Implementing guided inquiry: The influence towards students’ activities and communication skill

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Abstract. The aim of this research is to identify the effect of guided inquiry on students’ activities and communication skill in chemistry. The population was all eleventh grade high school students in SMAN 2 Wates. The samples of this study were obtained by using random sampling technique. The samples consist 48 students, with 21 students in class XI MIPA 2 as an experimental group and. 27 students in class XI MIPA 4 as control group. While the students of experimental group were taught using guided inquiry and the students of control group were taught using expository learning. Data of this research were collected by using questionnaire and observation for students’ activities and communication skill. The data were analyzed by using Multivariate Analysis of Variance (MANOVA) test whereas the significant level used was 0.05. The results show that there were significant differences between students who were taught using guided inquiry and students who were taught using expository. This study demonstrates that guided inquiry is significantly more effective to improving student’s activity and communication skill than the expository learning which are usually applied by teachers in class.

1. Introduction
The learning process in the curriculum applied in Indonesia has changed from teacher centered to student centered. The teaching and learning process in the 2013 curriculum provides opportunities for students to build and develop their own knowledge. But in reality, there are still schools that implement teacher-centered learning. Teachers still believe that students will become smarter if more and more know about the facts so that learning is only seen as an activity to remember / memorize facts. In such learning, students tend to emphasize the process of transferring knowledge rather than building knowledge [1]. This causes students to become less involved in building their knowledge.

The teacher has a role to create learning that is fun and interesting so that students can be actively engaged in learning activities. For example using appropriate learning methods or models. Inquiry is learning where students find and use various sources of information and ideas to improve understanding of a problem. Students do not merely submit and answer questions but are supported by investigation, exploration, search, quest, scientific research and study [2]. Muslich[3] reveals the characteristics of inquiry learning emphasize on the activities of students maximally to search and find, so that students act as the subject of learning. There are several types of inquiry, such as confirmation, structured inquiry, guided inquiry and open inquiry[4]. Guided inquiry used in this study is learning based on constructivist theory where knowledge is built into the minds of students[5]. Guided inquiry learning is carried out with the teacher as a facilitator to guide and direct students in classroom activities.

Communication skills is one skill competencies that must be owned by human resources in the 21st Century (21st Century Learning Partnership Framework). Communication is an activity of exchanging
information both verbally and nonverbally [6]. Communication skills can be developed through collaboration and discussion in learning. In the steps of inquiry learning, communication can be trained through a discussion process in finding problem formulations, conducting investigations and conclusions. In this step, students are trained to be able to interact well with friends or teachers.

Several studies that have implemented guided inquiry in learning have been conducted by several researchers. Mohammed, et al. [7] showed that there was an effect of guided inquiry learning and modified free inquiry on learning achievement. Conway [8] pointed out that the final exam score in the group that used guided inquiry was higher than the group using half guided inquiry and non-guided inquiry. Bilgin [9] conclude that students have develop their performance of acid and base concepts and positive attitude toward guided instruction better than students are studies with alone. Guided inquiry learning was indicated as a strong positive predictor for students achievements, and its effect was also positively associated with student interest [10].

The main purpose of this study was to investigate the effects of guided inquiry learning toward students’ activity and communication skill. The study was done by following research question: (1) Is there a significant mean difference between experimental group and control group on students’ activity and communication skill? (2) Is there an effect of guided inquiry on students’ activity and communication skill?

2. Method

Post-test only control group quasi experimental design was used in this study. This study aims to determine the effect of inquiry learning on the activities and communication skills of students.

This research was conducted at a high school in Kulon Progo district in the second semester of 2017. Population in this study was all eleventh grade students in SMAN 2 Wates. With randomly technique sampling, forty eight students from two classes were used as samples, namely the XI MIA 2 class as the experimental group using the guided inquiry learning and the XI MIA 4 class as a control group using expository learning. The research design is shown in table 1.

| Table 1. Research design |
|---------------------------|
| Group | Treatment | Postes          |
|-------|-----------|-----------------|
|       | X         | A<sub>1</sub>B<sub>1</sub> |
| Control |          | A<sub>2</sub>B<sub>2</sub> |

Description :
X : Guided inquiry learning
A<sub>1</sub> : Communication skill questionnaire after applied guided inquiry learning
A<sub>2</sub> : Communication skill questionnaire after conventional learning
O<sub>1</sub> : activity questionnaire after applied guided inquiry learning
O<sub>2</sub> : activity questionnaire after conventional learning

The study was conducted for 4 weeks in each class. The experimental class is carried out using guided inquiry learning, where students find knowledge/information related to the subject independently with the guidance of the teacher. While in the control class that uses expository learning, students listen to the teacher’s explanation of the subject in front of the class. Data collection was carried out using questionnaires of communication skills and activities provided as post test. In addition to using questionnaires, observation sheet is used to see students' activities and communication skills were also carried out during the learning process. The activities of students observed in this study are visual activity, listening activities, writing activities and motoric activities. Based on the observation, at the initial meeting (first meeting), the activities of students in the control and experimental classes were not much different. But at the next meeting, the activities of the two classes looked different. This difference can be seen from the activeness of students when conducting group discussions, practicing, and looking for reference sources. In practicum activities, experimental students found their own procedures for
conducting lab work from various sources/references. Whereas in the control class, practicum procedures have been prepared.

