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Syndicate Group Learning Instruction: An Interactive Way to Improve Students' Activities and Learning Outcomes

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Abstrak

This research aims to describe the influence of Syndicate Group Learning Instruction on the improvement of activities and physics learning outcomes of 8th-grade students at SMPN 18 Mataram. The research design employed is an experimental study. The population of this study comprises all 8th-grade students at SMPN 18 Mataram. The sample consists of 22 students from class VIIIA as the experimental group and 24 students from class VIIIC as the control group selected using a random sampling technique. Data for this study were obtained through pre-tests and post-tests given to the sample class students. Data collection techniques involve using observation sheets and formative tests that have been validated for validity, reliability, differential power, and difficulty index. Based on the data analysis, the average pre-test score for the experimental group is 56.13; for the control group, it is 46.66, categorized as homogeneous and normally distributed. The post-test results show an average of 69.31 for the experimental group and 58.54 for the control group. The final test data of the sample class students were analyzed using the t-test, resulting in a calculated t-value of 2.160 and a tabulated t-value of 2.016. The calculated t-value is greater than the tabulated t-value at a 5% error level, thus rejecting the null hypothesis (Ho). It can be concluded that the use of Syndicate Group Learning Instruction has a significant influence on the activities and physics learning outcomes of 8th-grade students at SMPN 18 Mataram.

Keywords: Syndicate group learning instruction; learning activities; learning outcomes

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INTRODUCTION

In the realm of formal education, particularly in Junior High School, the learning of Natural Sciences (NSE) necessitates diverse approaches, such as scientific inquiry, aiming to cultivate students' skills in scientific thinking, working, behaving, and communication – vital components of life skills, as asserted by Susetiyarini et al. (2022). Adopting various learning methods significantly influences junior high school students, addressing issues like deficient generic science skills and suboptimal biology learning outcomes through applying a scientific approach (Tuapattinaya & Rumahlatu, 2018). Furthermore, cooperative learning, precisely the Jigsaw method, positively impacts natural science learning achievement (Suendarti & Virgana, 2022). The research underscores the importance of identifying aspects that make science engaging for pupils, emphasizing the significance of engaging learning experiences in junior secondary science classes (McDonald, 2016; Osborne et al., 2003). Developing Science, Environment, Technology, and Society (SETS) based learning in junior high schools has been suggested to enhance students' critical thinking skills (Budi et al., 2017). Project-based learning, employing mind maps, has proven effective in improving students' environmental attitudes toward waste management in junior high schools (Susilawati et al., 2017).

Additionally, studies have investigated the effects of cooperative learning on students' behaviors, discourse, and learning in junior high school science-based activities, highlighting the significance of structured and unstructured cooperating groups (Gillies, 2008). In light of these findings, educators and policymakers should consider integrating these varied approaches into the curriculum to optimize the learning experiences of junior high school students in Natural Sciences. The aforementioned discoveries underscore the importance of diverse learning implementations in the natural science classroom for junior high school students. Employing a scientific approach, cooperative learning methods, creating engaging learning experiences, utilizing SETS-based learning, and incorporating project-based learning are all pivotal in improving students' learning outcomes and fostering positive attitudes toward science. Consequently, educators and policymakers should take these research findings into account when formulating and executing learning strategies in the natural science classroom for junior high school students. However, there are numerous obstacles faced by students learning natural science in junior high schools, as indicated by the results of pre-experimental research at SMPN 18 Mataram, where student learning outcomes fall into the category of less satisfactory. This is caused by (1) low student interest in learning; (2) students' limited understanding in receiving lessons provided by teachers, making it difficult to answer questions; (3) a lack of an active atmosphere in discussions; (4) students' insufficient knowledge about the benefits of group learning; (5) reluctance to express opinions in group learning; and (6) a lack of direct student involvement, leading to passive participation in the learning process.

The challenges encountered by junior high school students in science education learning and materials are complex and extensively studied. Research indicates that the implementation of online learning has presented hurdles, including incomplete material delivery and difficulties in practical science learning, particularly in laboratory work (Handayani & Jumadi, 2021; Sari et al., 2022). Obstacles such as a lack of knowledge about laboratory tools and materials, inability to perform independent lab work, and challenges in communicating findings during lab sessions have also been identified during the implementation of science education (Kurniawan et al., 2018). Filipino secondary science teachers have faced various obstacles and obligations related to instruction and assessment while adapting to flexible learning during the pandemic (Lansangan & Orleans, 2023).

