

Impact of Small Group Discussion on Student Outcomes in the Water Cycle Topic

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Abstract

Learning outcomes refer to change which results in shifts in attitudes and behavior. This study aims to determine the effect of implementing a student-centered learning method based on small group discussions on students' learning outcomes. The research method used is a quasi-experiment. The sampling was based on existing class groups rather than individuals, using cluster random sampling techniques. Based on the t-test calculations for the posttest data, the t-value obtained is 3.661, which is greater than the critical t-value of 2.024. Therefore, it can be concluded that $t \geq t_{table}$: H_0 is rejected, indicating an effect on students' learning outcomes in IPAS when using the student-centered learning method based on small group discussions. The results of the N-Gain Score test for pretest-posttest also show that the effectiveness of the student-centered learning method based on small group discussions is higher, at 91.54%, compared to the conventional method at 43.80%. Thus, there is a significant difference between the IPAS learning outcomes of students taught using the student-centered learning method based on small group discussions and those taught with the conventional method in the fourth grade of SDIT Insan Madani Jakarta.

Keywords: Learning Outcomes, Small Group Discussion, Student-Centered Learning

1 INTRODUCTION

Learning is an activity experienced by an individual as they progress from not knowing to knowing. It is a process within the individual that interacts with the environment to achieve changes in behavior (Amsari, 2018, Purwanto, 2019, Mardicko, 2022). These changes are obtained through effort rather than maturity, persist for a relatively long time, and are the result of experience (Wulandari, et al, 2023). Interest in studying the learning process is driven by the desire to provide teaching services that yield optimal results (Mawaridza & Rosita, 2019; Utami et.al, 2023).

Various factors support the teaching and learning process centered on students. A wide range of reference sources is available, not only from books but also from other practical and easily accessible sources in today's digital era (Awali, 2024). Resources are available not just in physical books but also digitally through e-books, as well as from learning applications, e-dictionaries, e-journals, e-libraries, and many more (Heryati, 2022). Students feel increasingly comfortable with the available features, such as keyword searches, example questions and discussions, fun games, and fun learning activities. This also highlights the importance of using appropriate learning methods in the educational process, which impact learning outcomes, such as the traditional learn method or the more contemporary small group discussion method.

This aligns with the goals of the Merdeka Curriculum, which is characterized by diverse intracurricular learning that optimizes content, allowing students enough time to explore concepts and strengthen competencies (Widiastuti, Bachri, & Maureen, 2023, Sentot & Ramli, 2023). Teachers have the flexibility to choose various teaching resources,

enabling instruction to be tailored to students' learning needs and interests. The characteristics of the Merdeka Curriculum include the development of soft skills and character, a focus on essential materials, and flexible learning (Directorate of Primary Schools, Directorate General of Early Childhood, Basic Education, and Secondary Education, 2022).

Learning is undertaken to bring about behavioral changes in the individual who is learning. These behavioral changes are the outcomes of learning. Learning outcomes refer to the changes that result in shifts in attitudes and behaviors. The aspects of change relate to the taxonomy of educational objectives developed by Bloom, Simpson, and Harrow, which encompasses cognitive, affective, and psychomotor aspects (Purwanto, 2019; Vioreza, 2018; Saruksuk, 2024; Ardhi, 2024).

There are two approaches to learning: teacher-centered approaches and student-centered approaches. Teacher-centered approaches involve strategies such as direct instruction, deductive learning, or expository learning. In contrast, student-centered approaches encompass inquiry and discovery strategies, as well as inductive learning (Purwanto, 2019; Utami, 2021).

One of the factors that influences students' learning outcomes is the teaching method used by the teacher. Engaging and enjoyable learning experiences that involve students directly will certainly affect their learning results. One such method is the student-centered learning approach based on small group discussions.

This learning approach positions students as active subjects in the educational process, resulting in their full involvement from lesson planning to the learning process and evaluation. It provides a platform for small group discussions, allowing them to learn from each other, understand the material, and develop their ideas, concepts, and creativity while respecting and understanding one another.

