The Effect of Focus Group Discussion Learning Method on Cognitive Ability and Cooperation Skills of Students on Redox Material

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Abstract

This research was motivated by the misconceptions about teacher learning methods in chemistry subjects. This study aims to determine the effect of Focus Group Discussion method on cognitive abilities and cooperation skills of students on redox material. The research method used is quasi experiment. The results showed that the application of learning with the Focus group discussion method was more effective than the lecture method. Based on the statistical analysis test of the cognitive ability of the experimental class, the average value of the pretest and posttest was 62.79 and 74.85, respectively. In the control class, the average pretest and posttest scores were 61.76 and 69.41, respectively. The results of the cooperation skills analysis test of the experimental class obtained an average value of 63, 35, and 75, 76. In the control class, the average pretest and posttest scores were 29.65 and 38.47, respectively. Overall, the data showed that the application of the Focus Group Discussion learning method was able to improve the cognitive abilities and cooperation skills of students in understanding abstract concepts in redox material. Thus, the Focus Group Discussion method is potential to be applied in other STEM learning materials to encourage active attitudes and critical thinking of students in learning.

Keywords: Cognitive Ability, Cooperation Skills, Focus Group Discussion Method

INTRODUCTION

A lesson is ideal if a teacher appropriately conveys learning material, is easy to accept, and is accompanied by adequate knowledge from a teacher of the subject being taught (Suyono & Hariyanto, 2012). In learning chemistry, especially redox material, an ideal teacher role is needed to support the development of students' thinking concepts and cooperation attitudes to facilitate students in finding learning solutions. Efforts in the teaching process are significant because these efforts present the teacher with a way of achieving an educational goal (Sutikno, 2009). Therefore, every teacher must provide appropriate learning methods to realize the indicators and essential competencies of learning (Rusman, 2011).

Chemistry learning is learning that emphasizes abstract concepts and is difficult for students to understand. This is related to the complexity in the development of redox reactions both regarding changes in oxidation numbers, changes in electrons, and reactions that occur. The misunderstanding of students related to redox which is microscopic in cases such as students' understanding of the theory and examples of redox reaction applications in everyday life also requires teachers to create learning conditions that can provide easy understanding for students. According to (Barke et al., 2009), the cause of these misconceptions is students' preconceptions of student learning. The need for students to understand redox reaction material

is also influenced by the need for students to be better prepared to master the concept of redox (Fajarianingtyas et al., 2018). In this case, many occur when students understand the reduction and oxidation reactions that occur, both when there is a change in bilox and electrons, as well as understanding or determining the position of compounds or elements that act as reductants and oxidizers. A big challenge for a teacher in teaching redox material is to involve the active role of students in learning. As well as changing the concept of teacher center learning to student center which can be applied through group discussions. The teacher must ensure that the discussion remains focused on the learning objectives and does not deviate from the main topic.

The Focus Group Discussion (FGD) method is one of the learning methods that can be an alternative to support students' activeness in learning chemistry. This is by research conducted by (Widayati, 2019), which states that students' learning outcomes and activities have increased significantly through FGD learning. Focus Group Discussion (FGD) collects data and information through group discussions (Bisjoe, 2018). In the Focus Group Discussion (FGD) learning method, there is interaction between students in which students exchange ideas and opinions (Elfi & Fitrianingsih, 2017) so that the learning process encourages students to gain broader knowledge related to learning materials.

The teacher's delivery technique affects the development of students' cognitive abilities in processing, remembering, and transmitting information related to redox material (Darouich et al., 2017). In addition, the teacher's learning media also affects students' cognitive abilities (Handayani et al., 2016). So, the role of a teacher is to provide learning. Teachers are also required to foster the active role of students in learning. Cooperation skills are one of the aspects that students in learning need. Cooperation occurs when two or more learners interact and share knowledge to realize common interests in learning (Rukiyati et al., 2015). Cooperation skills broaden perspectives and create an open and respectful attitude (Roopnarine & Johnson, 2011).