Furthermore, literature underscores the importance of addressing obstacles related to students' attitudes, perceptions, and achievements in science education. Inquiry-based laboratory activities, for instance, impact students' perceptions of the classroom learning environment, attitudes toward science, and achievement (Wolf & Fraser, 2008). The extent of implementation of inquiry-based science teaching and learning in Ghanaian junior high schools has emphasized the need to address obstacles related to the validity, reliability, credibility, and dependability of instruments used in science education (Mohammed et al., 2020). Additionally, a study on the scientific level of inquiry and classroom practices in junior high school students revealed difficulties in transitioning from remembering activities to true inquiry practices (Septiani et al., 2020).

Syndicate group learning instruction has demonstrated potential in addressing obstacles faced by junior high school students in science education. Research indicates that syndicate group work can shift students towards adopting a deep approach to learning, fostering a more questioning approach and deeper meaning in their learning (McKerlie et al., 2012). Inquiry-based laboratory activities have been found to promote more student cohesiveness, suggesting the potential of syndicate group learning to enhance student collaboration and engagement (Wolf & Fraser, 2008). The effectiveness of syndicate learning has been demonstrated in various fields, such as oral medicine and radiology, where it was found to be more interesting and conducive to creative idea interchange, meaningful participation, and discussion (Daigavane et al., 2021). Moreover, cooperative learning, sharing similarities with syndicate group learning, has been shown to positively impact students' behaviors, discourse, and learning in science-based learning activities (Gillies, 2008).

Several previous studies have demonstrated the positive and significant impact of syndicate group learning instruction on student learning outcomes, conceptual understanding, and motivation. Sudarmanto's (2016) research indicated that the implementation of the syndicate group peer learning model could enhance students' engagement and learning outcomes in the topic of static electricity. In the first cycle, student engagement reached 72.59%, with learning outcomes reaching 78.52%. Furthermore, in the second cycle, student engagement reached 77.78%, with learning outcomes reaching 83.52%. On the other hand, Fitriyani and Darto (2015) found that the Syndicate Group learning method influenced students' conceptual understanding. Unfortunately, these studies did not examine the impact of syndicate group learning instruction on physics learning materials for students. Therefore, the current study aims to investigate the influence of the syndicate group learning instruction on the improvement of activities and learning outcomes in the Natural Sciences (IPA) Physics for eighth-grade students in junior high school, focusing on the topic of energy and its transformations.

By employing syndicate group learning instruction, educators can establish a collaborative and interactive learning environment that promotes a deeper understanding, active participation, and meaningful discussions among junior high school students. This approach aligns with the necessity of addressing challenges related to students' attitudes, perceptions, and achievements in science education. As outlined by McKerlie et al. (2012), students expressed positive perspectives on syndicate learning, highlighting the added value of group learning in terms of both academic and social cohesion. The sense of responsibility towards peers, the autonomy of tutor-less groups, and the effectiveness of syndicate groups compared to other learning methods were also emphasized. These findings are pivotal in underscoring the potential advantages of syndicate group learning instruction, especially in cultivating collaborative learning environments and augmenting student engagement and responsibility. These elements are crucial in overcoming obstacles in science education for junior high school students.

METHOD

This study employs a quasi-experimental design with a pretest-posttest control group design (Fraenkel et al., 2012). In this design, the sample is divided into two groups: the first group serves as the experimental group, and the second group as the control group. The research design is presented in Table 1.

Table 1. Research design

Group	Pre-test	Treatment	Post-test
Experiment	O_1	Yes	O_2
Control	O_3	No	O_4

In this study, an initial test was conducted to assess the students' baseline abilities, allowing for the determination of the homogeneity of the sample or the variance in students' prior knowledge. The final test was carried out to evaluate the impact of the treatment provided to the experimental group. The research was conducted at SMPN 18 Mataram with a total sample size of 46 students selected through random sampling. The experimental group consisted of 22 students, while the control group comprised 24 students from Grade VIII, Semester II. The subject of the research was physics subject, specifically focusing on the topic of energy and its transformations, chosen to identify the effects of using syndicate group learning instruction on students' learning outcomes and activities. The instructional design applied to the experimental group using syndicate group learning instruction is presented in Table 2.

