

Implementation of the Guided Inquiry Learning Model to Improve Student Chemistry Learning Outcomes in Vocational Schools**Judika Sereana Damayanti Lumbantobing^{1*}, Hartono^{2**}, Eddy Dharmansyah³**

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Abstract: Implementation of Guided Inquiry Learning Models do Improve Student Chemistry Learning Outcomes in SMK. This experiment aims to knowing the increase in student chemistry learning outcomes using guided inquiry models and describe the learning process by using a guided inquiry model. This experiment is a classroom action research. On top that, this experiment is carried out in the class of XI TAV SMK N 4 Palembang, with 37 students. There are two cycles in this experiment through the steps : plan, action, observation, reflection. Based on the experiment result, there are improvements of learning outcomes, which are in the first cycle obtained that the percentage of students having the learning outcomes about the default value (KKM) 75 is about 45,95% and the second cycle is around 86,49%. That means there is a improvement of percentage from cycle I to II. The target percentage specified is 85% which means this experiment could be said successful in increasing learning outcomes.

Keywords: guided inkuiri, learning outcomes

▪ INTRODUCTION

Education is one of the important fields in educating the nation's next generation. In the era of globalization, education has the aim of developing intellectuals, attitudes and skills. One way to produce a better learning process in schools carried out by the government is by updating the curriculum. The implementation of the 2013 curriculum focuses on student-centered learning activities so that students become more active (Kurniawati et al., 2016).

Chemistry is a science that is widely applied in everyday life. This should make it easier for students to study chemistry lessons, however, in reality students still often face difficulties, because it contains many concepts. As a result, students become less interested in studying chemistry. In studying chemistry, you need to understand very basic concepts which will later be able to realize other related concepts.

Based on observations with the chemistry teacher of class (b) students' understanding of chemistry concepts is still relatively low because the academic abilities of students in vocational schools come from the lower middle class. This is what causes students' chemistry learning outcomes to only reach 40% passing with the minimum completeness criteria (KKM) being 75. So that students' cognitive learning outcomes in chemistry lessons have not yet reached the classical completeness criteria of 85%.

Learning objectives will be achieved by being influenced by the teacher's choice of learning model. The learning model chosen by the teacher in learning activities must be in accordance with the material and also the characteristics of the students. Students can be helped by applying learning models, such as in obtaining information, ways of thinking and ideas, skills (Suprijono, 2011). Implementing innovative learning models in learning

will create more conducive learning conditions. Innovative learning models can develop students' knowledge independently (Trianto, 2011).

One of the materials in chemistry that contains many concepts is colloids. This material is very closely related to everyday life. This material requires an in-depth understanding of the concepts, not just memorizing them, but in reality students still tend to only memorize the material (Rohmawati et al., 2016). Based on the characteristics of colloidal and polymer materials, the guided inquiry learning model is suitable for use.

The guided inquiry learning model is effective in helping teachers motivate students to ask questions which is an important part of inquiry-based learning. This learning model also encourages students to discover concepts for themselves and makes students understand the concepts and remember them (Assriyanto et al., 2014). Apart from that, the guided inquiry model can grow students' self-confidence and can improve students' cognitive learning outcomes.

Based on previous research conducted by Setiowati (2015), the application of the guided inquiry learning model equipped with Student Worksheets (LKS) resulted in cognitive achievement of 56% in cycle I and 84% in cycle II. Meanwhile, research conducted by Rohmawati (2016) using the cognitive improvement inquiry model averaged 83.33 and 80.22. The application of the guided inquiry learning model based on the research above shows that students' conceptual understanding of chemistry material increases so that students' chemistry learning outcomes improve.

Based on this description, researchers are interested in carrying out research with the title: "Implementation of the Guided Inquiry Learning Model to Improve Student Chemistry Learning Outcomes in Vocational Schools."

The formulation of the problem in this research is how can the implementation of the guided inquiry learning model improve the chemistry learning outcomes of class X students at SMK Negeri 4 Palembang? The limitations of the problem in this research are learning outcomes from the cognitive aspect. Cognitive aspects are seen from student learning achievement tests.

The aim of this research is to improve the chemistry learning outcomes of class XI students at SMK Negeri 4 Palembang through implementing the guided inquiry learning model and describing the learning process using the guided inquiry model.

This research has benefits for students in improving learning outcomes so that students will be more interested in learning more deeply about the chemistry material studied at vocational school; for teachers for consideration in choosing appropriate learning models in the teaching and learning process, especially in chemistry learning; for schools to contribute to improving the quality of chemistry learning at SMK Negeri 4 Palembang; for researchers to increase their insight, abilities and experience in improving their competence as prospective teachers.

