. This study aims to determine the effect of the guided discovery learning model based on LSLC on the chemistry of main group elements on student learning outcomes at SMAN 14 Padang. The type of research used is a quasi-experiment. In this study, two classes were used, namely the experimental and control classes, with a simple random sampling technique. In the experimental class XII MIPA 2, the special treatment was applying a Guided discovery learning model based on LSLC on the chemistry of the main group elements. In the control class XII MIPA 3 without LSLC based. The data analysis techniques used were the normality test, homogeneity test, hypothesis test, and hypothesis testing with t-test. The results of data analysis with the normality test and homogeneity test that have been carried out obtained that the data is normally distributed and homogeneous, so hypothesis testing is carried out with the t-test. The learning outcomes of students who apply the guided discovery learning model based on LSLC can be significantly improved than those without LSLC based on the main group element chemical material at SMAN 14 Padang.

Keywords: *Guided Discovery Learning, Lesson Study for Learning Community, Learning Outcomes, The Chemistry of Main Group Elements*

INTRODUCTION

Implementing the 2013 curriculum with a scientific approach aims to provide an understanding to students in recognizing and understanding various materials with a scientific approach that information can be obtained from anywhere and anytime through observation, not only depending on information from the teacher. Implementing the scientific approach in the learning process includes process skills, such as observing, classifying, measuring, predicting, explaining, and concluding [1]. Curriculum 2013 demands a scientific learning system so that students are more active and creative in learning activities. teachers act as educators to control the class well and use the right learning model [2]. Learning models can be used in applying the scientific approach to chemistry learning [3].

The role of the teacher as a facilitator in the 2013 curriculum must create an interactive learning atmosphere and be able to explore the potential of students so that in the learning process, student activeness is achieved according to the expected goals. Teachers must be able to design learning supported by the selection of the right learning model so that the learning outcomes obtained by students are optimal [4].

Chemistry is a branch of Natural Sciences (IPA) that specifically studies the structure, composition, properties, and changes in matter and the energy that accompanies material changes [5]. elemental chemistry is abstract because the human senses cannot directly see it, but only through logic during the learning process [6].

Based on the results of the questionnaire that 67 students of the class have filled in XII SMAN 14 Padang, a percentage of 75% show that chemistry is a difficult subject, and 79.9% show that chemistry uses a lot of abstract material. In addition, the learning process in the classroom is rarely carried out in group discussion activities which are stated with a percentage of 47.4% so that students are more likely to get concepts from the teacher's explanation. It causes the learning process in the classroom to be teacher-centered. Therefore, a suitable learning model is needed so that students are active in finding information to create student-centered learning. One of the appropriate learning models used is Guided Discovery Learning.

Guided discovery learning is a learning model that develops an active way of learning for students to find and explore the information themselves so that the results obtained will be long stored in students' memory [7]. Guided discovery learning is a learning model that requires students to discover concepts with guidance and direction provided by the teacher in the form of questions, instructions, and brief directions so that the teacher's role is to correct incorrect information and provide the information needed [8].

Guided discovery learning has several advantages, including providing opportunities for

students to find concepts in solving a problem with guidance and instructions provided by the teacher. In addition, students' activities in finding information will create long-term memory on the concepts that have been discovered. Guided discovery learning can be applied with a learning system that supports the teaching-learning process in class. The learning system is Lesson Study for Learning Community (LSLC).

Lesson Study for Learning Community (LSLC) is a method of learning by forming a community of teachers who collaborate professionally on student learning, and parents play a role in the activity [9]. LSLC provides a space for teachers to design and strategize learning together with other teachers and evaluate the learning process to make improvements at the next meeting. In its implementation, LSLC has three stages, namely, the learning planning process (plan), learning implementation (do), and evaluation and reflection (see) [10]. The implementation of LSLC can help the application of the Guided discovery learning model run well and optimally.

The current study focuses on the Effect of the Guided Discovery Learning Model Based on Lesson Study for the Learning Community on the Chemistry Material of Main Group Elements on Student Learning Outcomes at SMAN 14 Padang.

RESEARCH METHODS

The type of research used is quasi-experiments or pseudo-experiments. In this study, two classes were used, namely, the experimental class and the control class. In the experimental class, the special treatment was the application of Guided discovery learning based on LSLC on the chemistry of the main group elements. This study used a pretest-posttest control group design.

The subjects in this study were XII MIPA class students at SMAN 14 Padang with the experimental class, namely class XII MIPA 2 and control class XII MIPA 3. The research time was conducted in 2023. Research instruments are tools for collecting, processing, analyzing, and providing information and data systematically and objectively to test research hypotheses [11].