The data obtained were analyzed using MANOVA to see whether or not there were differences in activity and communication skills between the control class and the experimental class. Subsequently, partial eta-squared calculations were performed to see how much influence inquiry learning had on activities and communication skills.

3. Discussion and Result
After the data collected, it will be proceed with manova statistical analysis. However, before the manova test is carried out, multivariate normality test and homokedasticity must be tested first as a prerequisite test. Normality test in this study using mahalanobis vs chisquared statistics using SPSS 20 for windows. The percentage of mahalanobis values from both classes was 59% for the experimental class and 52% for the control class. This values shows that data from both classes is normally distributed.

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Table 2. Descriptive Statistics

| Group      | Variable     | Mean   |
|------------|--------------|--------|
| Experimental| Activity     | 69.6653|
|            | Communication skills | 36.206 |
| Control    | Activity     | 65.2192|
|            | Communication skills | 32.3502|

The results of the analysis using manova techniques with the Hotelling’s trace test can be seen in table 3.

Table 3. Summary of MANOVA

| Effect            | F      | Sig. |
|-------------------|--------|------|
| Pillai’s Trace    | 3.485b | .039 |
| Wilks’ Lambda     | 3.485b | .039 |
| Hotelling’s Trace | 3.485b | .039 |
| Roy’s Largest Root| 3.485b | .039 |

Based on the results in the table, Hotelling’s Trace shows that the significance value is 0.039 (p <0.05). These results indicate that at a 95% confidence level, there is a significant difference between experimental class that use guided inquiry and control classes that use conventional learning in terms of activity and communication skills. Furthermore, to see the influence of the learning model on each dependent variable (activity and communication skills) can be seen in the results of the Test of Between Subject Effects on the table 4.

Table 4. Test of Between Subjects

| Dependent Variable | Mean Square | F      | Sig. |
|--------------------|-------------|--------|------|
| Activity           | 233,503     | 4.550  | .038 |
| Communication      | 175,626     | 5.601  | .022 |

The table shows that the significance value for student activity is smaller than the significance level (0.05). This shows that there is a significant difference between the control class and the experimental class in terms of the activities of students. The same thing can be seen in communication skills that show a significance value of 0.022 (p <0.05), which shows that there are significant differences between experimental class that use guided inquiry learning and control class that use conventional learning. To
see how much influence the learning model has on each variable, Partial Eta Squared is used. Table 5 shows the partial eta squared values for activity variables and communication skills, respectively 0.090 and 0.109, meaning that inquiry learning affects student activity by 9% and communication skills by 10%.

| Source | Dependent Variable | Sig. | Partial eta-squared |
|--------|--------------------|------|---------------------|
| Intercept | Activity | .000 | 0.989 |
| | Communication | .000 | 0.975 |
| Model | Activity | .038 | 0.090 |
| | Communication | .022 | 0.109 |

Activity data and communication skills were obtained from questionnaires given to both classes after being given treatment. The results of the data analysis showed that there were significant differences in activity and communication skills between classes using guided inquiry and classes that were taught using expository. These results are supported by observations on communication activities and skills that are carried out during the learning process. The difference in the average student activity between experiment and control class can be seen in Table 2. Students who use expository learning are less involved because in learning activities, the teacher is more dominant in directing lessons and solving a problem. Guided inquiry learning is developed based on constructivism learning theory [11-13]. Student-centered learning in constructivism theory allows students to be more active in the process of discovering their knowledge. Teachers are advised to use student-centered learning such as problem based learning, peer lead team learning, or process oriented guided inquiry learning [14]. Learning process that involves students can minimize passive students so that students can express their ability to develop optimally.

Communication skills in this study are verbal communication in expressing opinions, questions and presentations. Students in the experimental class look more active and enthusiastic in presenting results, expressing opinions and giving responses to other groups. The average communication skills of the experiment and the control class can be seen in Table 5. These results are consistent with the research conducted by Iswatan, et al.[15] which shows the inquiry learning model improves communication skills as one of the aspects of science process skills. In the inquiry learning, students are trained to communicate through discussion activities so that communication skills can be improved.

The implementation of guided inquiry learning in this study is not optimal because students and teachers are not used to applying it in daily learning. Guided inquiry learning is a good approach for teachers who have not experienced implementing open inquiry [16]. Koksal & Berberoglu [17] revealed that guided inquiry learning is the transition from teacher centered to student centered. So to get optimal learning, students and teachers must use guided inquiry learning periodically.

4. Conclusion
Based on the results and discussion, it can be concluded that guided inquiry learning affects students' activities and communication skills. In more detail, the results of the study indicate that there are significant differences in communication activities and skills between the experimental class and the control class.

Researchers suggest that guided inquiry learning can be done periodically so that it can be applied more optimally in order to enhance students' activities and communication skill. In addition, further research needs to be carried out using guided inquiry models to improve other aspects of the learning process.

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