Learning becomes enjoyable as each group engages in discussion, presenting and explaining their ideas. Students' involvement includes activities that go beyond just listening, tapping into their potential for creative, logical, and systematic thinking. The student-centered learning method based on small group discussions enhances student motivation, increases their participation levels, and enables problem-solving, which can improve learning outcomes. The learning method using small group discussions can also be applied in IPAS in elementary schools (Nengsih et.al., 2024).

One of the subjects in elementary school is IPAS. IPAS in general refers to science as a combination of various knowledge organized logically and systematically, considering cause and effect. This knowledge encompasses both natural and social sciences (Kamus Besar Bahasa Indonesia, 2019). The water cycle occurs due to sunlight, which causes the evaporation of water from rivers, lakes, and seas. This process of water vaporization is called evaporation. Evaporation also occurs in certain plant tissues, known as transpiration. Water vapor rises and gathers in the air to form clouds. The process of water vapor changing into water crystals and forming cloud masses is called condensation. Wind then blows the clouds toward land. Over land, the clouds cool down, and the water vapor condenses into water droplets. These droplets fall back to Earth as rain. The process of dark clouds transforming into rain is called precipitation. Rainwater that falls to the ground will seep into the soil through its pores and become groundwater or reserves of water. Some of the rainwater will become surface water, flowing into rivers, lakes, and seas, and will undergo evaporation again (Aprilia, 2022).

2 RESEARCH METHODS

The research method used in this study is the quasi-experimental method. Quasi experiment is a quasi-experiment in research because it uses whole subject groups in experiments that are naturally formed in the classroom (Nugraheny & Widodo, 2021; Atmazaki et.al., 2023). This type of research was chosen because the research subjects are humans, which is not allowed distinguish one from another.

The sampling technique is a method for determining the samples to be used. Schematically, this technique consists of various methods. It can generally be classified into two categories: probability sampling and nonprobability sampling. Probability sampling is a sampling technique that gives each element (member) of the population an equal chance of being selected as a member of the sample.

In this study, the sampling technique used is cluster random sampling. Cluster sampling is where the entire population is divided into clusters or groups (Wahab, 2022). The selected clusters are not individuals but rather groups or areas. In this case, the sampling will refer to the fourth grade, consisting of three classes at SDIT Insan Madani Jakarta, from which two classes will be selected as samples. The fourth-grade class Hudzaifah will serve as the control group, while the fourth-grade class Abdurrahman will be the experimental group.

Accept H_0 if $t_{\text{count}} \leq t_{\text{table}}$, indicating that there is no difference between the average learning outcomes of the control group and the average learning outcomes of the experimental group. Thus, there is no effect of the student-centered learning method based on small group discussions on the learning outcomes of students in the subject of IPAS on the topic of the water cycle in the fourth grade, odd semester of the 2023/2024 academic year at SDIT Insan Madani Jakarta.

Reject H_0 if $t_{\text{count}} \geq t_{\text{table}}$, indicating that there is a difference between the average learning outcomes of the control group and the average learning outcomes of the experimental group. Therefore, there is an effect of the student-centered learning method based on small group discussions on the learning outcomes of students in the subject of IPAS on the topic of the water cycle in the fourth grade, odd semester of the 2023/2024 academic year at SDIT Insan Madani Jakarta.

3 RESULT AND DISCUSSION

This research was conducted at SDIT Insan Madani Jakarta, with a total of four meetings for the experimental class and two meetings for the control class. The study took place in the fourth-grade class Abdurrahman as the experimental class, which was taught using the student-centered learning method based on small group discussions. Meanwhile, the fourth-grade class Hudzaifah served as the control class, which was taught using conventional methods through lectures.