▪ **METHOD**

This classroom action research was carried out in class XI TAV at SMK Negeri 4 Palembang Jl. Sergeant Sani No.1019. All 37 students were used as research subjects, with details of 22 men and 15 women. This research was carried out in the even semester of the 2017/2018 academic year.

Implementation of Activities

This classroom action research was carried out in 2 cycles. Each cycle consists of four activity stages, namely: planning, action, observation and reflection. At the planning

stage, the activities carried out are determining learning materials, then preparing a Learning Implementation Plan (RPP) which will be implemented using the Guided Inquiry learning model, compiling Student Worksheets (LKPD) for learning activities, compiling observation sheets, compiling final evaluation test instruments.

After making a plan, action is taken, namely carrying out learning activities using the Guided Inquiry learning model. The RPP and LKPD have been prepared by researchers as a reference in implementation activities. At the end of the first cycle of action, students were given a learning outcomes test which was carried out individually to see whether there was an increase in student learning outcomes using the Guided Inquiry learning model.

Next is the observation stage which is carried out simultaneously during the learning action stage. At this stage, observers are assisted in observing the activities carried out by students during the learning process with the aim of finding out the conditions in which teaching and learning are carried out by designing a Learning Implementation Plan using the Guided Inquiry model.

At this reflection stage, observers and researchers discuss things that need to be improved in making decisions about planning the next action. The reflection stage includes implementing the Guided Inquiry learning model, learning tools, learning implementation activities, reflecting on learning outcomes obtained from learning evaluations. The conclusions drawn are then used as a basis for the planning stage that will be implemented in cycle II.

The next stage in cycle II is adjusted to the conditions obtained from the actions carried out in cycle I. The activities in the next cycle are the same as the activities in cycle I, consisting of planning, action, observation and reflection.

Data Collection Technique

Data collection techniques in this classroom action research were carried out using tests. The test in the research was used to measure students' chemistry learning outcomes after the learning process using the Guided Inquiry model. The form of test used in this research is multiple choice with 15 questions. This question will be given to students as a measure of student knowledge at the end of each cycle so that the end-of-cycle test results provide data on students' cognitive aspects.

Data Analysis Technique

In this research, a descriptive method was used by comparing learning outcomes before the action with learning results after the action. Data is calculated using the following steps:

Recapitulate learning results before action and test scores at the end of cycle I and subsequent cycles. Calculate the average score and classical learning completeness of student learning outcomes before action is taken with learning outcomes after action is taken in cycle I, and the next cycle to determine whether there is an increase in learning outcomes.

Average student learning outcomes are calculated using the formula:

$$X \text{ rata - rata} = \frac{\sum X_i}{N}$$

Keterangan:

$\sum Xi$ = Jumlah nilai siswa

N = Jumlah siswa

$$P = \frac{\sum n1}{\sum n} \times 100$$

Information:

P = Classical learning completeness value

$\sum n1$ = Number of students who have completed individual studies (score ≥ 75)

$\sum n$ = Total number of students

Student cognitive learning outcomes can be calculated using the following formula:

$$nilai = \frac{\sum jawaban\ benar}{\sum seluruh\ soal} \times 100$$

Work Indicator

This classroom action research is said to be successful if there is an increase in student learning outcomes, namely classically 85% of students have achieved a minimum completion criteria score of 75.

▪ RESULT AND DISCUSSION

Research Results

This research consists of two cycles, each cycle consisting of two meetings. Cycle I studies the colloid system, types of colloids, and the properties and role of the colloid system. Cycle II studies the manufacture of colloids and polymers. Student cognitive learning outcomes tests are carried out at the end of each cycle.

Description of Research Results for Each Cycle Cycle I

Planning Stage

At this stage, the researcher determined the learning material for cycle I. The learning topic for the first meeting was colloid systems and types of colloids. The second meeting is the properties and role of colloid systems. The next activities are preparing a lesson plan that will be implemented in accordance with the Guided Inquiry learning model, compiling Student Worksheets (LKPD) for learning activities, compiling observation sheets, compiling final evaluation test instruments for cycle I.

Action Stage

The first meeting with the topic of colloid systems and types of colloids was held on April 18 2018. The second meeting was held on April 25 2018 and studied topics related to the properties and application of colloid systems. The steps for learning activities are carried out in accordance with the RPP that has been prepared.