This study uses test questions on the chemistry of the main group elements of class XII SMA as a research instrument. The validated test questions amounted to 40 questions in multiple choices. Then several trials were conducted to validate the instruments used. Validity Test The test is categorized as valid if the test can measure what we will measure. The evaluation data obtained is valid if the test is also valid [12].

Reliability Test a reliable instrument is an instrument that, if used to measure the same object several times, will produce fixed data [13]. The reliability test was conducted with Cronbach's alpha with a significance level of 5%. The test criteria are said to be reliable when the $_{count > table}$ value [14]. The question's differentiating power is the question's ability to distinguish students with high and low group abilities from their scores [15].

The level of difficulty of the problem can be known from the magnitude of the interval that symbolizes the level of difficulty of a problem. Generally denoted by the letter P (proportion) with intervals ranging from 0,00 to 1,00 [16]. Questions can be good if the criteria are not too easy or difficult [17]. Data analysis was carried out by the normality test, homogeneity test, and hypothesis testing.

The normality test is carried out to determine whether the data distribution is normally distributed [18]. The normality test was conducted using the Kolmogorov-Smirnov test. A homogeneity test was conducted using Levene's test. In the homogeneity test, the data is said to be homogeneous if it has a significance value > 0,05, while the data is inhomogeneous if the significance level is < 0,05 [19]. Hypothesis testing was carried out using parametric statistics because the data were normally distributed and homogeneous.

RESULTS AND DISCUSSION

The research was conducted in class XII MIPA SMAN 14 Padang, precisely in class XII MIPA 2 as the experimental class and XII MIPA 3 as the control class on the chemistry of the main group elements. The experimental class was treated by applying the guided discovery learning model based on LSLC, while the control class used the guided discovery learning model not based on LSLC. The research data collected is quantitative in the form of student learning outcomes. This data was obtained by giving a pretest and posttest in 20 multiple-choice questions. Tests are used to measure knowledge and competence [20]. Each question has been tested for validity, reliability, differentiability, and difficulty level. Questions tested and passed the criteria will be used as pretest and posttest questions. Pretest is conducted to test the initial ability of students [21]. The pretest and posttest data obtained were analyzed for normality, homogeneity, and hypothesis testing.

The normality test is carried out to determine whether the data distribution is normally distributed. The following are the normality test results of the research results obtained.

Table 1. Normality Test Results

Class	Statistics	Df	Sig	Description
Experimental	0.093	39	0.2	Normal
Control	0.113	38	0.2	Normal

The normality test was carried out using the Kolmogorov-Smirnov test through SPSS software, with the significance value of the experimental and control class groups being 0.200 > 0.05; this states that the data is normally distributed. Then it is concluded that the guided discovery learning model

based on LSLC effectively improves learning outcomes.

In the homogeneity test, the data is said to be homogeneous if it has a significance value > 0.05, while the data is inhomogeneous if the significance level is < 0.05. The following are the results of the homogeneity test obtained.

Table 2. Homogeneity Test Results

Levene Statistic	df1	df2	Sig	Description
0.581	1	75	0.448	Variant Homogen

Furthermore, the homogeneity test results obtained in the experimental and control classes were homogeneously distributed because they had a significance level > 0.05, namely 0.448.

The results of data analysis with the normality test and homogeneity test that have been carried out previously obtained that the data is normally distributed and homogeneous, then hypothesis testing is carried out with the t-test. The results of the hypothesis testing were carried out; the following data were obtained.

Table 3. Hypothesis Test Results

t-test	Description
0.047	Ha accepted Ho rejected

Based on the results of the hypothesis test conducted, the sig. (2-tailed) value of 0.047 < 0.05 is obtained, which means Ho is rejected, while Ha is accepted.

The experimental and control classes were given a pretest to determine students' initial ability and then a posttest after all meetings in the learning were completed. Based on the data that has been obtained, it can be seen that the average value of the experimental class pretest is 40.51 and the posttest value is 81.15, while the average result of the control class pretest is 38.42 and the posttest value is 74.61. These results show that each class has improved learning outcomes.

The difference in student learning outcomes between the experimental and control classes is due to the different treatments. After each class was given a pretest, then continued by applying the guided discovery learning model based on LSLC in the experimental class and the guided discovery learning model without LSLC based in the control class. The research was conducted with four meetings and assisted by Ulfa Khaira's guided discovery learning e-module, which has been validated. Guided discovery learning is a learning model that requires students to find concepts with guidance and direction provided by the teacher in the form of questions, instructions, and brief directions so that the teacher's role is to correct incorrect information and provide the information needed [22].