Several studies have been conducted such as the application of cooperative learning and inquiry learning showing good cognitive results related to understanding redox material, but the activeness of students is still less visible and the involvement of students in discussions has not been discussed in depth. So in this case the Focus Group Discussion method needs to be explored more deeply. Based on this background, this study aims to determine the effect of Focus Group Discussion (FGD) learning method on students' cognitive abilities and skills on oxidation-reduction (redox) material. The importance of the Focus Group Discussion learning method to be applied by students to develop cognitive abilities and levels of cooperation. With the Focus Group Discussion, it is expected that students' understanding will be maximized.

METHODS

Research Type and Design

The type of research is experimental research with a quasi-experiment design. This quasi-experiment design has a control group but does not play a role in fully controlling the external variables that influence the implementation of the experiment. (Sugiyono, 2014). The quasi-experiment design used in this research is a non-equivalent control group design in which two groups are not randomly selected (Sugiyono, 2014).

Both groups will be given a pretest and post-test. The existence of the pretest and post-test is to find out how much influence a treatment has. The experimental class will be given treatment using the Focus Group Discussion (FGD) learning method, and the control class will be given treatment using the lecture learning method.

Time and Place of Research

This research was conducted in one of the high schools in Jombang Regency, class X IPA. The X IPA 3 class used the Focus Group Discussion (FGD) learning method as an

experimental group, while the control group or class used the lecture learning method. The research was conducted from February 22nd to March 1st, 2023.

Population and Sample

Population is the entire research object with specific characteristics that researchers can observe and conclude from (Sugiyono, 2019). The population in the study were all students of class X IPA, one of the high schools in Jombang Regency. At the same time, the sample is part of the subject under study (Sugiyono, 2016). The samples in this study were class X IPA 3 and class X IPA 2. The sampling technique in the study uses random sampling, which is random sampling, and each individual in a population gets the same opportunity to be selected in the sample (Sugiyono, 2017).

Data and Research Instruments

The type of data used in this study is quantitative data. According to Suharsimi (Arikunto, 2010), data collection instruments assist data collection in research activities. The data collection instrument used in this study is a test that must be done (Widoyoko, 2015). The tests used in this study consisted of pretest and post-test. The test is presented in the form of multiple-choice questions that contain redox reaction learning materials. The non-test is done through observation and documentation. Data collection through observation and documentation was done by filling out observation sheets and documenting each learning process to support research data (Arifin, 2014). Observation assessment is obtained from the application of indicators of cooperation skills indicators which will be given a score in the range (1-5) in each application. Assessment with scores (1-5) is based on the activeness and role of students in fulfilling the components of the cooperation criteria during learning. The following is an observation sheet for indicators of cooperation, which is adjusted to the elements of cooperation according to (Lie, 2010).

Table 1. Cooperation indicators

No	Indicator	Criteria	Points				
			1	2	3	4	5
1	Positive Interdependence	Dependence on achieving goals, completing tasks, dependence on roles.					
2	Individual Responsibility	Responsible for the tasks assigned, the success of the group, and mastery of the material.					
3	Promotive Interaction	Informing, arguing, and motivating each other					
4	Inter-personal communication	Know each other, accept each other.					
5	Group processing	Play an active role in the group					

The learning process is carried out in accordance with the RPP (Learning Implementation Design) that has been made. Learning with the provision of Focus Group Discussion treatment is carried out 3 times a meeting. The learning allocation is carried out for 3 x learning hours (45 minutes). The following is Table 1, shows the implementation of learning activities using the Focus Group Discussion method.

Table 2. Focus Group Discussion learning rubric

Meeting	Activities	Duration
1,2,3	Orientation:	15 minutes

Meeting	Activities	Duration
	Introduction, Apperception, and motivation	
1	Pretest	30 minutes
1, 2, 3	Core activities (Treatment):	75 minutes
	1. Division of groups and topics:	
	Group 1: Development of Redox Reaction Concept	
	Group 2: Calculation of oxidation Numbers and Determination of redox reactions	
	Group 3: Determination of oxidizer and Reductor	
	(every meeting the topic is exchanged with another group)	
	2. The teacher appoints a discussion moderator and students discuss	
	3. The teacher gives questions to each group to answer after the discussion.	
	4. The teacher observes and supervises the discussion process.	
	5. The teacher asks some group representatives to present the results of the discussion and answer the questions given.	
3	Post test	30 minutes
1, 2, 3	Closing:	15 minutes
	1. The teacher responds to the students' presentations and answers	
	2. The teacher gives conclusion at the end of the meeting	
	3. Greetings	