Observation Stage

Observations are carried out during the learning process through a guided inquiry learning model. At this stage the observer observes the activities carried out by students during the learning process and records the results on the observation sheet.

The first meeting discussed the topic of colloid systems and types of colloids. Learning begins with preliminary activities of saying hello, checking student attendance, giving an apperception, conveying motivation by displaying 2 pictures and asking questions. After that, the researcher conveyed the learning objectives and formed 8 groups consisting of 4-5 people. The researcher distributed LKPD to each group and explained the work instructions contained in the LKPD.

The core activity begins with the stage of asking questions or problems. The researcher delivered an introduction to learning about the differences between solutions, colloids and suspensions with demonstrations. This activity was assisted by student number 13. During the demonstration activity the researcher directed each group to pay attention to the questions on the LKPD. Next, at the stage of formulating a hypothesis, the researcher directs students in each group to determine the hypothesis from the questions on the LKPD according to the demonstration presented by the researcher. Then continued with the data collection stage, each group collected information from teaching materials and reading books and the researcher gave each group the opportunity to ask questions if there was something unclear, then the researcher guided students to discuss colloid systems and types of colloids. The activity continued with the data analysis stage, each group presented the results of their discussion in the LKPD that had been provided by the researcher. And the researcher appointed one of the groups, namely group 7, to present the results of their group discussion. The core activity ends with the stage of making conclusions about the topic studied. There were 2 students who raised their hands to convey the conclusions obtained, namely students number 27 and 32. Next, the researcher gave praise or appreciation for the students' participation.

Closing the learning activity, the researcher instructed each group to collect LKPD. The researcher presented the topic that will be studied at the next meeting regarding the properties and role of colloid systems. Then the researcher closed the lesson by saying hello.

The second meeting discussed the topic of the properties and role of colloid systems. The preliminary learning process is the same as in the previous meeting, namely starting with greetings, checking student attendance, conveying apperception by asking questions related to the material previously studied. After that, the researcher conveyed motivation by displaying pictures and conveying learning objectives. Next, the researcher directed students to sit in groups that had been determined previously. The researcher distributed LKPD to each group and explained the work instructions contained in the LKPD.

The core activity begins with the stage of asking questions or problems. The researcher delivered an introductory lesson about the properties and role of colloid systems. Next, at the stage of formulating a hypothesis, the researcher directs students in each group to determine the hypothesis from the questions on the LKPD. Then continued with the data collection stage, each group collected information from teaching materials and the researcher gave each group the opportunity to ask if there was something unclear, then the researcher guided students to discuss the properties and role of the colloid system. The activity continued with the data analysis stage, each group presented the results of their discussion in the LKPD that had been provided by the researcher. And the researcher appointed one of the groups, namely group 1, to present the results of their group discussion. At this stage, student number 27 provided responses regarding the results of the discussion that had been submitted by group 7. The core activity ended with the stage of making conclusions about the topic being studied. Student number 15 raised his hand

to convey the conclusions obtained. Researchers direct students to give praise or appreciation for the student's participation.

Closing the learning activity, the researcher instructed each group to collect LKPD. Next, the teacher gave a final learning outcomes test for cycle I. After the students worked on the final cycle learning outcomes test questions, the researcher presented the topic that would be studied at the next meeting regarding making colloids. The researcher closed the lesson by saying hello.

Reflection Stage

Increasing student cognitive learning outcomes can be seen from the average learning outcomes and student learning completion. Students' cognitive learning outcomes can be seen after the first cycle (T1) in Table 1.

Table 1. Student cognitive learning results after cycle I actions

Predikat	Skor	Jumlah Siswa	Ketuntasan Belajar	Rata-rata Belajar	Hasil
A	$86,00 \leq N < 100,00$	3	45,95%	64,11	
B	$75,00 \leq N < 86,00$	14	(Tuntas)		
C	$55,00 \leq N < 75,00$	5	54,05%		
D	$00,00 \leq N < 55,00$	15	(Tidak tuntas)		
Jumlah		37 orang	100%		

Based on data analysis that has been carried out on learning observations during two meetings in cycle I, it is known that the average student learning outcome is 64.11. Learning completeness of 45.95% indicates that classical completeness has not been achieved, so corrective action needs to be taken in the learning process in the next cycle. The weakness of learning in cycle I is that there are still students who do not pay close attention to the material being studied and are still less active in group activities. Apart from that, in data collection activities there were several groups that did not have reading books that could be used as references in answering questions in the LKPD. Another weakness is that the number of students who want to ask questions, respond or conclude is still small.