Guided discovery learning has five syntaxes that have been modified: motivation and problem prevention, data collection, data processing, verification, and closure [5]. Students' activeness in exploring information is expected to increase their understanding of the knowledge they find independently with the application of this guided discovery learning model. Teacher guidance in applying guided discovery learning helps students formulate hypotheses from the problems given. The teacher, as a facilitator, will explore students to find concepts so that students can conclude from the data collection and processing results that have been done [23].

LSLC itself is a learning system that has three stages, namely, the process of learning planning (plan), learning implementation (do), and evaluation and reflection (see) [7]. Before the learning begins, the model teacher and the community conduct the first stage of LSLC, namely the plan stage to plan to learn. The planning stage is offline by discussing lesson plans, Chapter Design, Future Mapping, Lesson Design, and learning media. The model teacher presents the prepared plan, then the observers will respond by providing suggestions and input.

Feedback and suggestions at the planning stage will be applied at the do stage. At this stage, the teaching-learning process is carried out offline according to the syntax of guided discovery learning. The first syntax of guided discovery learning is motivation and problem presentation. In this syntax, the model teacher facilitates students by providing motivation to increase their enthusiasm for learning and providing a problem that can stimulate students to think critically in finding solutions.

Then, in the second syntax, namely data collection, the teacher forms students into four groups to collect data in working on student worksheets by looking for answers from various sources. The observers observed the learning process. Observers observed the activities carried out by students in working on the student worksheets given. The results of the observers' observations are written in notes that will be discussed at the see stage in LSLC.

Furthermore, the third syntax is data processing; students in groups solve problems from the concepts they have understood. Learners process data obtained during discussions based on various relevant sources that have been previously understood. Then learners compare the results of their discussion with the hypothesis that has been made before. This stage is the fourth syntax application in guided discovery learning. One of the groups presented the results of their discussion accompanied by questions and answers, giving suggestions and additions between groups or additions from the model

teacher to strengthen the concept if there are areas for improvement in the discussion results.

The last stage in the guided discovery learning syntax, namely closure, is where students conclude the learning that has been carried out. The model teacher also provides evaluation and reflection on the learning that has been done. Teacher guidance in applying guided discovery learning helps students formulate hypotheses from the problems given. The teacher, as a facilitator, will explore students to find concepts so that students can conclude from the data collection and processing results.

The series of do carry out are discussed in the last stage of LSLC, namely the seed stage. This stage was also conducted offline with the observers, starting with the model teacher conveying what was felt during the learning process that had been carried out. Then the observers responded and provided criticism, input, and suggestions from the observers who had observed the teaching process. The reflection results are used as guidelines in preparing the next lesson plan [24-26]. The criticism, input, and suggestions given are used as improvements for implementing further learning so that better learning continues to be created at each meeting. The criticism, input, and suggestions given are used as improvements for implementing further learning so that better learning continues to be created at each meeting. Learning with the LSLC-based can improve the learning process because of the reflection to improve learning at the next meeting [27].

Based on the explanation described, it is concluded that the learning outcomes of students using the guided discovery learning model based on LSLC on the chemistry material of the main group elements increase significantly compared to the class that applies the guided discovery learning model not based on LSLC.

CONCLUSION

Based on the results of research and discussion, it is found that the application of the guided discovery learning model based on LSLC can improve students' learning outcomes in the chemistry material of the main group elements and attract students' attention in chemistry material learning. It shows that applying the guided discovery learning model based on LSLC on the chemistry material of the main group elements influences student learning outcomes at SMAN 14 Padang. Chemistry teachers should be able to use the guided discovery learning model based on LSLC in improving student learning outcomes.

REFERENCES

[1] Nurdyansyah, & Fahyuni, E. F. (2016). *Inovasi Model Pembelajaran Sesuai Kurikulum 2013*. Sidoarjo: Nizamia Learning Center.

[2] Hidayah, N., Muhlis, M., & Artayasa, I. P. (2021). Pengembangan Bahan Ajar Jaringan Tumbuhan Berbasis Discovery Learning Siswa Kelas XI SMA. *Jurnal Pijar Mipa, 16*(3), 358–365.

[3] Ellizar, E., Hardeli, H., Beltris, S., & Suharni, R. (2018). Development of Scientific Approach Based on Discovery Learning Module. *IOP Conference Series: Materials Science and Engineering*, *335*(1).

[4] Adhim, A. Y., & Jatmiko, B. (2015). Application of Guided Discovery Learning Model with Laboratory Activities to Improve Learning Outcomes of Class X Students on Temperature and Heat Material. *Journal of Physics Education Innovation (JIPF)*, *4*(3), 77-82.