Table 2. Learning Design Using Syndicate Group Learning Instruction

Phases	Teacher activities	Student Activities
Formation of Groups (10 minutes)	• The teacher explains that the purpose of forming groups is to facilitate collaboration and mutual learning. • The teacher provides examples of everyday situations where cooperation is needed to achieve common goals, such as rolling a large ball into the classroom.	• Students form small groups that include students with diverse levels of understanding about the concept of energy.
Initial assignment (15 minutes)	• Each group is given a question or problem related to the concept of energy. For example, it could be related to how energy can be transformed from one form to another in daily life.	• Identifying five different energy sources and explaining how energy can be converted from one form to another.
Work in Group (30 minutes)	• Facilitating students in conducting scientific activities based on the assigned tasks. For example, the teacher facilitates students in creating concept maps and organizational diagrams of information/knowledge.	• Groups collaborate to find answers and design presentations. For instance, identifying concrete examples of energy changes and preparing presentations with pictures and real-life examples. • Groups use concept maps or diagrams to organize the

Phases	Teacher activities	Student Activities
		information they have about energy changes. • Creating a simple model to visualize the concept of energy changes.
Group presentation (20 minutes)	• Facilitating students to present their knowledge	• Each group presents their answers and findings through stories, diagrams, or multimedia presentations.
Experiment (30 minutes)	• Monitoring simple experiments conducted by students related to the concept of energy.	• Students conduct experiments to observe how heat energy can be produced by rubbing two objects together. • Students participate in an experiment burning a candle to observe the change in heat energy. • Recording the experiment results and discussing the findings within the group.
Reflection and conclusion (15 minutes)	• Reflecting on the learning, for example, by asking the question, "What did you learn from this experiment?"	• Students reflect on what has been learned and their understanding of the concept of energy after the lesson. • Participating in a class discussion about the practical applications of this understanding in everyday life.

The research data related to activities were obtained using observation sheets by two observers during the teaching and learning process, while students' learning outcomes data were collected using a multiple-choice test instrument consisting of 20 items on the topic of energy and its transformations. The subsequent research data were analyzed descriptively and statistically. The improvement in student learning activities was determined using the normalized N-Gain equation (Hake, 1999), as indicated in Equation 1, where $\langle g \rangle$ represents the n-gain; T_2 represents the pre-treatment test scores; T_1 represents the post-treatment test scores; dan T_{maks} represents the maximum score. The improvement in student activities in both the experimental and control groups was subsequently classified using Table 3.

$$\langle g \rangle = \frac{T_1 - T_2}{T_{maks} - T_2} \quad \text{.......} \quad (1)$$

Tabel 3. N-gain criteria

Range	Criteria
$0.00 < g \leq 0.30$	low
$0.30 < g \leq 0.70$	medium
$0.70 < g \leq 1.00$	high

The students' learning outcomes data were analyzed statistically to determine the influence of syndicate group learning instruction. The research data were initially tested for distribution before conducting the hypothesis test. The data distribution test was carried out using the chi-square equation. The variance test for the research data was also conducted using the F equation as a prerequisite for determining the hypothesis test.

The hypothesis test was performed using the t-test to determine the difference in the influence of syndicate group learning instruction on students' physics learning outcomes in the topic of energy and its transformations. The hypothesis testing steps were conducted using Microsoft Excel software, which provided the equations for these tests. The statistical hypotheses tested in this research are presented in Table 4.

Table 4. Statistical Hypotheses of the Study

H0 :	No significant influence of syndicate group learning instruction on students' physics learning outcomes was observed when compared to the lecture method in the topic of energy and its transformations.
Ha :	There is a significant influence of using syndicate group learning instruction on students' physics learning outcomes compared to the lecture method in the topic of energy and its transformations.

RESULT AND DISCUSSION

Learning activities

The learning activities of students in the experimental and control groups were observed by two observers. Figure 1 illustrates the difference in learning activities among groups 1, 2, 3, and 4 in the control group during meetings 1 and 2. There is an increase in student learning activities in each learning group. The improvement in student learning activities in all learning groups in the control group was found to be moderate, based on the criteria of N-Gain presented in Table 3.