The follow-up plan for cycle II was prepared based on the learning weaknesses in cycle I, namely that the researcher paid more attention to students who were less active by meeting them directly in groups. Then tell students to each have a chemistry reading book by borrowing a book from the library. Then the researcher will give awards to active students to make them more motivated in learning activities.

Cycle II

Planning Stage

The activities carried out in cycle II for the planning stage were determining the learning material, namely making colloids at the first meeting and at the second meeting continuing with polymer material. Based on the reflection results of cycle I, the RPP will be implemented in accordance with the guided inquiry learning model, compiling LKPD for learning activities in cycle II, compiling observation sheets, and compiling final evaluation test instruments for cycle II.

Action Stage

Learning activities are carried out in accordance with the RPP that has been prepared. The first meeting was held on May 2 2018 studying the topic of making colloids. The second meeting was held on May 9 2018 with the next topic, namely polymers.

Observation Stage

The first meeting discussed the topic of making colloids. The learning process begins with preliminary activities, namely the researcher saying hello, checking students' attendance, conveying apperception by asking questions related to the material that has been studied previously. After that, the researcher conveyed motivation and conveyed the learning objectives. Next, the researcher directed students to sit in groups that had been determined previously. The researcher distributed LKPD to each group and explained the work instructions contained in the LKPD.

The core activity begins at the stage of asking questions or problems. The researcher delivered an introductory lesson on making colloids. Next, at the stage of formulating a hypothesis, the researcher directs students in each group to determine the hypothesis from the questions on the LKPD. Then continued with the data collection stage, each group collected information from teaching materials and the researcher gave each group the opportunity to ask questions if there was something unclear, then the researcher guided the students in discussions related to making colloids. The activity continued with the data analysis stage, each group presented the results of their discussion in the LKPD that had been provided by the researcher. And the researcher appointed one of the groups, namely group 4, to present the results of their group discussion. At this stage, group 4 gives other groups the opportunity to ask questions and respond. The core activity ends with the stage of making conclusions about the topic studied. Student number 31 conveyed the conclusions obtained based on the results of discussions in his group. The researcher directed students to give praise or appreciation to each student who provided responses.

Closing the learning activity, the researcher instructed each group to collect LKPD. The researcher conveyed the topics that would be studied at the next meeting regarding polymers. The researcher closed the lesson by saying hello.

The second meeting discussed the topic of polymers. The preliminary learning process is the same as in the previous meeting, namely starting with greetings, checking student attendance, conveying apperception by asking questions related to the material that has been studied previously. After that, the researcher conveyed motivation by displaying pictures and conveying learning objectives. Next, the researcher directed students to sit in groups that had been determined previously. The researcher distributed LKPD to each group and explained the work instructions contained in the LKPD.

The core activity begins at the stage of asking questions or problems. The researcher delivered an introduction to learning about polymers. Next, at the stage of formulating a hypothesis, the researcher directs students in each group to determine the hypothesis from the questions on the LKPD. This was then continued with the data collection stage, then the activity continued with the data analysis stage, each group presented the results of their discussion in the LKPD that had been given by the researcher. And the researcher appointed one of the groups, namely group 2, to present the results of their group discussion. At this stage, group 2 gives other groups the opportunity to ask questions and respond. Student number 29 from group 7 asked a question about the results of the

discussion submitted by group 4. "In LKPD question number 3, why are cars made from plastic bottles included in thermoplastic polymers and not included in thermosetting polymeth?". The answer from group 4 "used plastic bottles will soften when heated, so that the properties that soften easily are included in thermoplastic polymers." The core activity ends with the stage of making conclusions about the topic studied. Student number 33 conveyed the conclusions obtained based on the results of discussions in his group. The researcher directed students to give praise or appreciation to each student who provided responses.

Closing the learning activity, the researcher instructed each group to collect LKPD. Next, the teacher gives a test on learning outcomes at the end of cycle II. After the students worked on the final cycle learning outcomes test questions, the researcher presented the topic that would be studied at the next meeting regarding polymer formation reactions. The researcher closed the lesson by saying hello.

Reflection Stage

Students' cognitive learning results can be seen after the actions of cycle II (T2) in Table 2.