Data Analysis Technique

Data analysis is done after collecting all data and other sources(Sugiyono, 2011). The data analysis techniques carried out in this study are prerequisite analysis tests (normality test and homogeneity test) and hypothesis testing. Research instruments in Learning Implementation Plans (RPP), pretest and post-test items, and learning observation sheets were tested first to determine data validity, reliability, differentiating power, and difficulty level. Cognitive ability test questions consist of 20 items arranged per KI and KD Chemistry Material on Redox Reactions. The observation sheet was validated by the assessment criteria on a scale (1 = very invalid, 2 = invalid, 3, less valid, 4 = quite valid, and 5 = valid). The study results are considered valid if there is a match between the data collected and the actual data (Sugiyono, 2016).

RESULTS AND DISCUSSION

Instrument Analysis Data Description

Before the research or data collection process is carried out, a test of the test question instrument will be used for the pretest and post-test. The test phase of the test questions was carried out in one of the high schools in Jombang Regency in class X IPA 1 with a total of 33 students. The selection of the test class was carried out on students who had obtained or studied redox material.

Item Validity Test

After the trial stage is conducted on students, the test results will be analyzed for validity using SPSS 25 software. Indicator or instrument testing is valid if r count> r table. The significance level used in this validity test is 5% or 0.05. After testing, it was found that there

were invalid instruments and 17 items or instruments that were declared valid. This is because the value of r count < r table.

Table 3. Question Item Validity

Status	Total	Question Item
Valid	17 item	1,2,3,4,7,8,10,11,12, 13,14,15,16,17,18, 19,20
Invalid	3 item	5,6,9

Reliability Test

The reliability test determines the extent to which the measuring instrument can be used (Widi R, 2011). This study uses a reliability test with Cronbach's Alpha method. To find the reliability of an instrument whose score is 1 or 0 (Arikunto, 2010). Cronbach's Alpha reliability testing is said to be reliable if Cronbach's Alpha value> 0, 70 (Nunally & Bernstein, 1994). Based on the reliability test that has been carried out, it is stated that the pretest and post-test question instruments produce reliable data with a relatively high level of reliability with a Cornbach's Alpha value of 0, 785.

Differentiating Power Test

The differentiator test is used to measure how far the ability of the item is between the test that knows the answer correctly and the test that answers incorrectly (Suherman et al., 2003). Based on the differentiation test results data, six items were obtained in the excellent category, twelve in the good enough category, and two in the wrong category. The questions that are categorized as bad are invalid in the validity test.

Difficulty Level Test

The level of difficulty test results are classified into several criteria for the level of difficulty of the questions(Suherman et al., 2003). After testing the difficulty level, the results showed that all questions were categorized as medium. The coefficient is less than 0.70 above 0.30.

Research Data Analysis Test

Data Analysis of Cognitive Ability Results

After obtaining the value of the test results, a prerequisite analysis test will be carried out, which is seen from the normality and homogeneity of the data. The interpretation used in the Kolmogorov Smirnov (K-S) test is that the data is normally distributed if it has a significance value ≥ 0.05. Based on the analysis of student learning outcomes, the normality data is obtained as follows.

Table 4. Normality Test

Class	Kolmogorov-Smirnov Sig.
PreEks	0,162
PostEks	0,200
PreKontrol	0,106
PostKontrol	0,059

Data that has been customarily distributed is tested for homogeneity to determine whether the two variances are homogeneous or not. The homogeneity testing technique using Levene's Test was carried out with the help of SPSS 25 Software with a significance level of 0.05. Data is homogeneous if the significance value (p) > 0.05. Data analysis shows that both variances of the pretest and post-test scores of the control and experimental classes are data derived from homogeneous variance with a significance value of 0.428 > 0.05.