The topic taught in this research is about the water cycle. This study was conducted to assess students' learning outcomes regarding the concept of the water cycle. To determine this, after applying different teaching methods to the experimental and control classes, both classes were given tests in the form of multiple-choice questions and written explanations.

The researcher used 20 multiple-choice questions and 5 open-ended questions in the test instrument. This test was conducted at the end of the water cycle lesson. The following presents the data results from the experimental class and the control class. The table below shows the statistical data from the pretest for both classes based on the calculations as follows:

Table 1. Description of Pretest Data for the Experimental Class and Control Class

Description	Experimental Class	Control Class
Minimum	21	20
Maximum	89	86
Average	53,1	53,45
Standard Deviation	21,317	19,441

Based on the Table 1, the pretest results for both classes show that the minimum and maximum scores achieved differ. The minimum score for the experimental class is 21, while the maximum score is 89. In contrast, the minimum score for the control class is 20, and the maximum score is 86. Additionally, the average score for the experimental class is 53.1, compared to 53.45 for the control class. The average scores for both classes are still considered very low.

The following presents the statistical data from the posttest for both classes based on the calculations, it can be seen in the Table 2.

Table 2. Description of Posttest Data for the Experimental Class and Control Class

Description	Experimental Class	Control Class
Minimum	75	35
Maximum	100	88
Average	94,70	72,95
Standard Deviation	5,921	15,863

The Table 2 shows the posttest results for both classes in the study. It indicates a significant difference. The maximum posttest score achieved by the experimental class is higher than that of the control class, with 100 for the experimental class and 88 for the control class. Additionally, the average scores for the two classes also demonstrate a difference, with 94.70 for the experimental class and 72.95 for the control class. These results indicate that the posttest scores for the experimental class are higher than those of the control class.

The normalized gain (N-gain Score) aims to assess the effectiveness of a method in research using both the one-group pretest and posttest design, as well as studies involving experimental and control classes. It can be used when there is a significant difference between the average posttest scores of the experimental class and the posttest scores of the control class, as determined by an independent sample t-test.

The effectiveness of a learning model is difficult to measure through the learning process because there are many factors to observe. The most feasible approach is to measure the extent of improvement from the initial targets before treatment (pretest) to the learning outcomes after treatment (posttest). The goal is for students to master 100% of the material and to at least achieve the Minimum Completeness Criteria (KKM). To test the effectiveness of the student-centered learning method based on small group discussions, a manual calculation using the normalized Gain Score formula (N-Gain) is conducted to determine the improvement in students' learning outcomes after the intervention.

Table 3 N-Gain Test Results for Pretest-Posttest

Description	Experimental Class	Control Class
Average (mean)	91,54 %	43,80 %
Minimum	68,35 %	18,75%
Maximum	100 %	59,46%

Information from table 3 can be concluded that the use of the student-centered learning method based on small group discussions is effective in improving learning outcomes in the subject of IPAS on the topic of the water cycle for the fourth grade at SDIT Insan Madani Jakarta for the 2023/2024 academic year. Thus, the use of conventional methods with lectures in the control class is less effective in enhancing

learning outcomes, with an average of 43.80%, compared to the experimental class, which achieved an average of 91.54%.

After the research data is obtained, it will be processed through hypothesis testing. Before conducting hypothesis testing, prerequisite data analysis tests are performed, including normality and homogeneity tests, to determine whether the data is normally and distributed and has homogeneous variance. The results obtained from the prerequisite data analysis tests are (1) Normality Test for Pretest and Posttest, and (2) Homogeneity Test for Pretest-Posttest. The normality test was conducted using the Lilliefors test. The results of the Lilliefors test for the pretest and posttest of both samples indicate that the data is normally distributed, as $L_{\text{calculated}} \leq L_{\text{table}}$. The homogeneity test was conducted using the Fisher test. The results of the Fisher test for the pretest and posttest of both samples indicate that the data falls into the homogeneous category, as $F_{\text{calculated}} \leq F_{\text{table}}$.