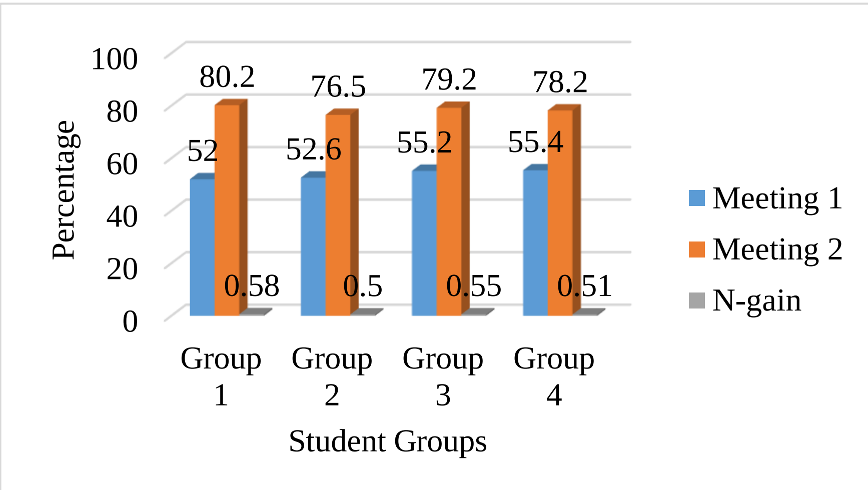

Figure 1. Control group activities

On the other hand, Figure 2 illustrates the difference in learning activities among groups 1, 2, 3, and 4 in the experimental group during meetings 1 and 2. There is an increase in student learning activities in each learning group. The improvement in student learning activities in the experimental group found that learning group 1 and learning group 4 are in the high category, while learning group 2 and learning group 3 are in the moderate category, based on the criteria of N-Gain presented in Table 3.

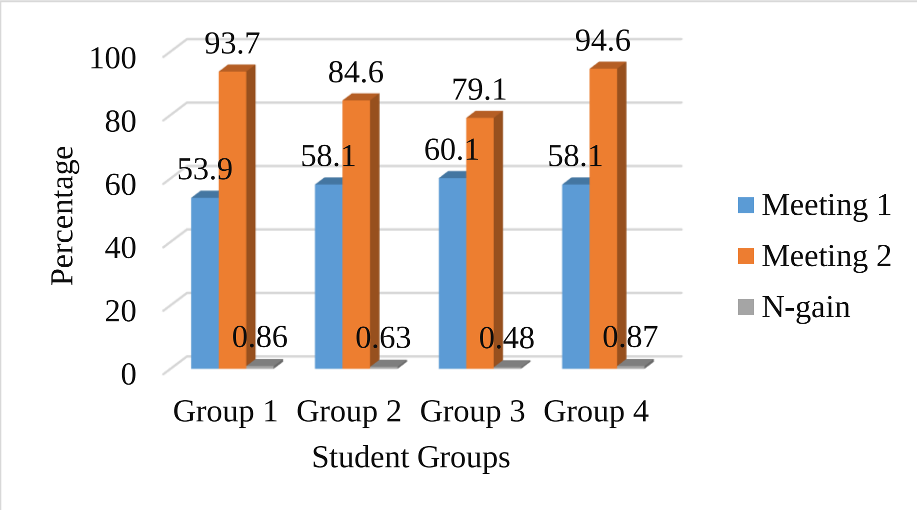

Figure 2. Experimental group activities

Learning outcomes

The statistical test results for student learning outcomes data are presented in Table 5. Based on the analysis, it can be stated that the pre-test and post-test data for both the experimental and control groups are normally distributed at a significant level of 5%. Furthermore, the criteria for testing sample homogeneity are met when Fcalculated < Ftable. The analysis results show that the value of Fcalculated is less than Ftable (1.679 < 2.015), indicating that the data for both sample groups have homogeneous variance.

Table 5. Results of the Statistical Test for Student Learning Outcomes Data

Group	Test	N	$X^2_{calculated}$	X^2_{table}	$F_{calculated}$	F_{table}	$T_{calculated}$	T_{table}
Experiment	*Pre-test*	22	10.9	11.070	1.679	2.015	2.160	2.016
	Post-test	24	5.2					
Control	*Pre-test*	22	10.4		1.976			
	Post-test	24	10.9					

Hypothesis testing was conducted to determine the difference in physics learning outcomes between students taught using syndicate group learning instruction and those taught using the lecture method. The research results indicate that tcalculated > ttable (2.160 > 2.016), thus rejecting the null hypothesis (Ho) stating "there is no significant influence of syndicate group learning instruction on students' physics learning outcomes compared to the lecture method in the topic of energy and its transformations." This result suggests a significant difference in the physics learning outcomes of students taught using syndicate group learning instruction compared to the lecture method on the topic of energy and its transformations.

Furthermore, the statistical analysis results are supported by descriptive analysis presented in Table 6 and Figure 3. The student learning outcomes using syndicate group learning instruction show an average pre-test score of 56.13 for the experimental group and 51.45 for the control group. The average post-test score for the experimental group is 69.31. For the control group, it is 58.54, with a difference in the average pre-test and post-test scores of 7.09 and 13.18 for the experimental group.