Results of Descriptive Analysis of Cognitive Ability Test Questions

Descriptive analysis of data was carried out with the help of SPSS 25 software. Descriptive statistical results of cognitive abilities between control and experimental classes have differences. Figure 1 shows the results of the descriptive statistical test.
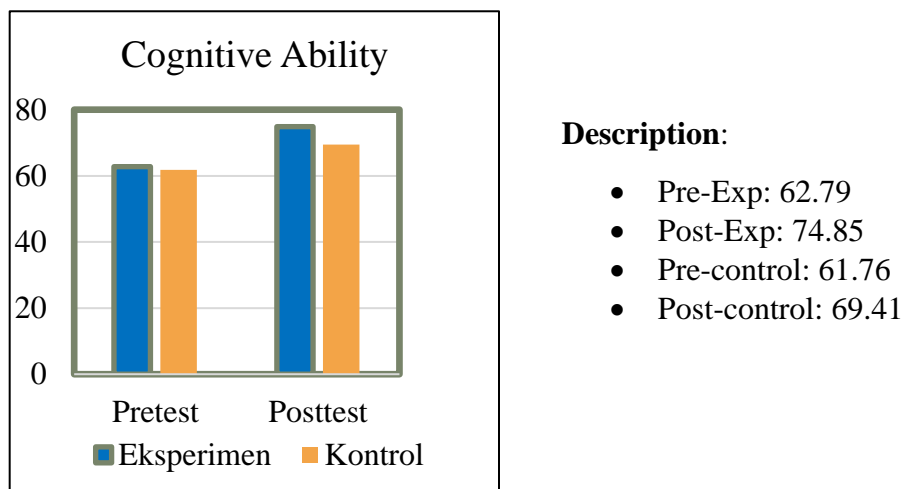

Description:

- Pre-Exp: 62.79
- Post-Exp: 74.85
- Pre-control: 61.76
- Post-control: 69.41

Figure 1. Students' cognitive ability

Cognitive Ability Test Hypothesis Test Results

Hypothesis testing using the paired sample t-test method. The paired sample t-test is a different test of related variables (Sugiyono, 2018). The interpretation of this test is that if the significance value> 0.05, ha is rejected, and if the significance value <0, 05 then ha is accepted. Based on the results of the paired sample t-test data, it can be stated that there is a significant influence of the Experimental Class related to the Focus Group Discussion Learning Method on the cognitive abilities of students with a significance value (2-tailed) of 0.000 and an increase in the average value of 12.059. The control class also stated a significant influence related to the lecture learning method with a significance value (2-tailed) of 0 000 and an increase in the average value of 7.647.

Data Analysis of Observation Results of Cooperation Skills

Observation is carried out with the rubric guidelines for assessing student cooperation, which becomes a reference for assessment when learning occurs. The observation results were tested for data normality using the Kolmogorov-Smirnov normality test. Based on the normality test, the significance values for the pretest and post-test of the experimental class were 0.062 and 0.096, respectively, indicating that the experimental class data were normally distributed. In the control class, the significance values for the pretest and post-test were 0.066 and 0.058, respectively, indicating that the data in the control class were also normally distributed. Normally distributed data were tested for homogeneity and obtained a significance value of 0.03 < 0.05. This indicates that the control and experimental class data are not homogeneous. The results of the homogeneous test data that are not homogeneous can still be continued with hypothesis testing. Homogeneity is not an absolute requirement in the Paired Sample T-test.

Results of Descriptive Analysis of Cooperation Skills

Descriptive analysis of observation results was carried out with the help of SPSS 25 software. Descriptive statistical results of Cooperation skills between control and experimental classes have differences. The descriptive statistical results are like the following graph (Figure 2).
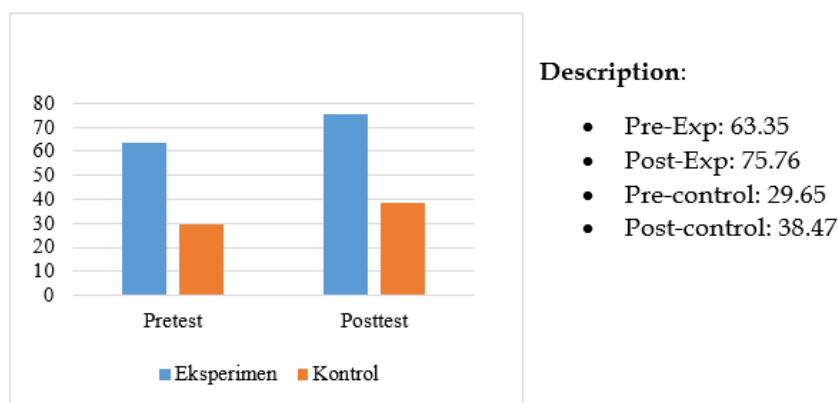
Description:
- Pre-Exp: 63.35
- Post-Exp: 75.76
- Pre-control: 29.65
- Post-control: 38.47