3.1 Hypothesis Testing

3.1.1 Test for Equality of Two Means for Pretest

The testing is conducted to determine whether there is a significant difference between the pretest scores of the experimental class and the pretest scores of the control class. The criteria for this test are as follows: if $t_{\text{calculated}} \leq t_{\text{table}}$, H_0 is accepted at a confidence level of 0.95; and if $t_{\text{calculated}} \geq t_{\text{table}}$, H_0 is rejected at the confidence level.

The results of the study indicate that there is no difference in the average pretest scores between the control class and the experimental class. Based on the t-test results, the $t_{\text{calculated}}$ for the pretest is 0.054. When comparing the $t_{\text{calculated}}$ for the pretest with the t_{table} at a 95% confidence level, which shows a value of 2.024, it can be determined that the $t_{\text{calculated}}$ for the pretest is smaller than the t_{table} . According to the established testing criteria, if $t_{\text{calculated}} \leq t_{\text{table}}$, then H_0 is accepted, and it can be stated that there is no difference in the average pretest learning outcomes between the control class and the experimental class.

3.1.2 Test for Equality of Two Means for Posttest

This test is conducted to determine whether there is a significant difference between the posttest scores of the experimental class and the posttest scores of the control class. The criteria for this test are as follows:

If $t_{\text{calculated}} \leq t_{\text{table}}$, then H_0 is accepted at a 0.95 confidence level; and if $t_{\text{calculated}} \geq t_{\text{table}}$, then H_0 is rejected at a 0.95 confidence level. The results of the hypothesis testing conducted with the t-test on the posttest results for the experimental and control classes can be seen in the table below:

The results of the study indicate that there is a difference in the average learning outcomes between the experimental class and the control class. Based on the t-test calculations, the $t_{\text{calculated}}$ for the posttest is 3.661. When compared to the t_{table} at a 95% confidence level, which shows a value of 2.024, it can be seen that the $t_{\text{calculated}}$ for the posttest is greater than the t_{table} . According to the established testing criteria, if $t_{\text{calculated}} \geq t_{\text{table}}$, then H_0 is rejected, and it can be stated that there is a difference in the average posttest learning outcomes between the experimental class and the control class.

The results of the hypothesis calculation using the "t" test for the pretest of the experimental class and the control class yielded a $t_{\text{calculated}}$ value of 0.054. From the t distribution table for a significance level of $\alpha = 0.05$ and degrees of freedom of 38, the t_{table} value is 2.024. Since $t_{\text{calculated}} \leq t_{\text{table}}$, we accept H_0 , indicating that there is no difference in the average pretest learning outcomes between the experimental class and the control class.

The pretest results, which did not receive treatment using the student-centered learning method based on small group discussions, show no difference between the

experimental class and the control class. This means that at this stage, both classes have the same level of knowledge, as evidenced by the average scores obtained from each class, which are still relatively low: 53.1 for the experimental class and 53.45 for the control class.

The hypothesis calculation using the "t" test for the posttest of the experimental class and the control class yielded a t calculated value of 3.661. From the t distribution table for a significance level of $\alpha = 0.05$ and degrees of freedom of 38, the t table value is 2.024. Therefore, since $t_{\text{calculated}} \geq t_{\text{table}}$, we reject H_0 , indicating that there is a difference in the average posttest learning outcomes between the experimental class and the control class.

The difference in average learning outcomes between the two classes indicates that instruction using the student-centered learning method based on small group discussions is more effective than conventional teaching methods. This is supported by observations made during the learning process. Throughout the study, it was noted that the student-centered learning method based on small group discussions effectively engages students. With this method, students can actively participate in the learning process, which helps them maintain focus and enhances their understanding. Students are also given the opportunity to express their ideas and thoughts while collaborating with their peers in small groups.