[5] Hasibuan, M. P., & Silaban, R. (2017). Analisis Kualitas Buku Ajar Kimia Berbasis Kurikulum 2013. *Jurnal IPA & Pembelajaran IPA, 1*(2), 159–164.

[6] Putri, E. J., & Yerimadesi, Y. (2022). Effectivity of guided discovery learning supported with elemental chemistry e-module on students learning outcomes. *Jurnal Pijar Mipa, 17*(3), 375–379.

[7] Yerimadesi, Kiram, P. Y., & Lufri. (2017). *Buku Model Guided Discovery Learning untuk Pembelajaran Kimia (GDL-PK) SMA*. Padang: Unp Press.

[8] Jhonson, A. P. (2010). Making Connections In Elementary And Middle School Social Studies. Sage.

[9] Saito, E., Murase, M., Tsukui, A., & Yeo, J. (2015). *Lesson Study for Learning Community : a guide to sustainable school reform*. Third Avenue, New York: Routledge.

[10] Rejeki, S., Humaira, H., Maryani, S., & Nizar. (2018). Lesson Study For Learning Community (LSLC): Pengalaman Berharga Dalam Pengelolaan Pembelajaran Secara Terbuka. *INOPENDAS: Jurnal Ilmiah Kependidikan*, *1*(1), 54–60.

[11] Nasution, H. F. (2016). Instrumen Penelitian Dan Urgensinya Dalam Penelitian Kuantitatif. *Jurnal Ilmu Ekonomi Dan Keislaman*, *4*(1), 59–75.

[12] Arikunto, S. (2014). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Asdi Matraman.

[13] Sugiyono. (2015). *Metode Penelitian Pendidikan. Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

[14] Yusup, F. 2018. Uji Validitas dan Reliabilitas Instrumen Penelitian Kuantitatif. *Tarbiyah: Jurnal Ilmiah Kependidikan*, *7*(1).

[15] Naga, & Dali, S. (2002). *Pengantar Teori Skor pada Pengukuran Pendidikan*. Jakarta: Gunadarma.

[16] Bagiyono. (2017). Analisis Tingkat Kesukaran dan Daya Pembeda Butir Soal Ujian Pelatihan Radiografi Tingkat 1. *Widyanuklida*, *16*(1), 1–12.

[17] Arikunto, S. 2008. *Dasar-Dasar Evaluasi*

Pendidikan. Jakarta: Bumi Aksara
[18] Sugiyono. 2011. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
[19] Hartati, A., Wuryandari, T., & Wilandari, Y. (2013). Analisis varian dua faktor dalam rancangan pengamatan berulang (repeated measures). *Jurnal Gaussian*, *2*(4), 279–288.
[20] Mulyatiningsih, E. 2011. *Riset Terapan Bidang Pendidikan dan Teknik*. Yogyakarta: UNY Press.
[21] Putri, E. J., & Yerimadesi. (2022). Effectivity of Guided Discovery Learning Supported With Elemental Chemistry E-Modul on Students Learning Outcomes. J. Pijar MIPA, *17*(3).
[22] Jhonson, A. P. (2010). *Making Connections In Elementary And Middle School Social Studies*. Amerika: Sage.
[23] Arya Wulandari, I. G. A. P., Sa'Dijah, C., As'Ari, A. R., & Rahardjo, S. (2018). Modified Guided Discovery Model : A Conceptual Framework for Designing Learning Model Using Guided Discovery to Promote Student's Analytical Thinking Skills. *Journal of Physics: Conference Series*, *1028*(1).
[24] Luthfiani, A., & Yerimadesi, Y. (2022). Effectiveness of e-module based on guided discovery learning on learning outcomes of high school students. *Jurnal Pijar Mipa*, *17*(6), 770-774.
[25] Luthfiani, A., & Yerimadesi, Y. (2022). Effectiveness of E-Module Based on Guided Discovery Learning on Learning Outcomes of Higt Students. *Jurnal Fijar MIPA*, *17*(6), 270-774.
[26] Rustono, W. S. (2008). Meningkatkan Kemampuan Mahasiswa Menerapkan Strategi Pembelajaran Melalui Lesson Study di Sekolah Dasar. *Jurnal Pendidikan Dasar, 10*(1), 1–7.
[27] Defista, C., Andromeda, & Sovia, E. (2022). The Effect of Guided Inquiry Learning Model Based On Lesson Study For Learning Community On Chemical Equality Materials. *IJIS Edu : Indonesian J. Integr. Sci. Education, 4*(1), 40-44.