Figure 2. Students' cooperation skills

Hypothesis Test Results of Cooperation Skills

Based on the results of the paired sample t-test data, it can be stated that there is a significant influence on the Experimental Class related to the Focus Group Discussion Learning Method on students' cooperation skills with a significance value (2-tailed) of 0.000 and an increase in the average value of 6.460. The control class also stated that there was a significant effect related to the lecture learning method with a significance value (2-tailed) of 0 000 and an increase in the average value of 4.551.

Table 5. Hypothesis Test

Experiment			Control		
t	Df	Sig. (2-tailed)	t	Df	Sig. (2-tailed)
6.460	33	.000	4.551	33	.000

Discussion

This research was conducted in one of the high schools in Jombang Regency after going through several stages, such as observation, pre-research trials, and validation of research instruments. After the instrument test was carried out, the test continued with prerequisite analysis tests such as normality and homogeneity tests. As for the validity test stage of the test instrument, the results obtained 17 items in the valid category and three invalid items from a total of 20 items. The invalid question is because the calculated value is smaller than the r table. The reliability of the data is 0,785, which indicates reliable data. The results of the differentiation test show two questions in the wrong category because the differentiation coefficient is less than 0, 20. The difficulty test shows that all questions are in the medium category. The test continued with prerequisite analysis tests such as normality and homogeneity tests. Based on normality and homogeneity testing data of students' cognitive ability scores, all pretest and post-test data for control and experimental classes are typically distributed and homogeneous. So, proceed with hypothesis testing. Data from normality and homogeneity testing of the students' cooperation skills scores show that the data is usually distributed in both control and experimental classes but is not homogeneous.

This research is a quasi-experimental study that aims to determine the effect of a treatment through an experiment (Sugiyono, 2019). So that there is an experiment or treatment. The treatment is in the form of learning in experimental and control classes using oxidation-reduction (redox) class X. In learning values that will be the benchmark in this study will be taken. Students' cognitive abilities are analyzed based on the results of pretests and post-tests. The benchmark for students' cooperation skills is obtained from observations during class.

Experimental Class Cognitive Ability Results

The experimental class in this study was class X IPA 3, consisting of 34 students. Experimental class learning uses the Focus Group Discussion (FGD) method with redox material.

Based on statistical tests of cognitive abilities that have been carried out, the average pretest value is 62.79, and the post-test value is an average of 74.85. The results of the hypothesis test (t-test) showed an increase in the average value of 12.059 with a probability/significance value (0.000 <0.05). Then Ho is rejected, or there is a difference in the average value of redox material in one of the high schools in Jombang Regency before and after applying the Focus Group Discusssion learning method. This proves that applying the Focus Group Discussion learning method significantly affects students' cognitive abilities in the experimental class (X IPA 3).

The Focus Group Discussion (FGD) method involves small groups discussing specific topics. Research conducted (Massi, 2018) stated that the (FGD) method effectively improved students' cognitive abilities. In addition, research conducted by (Nurwahidah, 2019) also stated that the Focus Group Discussion (FGD) learning method increased students' understanding of capturing classroom learning. In line with this, research conducted by (Widayati, 2019) also stated that Focus Group Discussion (FGD) improved students' learning outcomes. Some of these statements prove that the Focus Group Discussion (FGD) method significantly affects students' cognitive abilities. So, this method needs to be applied to develop students' cognitive abilities, especially in redox material.

Experimental Class Cooperation Skills Results

The results of the analysis of students' cooperation skills in the experimental class obtained an average of 63.35 at the time before treatment. After learning the Focus Group Discussion (FGD) method, the average value was 75.76, with an increase of 12.412. At the same time, the hypothesis test with the t-test obtained a significance value of 0.000 <0.05. So, applying the Focus Group Discussion (FGD) method has a significant effect with a relatively high increase in average value.