Table 2. Student cognitive learning results after cycle II actions

Predikat	Skor	Jumlah Siwa	Ketuntasan Belajar	Rata-rata Belajar	Hasil
A	$86,00 \leq N < 100,00$	17	86,49% (Tuntas)	82,51	
B	$75,00 \leq N < 86,00$	15			
C	$55,00 \leq N < 75,00$	5	13,51 %		
D	$00,00 \leq N < 55,00$	0	(Tidak tuntas)		
Jumlah		37 orang	100%		

Based on data analysis carried out on the results of learning observations during two meetings in cycle II, it was found that the average student learning outcome was 82.51. Classical student learning completeness was 86.49%, which shows that there has been an increase in the average student cognitive learning outcomes. Completeness of students' cognitive learning outcomes in cycle I was 45.95%, increasing to 86.49% in cycle II. Learning completeness in cycle II has reached classical learning completeness, namely $\geq 85\%$ of students reaching the KKM.

Discussion

Classroom action research conducted at SMK Negeri 4 Palembang was carried out to determine improvements in student chemistry learning outcomes using the guided inquiry learning model. The class used in this research is class XI TAV. This classroom action research was carried out in 2 cycles and 2 meetings each.

The guided inquiry learning model is a learning model that can improve students' cognitive learning achievement by providing opportunities for students to learn according to their learning style and is able to meet the needs of students who have above average skills (Hamruni, 2012). Guided inquiry learning will enable students to develop the concepts they learn. Students are also given the opportunity to exchange information with their peers in group discussion activities. This learning model also makes students more enthusiastic about learning (Sumarni et al., 2017).

In this study, students' cognitive learning outcomes in cycle I were seen through the end-of-cycle test. The average student cognitive learning outcomes in cycle I was 64.11

and students' classical learning completeness in cycle I was 45.95%. Based on these data, it shows that students' learning completeness in cycle I has not reached the classical completeness criteria of $\geq 85\%$ and there are still weaknesses found so that the research continues to cycle II. In the final test of cycle I there were 2 students who were only able to answer 5 test questions correctly and got a score of 33. This was the lowest score in cycle I.

Based on observation and reflection data, the results showed that during the first cycle learning process there were weaknesses, including, at the core activity stage of asking questions or problems, there were still students who did not pay proper attention to the topic being studied. Apart from that, at the data collection stage there were several groups (groups 6 and 8) who did not have reading books that could be used as references in answering questions in the LKPD and at the data analysis stage there were still students who were less active in group activities or did not focus on questions or problems being discussed in the group. Another weakness is that the number of students who want to ask questions, respond or conclude is still small. The weaknesses that occurred in cycle I were corrected, so a plan for corrective action was created in cycle II, namely, researchers paid more attention to students who were less active by meeting them directly in groups. Then tell students to each have a chemistry reading book by buying or borrowing a book from the library. Then the researcher will give awards to active students to make them more motivated in learning activities.

Students' cognitive learning outcomes in cycle II can be seen from the end of cycle test. The lowest score in cycle II was 60 and there were 3 students who got the lowest score and one of them was the student who also got the lowest score in cycle I. The average cognitive learning outcomes of students in cycle II was 82.51 and student learning completeness classically in cycle II it was 86.49%. Based on these data, it shows that students' cognitive learning completeness in cycle II has reached the classical completeness criteria of $\geq 85\%$ so the research was stopped. The increase in classical completeness of student learning outcomes is presented in Figure 1.

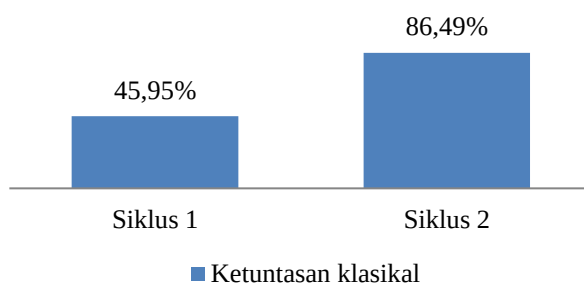


Figure 1. Percentage of classical completion

These results show that the implementation of the guided inquiry learning model is able to improve student chemistry learning outcomes. This is because in learning using this model students are trained or accustomed to solving problems so that students become active in the problem solving process. This is in accordance with research conducted by Gustiah et al., (2018).

▪ CONCLUSION

Based on the research objectives, a conclusion can be obtained, namely: Implementation of the guided inquiry learning model can improve chemistry learning

outcomes for class XI students at SMK Negeri 4 Palembang. This was obtained from an increase in completeness and the average of students' cognitive learning outcomes from cycle I and cycle II. The learning process using the guided inquiry model in this research involves students in formulating problems, formulating hypotheses, collecting data, analyzing data and making conclusions, therefore students find their own concepts through group discussion activities so that the concepts obtained will be easily remembered by students so they are able to improve learning outcomes.

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