Table 6. Descriptive Data of Student Learning Outcomes

Group	Test	N	Highest score	Lowest score	Average
Experiment	Pre-test	22	70	35	56.13
	Post-test		90	50	69.31
Control	Pre-test	24	80	10	51.45
	Post-test		80	35	58.54

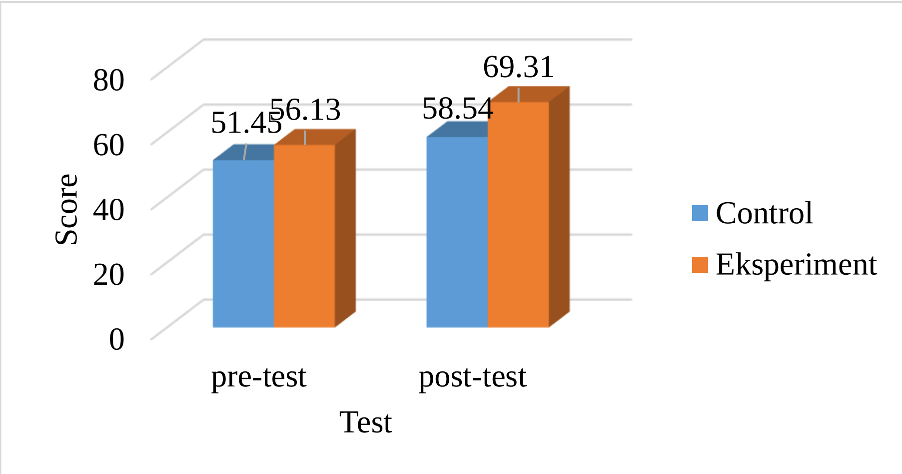

Figure 3. Learning outcomes different

Discussion

Based on the research, syndicate group learning instruction has been found to significantly impact students' learning outcomes and activities. Gillies (2008) emphasizes the benefits of cooperative learning, highlighting its positive impact on students' learning outcomes and activities. Similarly, Mckerlie et al. (2012) found that syndicate learning offers valuable benefits to the undergraduate dental curriculum, enhancing students' preparation for future work and positively impacting their learning outcomes. Furthermore, Prasetya (2017) supports the idea that group work with collaborative learning promotes the development of learning outcomes. Fredricks et al. (2004) also suggest that school engagement, fostered through syndicate group learning, contributes to positive student experiences and learning outcomes.

In addition, Theobald et al. (2017) found that group activities with positive interdependence and explicit prompts for students to explain their reasoning can reduce the negative impact of inequitable groups, further supporting the positive impact of syndicate group learning on students' activities and outcomes. Furthermore, Wang et al. (2023) highlight the need for more research to disentangle the effects of adaptive learning, whole-class instruction, and small-group instruction, indicating the significance of exploring different instructional approaches, including syndicate group learning, to understand their impact on student learning outcomes.

The research suggests that syndicate group learning instruction positively influences students' learning outcomes and activities, promoting engagement, collaboration, and positive interdependence among students. The implementation of syndicate group learning instruction addresses several potential issues and considerations. Firstly, the variability in the performance of instructional methods and the measures used to assess student abilities pose challenges in evaluating the effectiveness of different instructional approaches (Pashler et al., 2008). This highlights the importance of standardizing the implementation of syndicate group learning to ensure consistency and comparability across studies. Additionally, the effectiveness of differentiated instructions in various contexts and their impact on students' learning outcomes warrant further investigation (Melka & Jatta, 2022). Understanding the contextual factors that influence the effectiveness of differentiated instructions can provide valuable insights into optimizing instructional strategies. Moreover, the use of online learning strategies has been shown to predict students' online learning outcomes, emphasizing the significance of considering the role of technology in syndicate group learning instruction (Lin et al., 2017). Furthermore, the specific demands and challenges associated with syndicate group learning in different educational settings, such as dental education and MBA programs, underscore the need to tailor instructional approaches to the unique requirements of diverse learning environments (McKerlie et al., 2012). Additionally, certain skills, such as imitation and compliance, can influence the efficacy of small-group instruction, highlighting the importance of considering individual student characteristics in instructional design (Ledford et al., 2008).

CONCLUSION

Based on the results of the research and discussions, it can be concluded that there is a significant influence on the physics learning outcomes of students taught using Syndicate Group Learning Instruction compared to those taught using the lecture method. The research findings are supported by increased learning activities categorized as medium and high within the experimental group.

RECOMMENDATION

Based on the research results, it is crucial to reinforce students' prior knowledge, especially procedural knowledge, to support the smoothness of learning and discussions. Additionally, it is essential to conduct further studies to replicate and expand the research in different school settings or with a larger sample size to enhance the generalizability of the findings. Furthermore, comparing the effectiveness of Syndicate Group Learning Instruction with other teaching methods in the context of physics education is essential. This comparative analysis could offer insights into different instructional approaches' relative advantages and disadvantages.

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