This contrasts with the learning in the control class, where instruction was delivered solely through conventional methods, specifically through lectures. In this method, the student is seen as the active participant in the learning process, while the students are not. Their activities during the learning process can be described as merely memorizing and noting down what they consider important, resulting in insufficient active engagement in the learning process, which tends to create a boring atmosphere.

The information above can be summarized to indicate that the difference in average learning outcomes between the experimental class and the control class is due to the monotonous learning environment in the control class, which causes students to quickly become bored with their studies. In contrast, in the experimental class, students are actively engaged in the learning process, making it appear much more dynamic and enjoyable.

Thus, the posttest results that received treatment using the student-centered learning method based on small group discussions indicate a difference between the experimental class and the control class. This means that in the hypothesis testing using the "t" test for the posttest results of the experimental and control classes, a comparison of scores was obtained. The average scores from each group show a very significant difference, with 94.7 for the experimental class and 72.95 for the control class. The average score of the experimental class is higher than that of the control class, leading to the rejection of H_0 . This means that this study can demonstrate that learning using the student-centered learning method based on small group discussions has a positive impact on students' learning outcomes in Integrated Social Studies (IPAS).

The learning outcomes achieved by students can be influenced by several factors. The factors affecting student learning can be categorized into three types: internal factors, external factors, and the most important factor, which is the learning approach. The learning approach can be understood as the effectiveness of all methods or strategies used by students to enhance the effectiveness and efficiency of the learning process for specific material.

The roles of students and teachers in the teaching and learning interaction are greatly influenced by the strategies or methods used (Vioresa, et.al; . In an active learning process, the role of students is more significant; they are not given pre-packaged material to memorize but are presented with problems that require exploration, observation, experimentation, analysis, synthesis, comparison, evaluation, and conclusions made by the students themselves. In such a teaching and learning strategy, students take a more active role, interacting not only with the teacher but also with other

sources of information, both within and outside the school, including fellow students, books, and other media.

It is suspected that the learning approach that can help teachers achieve the learning objectives for IPAS is the student-centered learning method based on small group discussions. This method positions students as subjects in the learning process, which leads to their full involvement from the planning of lessons, through the learning process, to the evaluation of learning. By providing a platform for small group discussions, students can learn from one another, understand the material, and develop their ideas, concepts, and creativity while maintaining respect and understanding among their peers.

In the implementation of the student-centered learning method based on small group discussions, there are several stages involved: first, the teacher divides students into small groups of 4 to 6 members and provides each group with a problem to discuss. After that, the teacher asks the students to discuss the issue. Each group is then required to write down the key points from their discussion on a piece of paper. Next, each group is asked to appoint 1-2 spokespersons. These spokespersons are tasked with presenting the group's discussion results. Meanwhile, the other groups are invited to provide feedback or ask questions. Finally, the teacher conducts clarification, summarizes the discussion, and outlines the next steps.

Learning using the student-centered approach based on small group discussions is essential in IPAS education because it helps students understand the material presented. In this method, students are actively involved in the teaching and learning process, making them the focus of the activities. Additionally, observations made during the research indicated that the implementation of the student-centered learning method based on small group discussions creates a more engaging and varied atmosphere, resulting in increased enthusiasm among students, who do not feel bored or fatigued during the learning process.

4 CONCLUSION

Based on the research findings and data analysis, it can be concluded that the student-centered learning method based on small group discussions has a significant impact on students' learning outcomes in IPAS, specifically regarding the water cycle material. This is evident from the average posttest scores, where the experimental class achieved a higher score of 94.70 compared to the control class's score of 72.95. The results of the N-Gain Score test for pretest and posttest also demonstrate the effectiveness of the student-centered learning method, with an N-Gain of 91.54% compared to 43.80% for the conventional method. Additionally, the calculation of the t-test for the posttest data yielded a t-value of 3.661, which is greater than the t-table value of 2.024. Therefore, it can be stated that $t \geq t_{\text{table}}$: H_0 is rejected, indicating a significant effect and a difference between the average learning outcomes of the experimental class and the control class.

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