Focus Group Discussion (FGD) is a research method that allows learners to interact, exchange opinions, and solve solutions in learning. The learning process is carried out by involving small groups to discuss problems related to learning, which will build the character of cooperation in learners. The character of cooperation can arise through the ability of learners to find solutions to these problems together (Jerzembek, G., & Murphy, 2013). According to research conducted by (Yulianti & Fianti, 2010), cooperation allows students to establish communication in all directions. Some of these studies show a significant effect of the Focus Group Discussion method on cooperation skills. Therefore, FGD needs to be applied because the cooperation skills of students will be formed through the directed discussion (West, 1998).

The application of Focus Group Discussion learning method is overall effective for learning chemistry, especially redox material. Focus Group Discussion is very effective and relevant if applied because in Focus Group Discussion there is an in-depth discussion related to learning materials. The mechanism is also considered to be able to increase student involvement through interaction with their peers. Student activeness in the discussion is able to develop collaborative attitudes, and collective problem solving. So that the Focus Group Discussion learning method also stimulates cognitive abilities with connecting material concepts to real experiences and creating an inclusive and dynamic learning environment. It is also in accordance with research conducted by (Hidayani, 2016) which shows that Focus Group Discussion is able to improve cognitive and critical thinking skills students, but this is not in line with research conducted by (Putri & Solehati, TettiTrisyani, 2019) which provides slightly more different results regarding the effect of the Focus Group Discussion method and the lecture method.

Control Class Cognitive Ability Results

Learning for learners in the control class was conducted using the conventional method (lecture). This experimental class also consisted of 34 students. The control class is the X IPA 2 class that has learned redox material. Based on statistical test data, the control class has a pretest score with an average of 61.76 and an average post-test score of 69.41. After conducting the Paired Sample t Test hypothesis test, it can be seen that there is an increase in the average value

of 7.647 with a probability/significance value (2-tailed) of 0.000 <0.05, so it can be stated that there is a significant difference in the average value of redox material before and after the application of the lecture method. This shows a significant effect of the lecture method on students' cognitive abilities in the control class (X IPA 2).

The lecture method is a teacher-centered learning method. Melvin L. Silberman (Hidayani, 2016) stated that the teacher speaks one hundred to two hundred words per minute. However, students' absorption of the teacher's learning depends on their perception. In addition, students' attitude when carrying out classroom learning with the lecture method often shows less response (passive) because the material delivered by the teacher is too textual and pays less attention to the students' creativity (Agung, 2015). Based on some of these statements, the lecture method significantly affects students' cognitive abilities. However, the lecture method still needs some improvement compared to the Focus Group Discussion method.

Control Class Cooperation Skills Results

The analysis of students' cooperation skills in the control class showed that the average value of students' cooperation skills before treatment was 29.65 and after treatment. 38.47, with an increase of 8.824. The Paired Sample t-test with a significance level of 5% (0.05) obtained a significance value of 0.000> 0.05. This shows that learning with conventional methods (lecture) significantly affects the cooperation skills of X IPA 2 class students on oxidation-reduction reaction (redox) material.

Regarding the research evidence, the lecture method is teacher-dominated and involves the teacher's entire role in understanding students (Jumaisyaroh, T., Napitupulu, E. E., & Hasratuddin, 2015). The teacher-centered conventional learning method (lecture) allows a teacher to fully control learners' emotions and encourage or motivate learners to improve learning achievement and behave correctly when learning. However, it results in learners' need for a more active role in solving problems and a low level of participation, cooperation, and interaction of learners with others. Based on this, the lecture method significantly affects students' cooperation skills, but the Focus Group Discussion method has a more significant effect.

CONCLUSION

Based on data analysis and hypothesis testing, paired t-test of Cognitive Ability and Cooperation skills between experimental and control classes showed significant differences, which proved that the Focus Group Discussion method improved cooperation and cognitive skills. The success in the application of the Focus Group Discussion method in encouraging active interaction and strengthening conceptual understanding shows the potential to be integrated or implemented widely in the field of learning, especially STEM learning.

RECOMMENDATION

Focus Group Discussion can be an active and effective learning strategy, but in this study, the duration used was relatively short and the scope was quite limited. Therefore, to expand its impact, further research could explore the integration of Focus Group Discussion with other innovative teaching methods, such as the use of digital tools and the flipped classroom model. Thus the Focus Group Discussionb learning approach can serve as a key element in more flexible, interactive and technology-based active learning.

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