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Research Article

The Effect of Active Knowledge Sharing Strategy on Cognitive Learning Outcomes and Students' Learning Activities on Chemical Bonding Material

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ABSTRACT

This research is an Active Knowledge Sharing Strategy in learning chemical bonds to examine its effect on cognitive achievement and learning activities of students. This strategy encourages students to be active subjects in the learning process, not just recipients of information. Quantitative approach with Intact Group Comparison design was used at SMAS Syamsuddhuha in the odd semester of the 2024/2025 academic year. The sample was taken purposively by considering certain characteristics: each class consisted of 20 students. The research instruments consisted of 16 multiple choice questions and observation sheets that had been tested for validity, reliability, difficulty level, and differentiation. The results showed that the experimental class using active knowledge sharing strategy had an average cognitive achievement of 72.50 far above the control class which reached 56.25. In terms of learning activities, the experimental class achieved an average score of 75.22 almost twice that of the control class of 40.47, indicating a statistically significant difference. Thus, the active knowledge sharing strategy proved to be effective in improving students' cognitive understanding and learning activities on chemical bonding materials.

Keywords: Cognitive outcome; Learning activity; Active knowledge sharing strategy; Chemical bonding

1. INTRODUCTION

Education stands as the cornerstone that shapes the destiny of individuals, empowers communities, and drives the progress of nations. Through education, a person can broaden their horizons and develop character that supports the fulfillment of personal needs while contributing to the progress of the nation. Broadly speaking, education is the main key in raising the standard of living and bringing prosperity to the wider community (Permanasari & Pradana, 2021). "This aligns with a core function and goal of education as outlined in the Republic of Indonesia's Law No. 20 of 2003 on the National Education System, Article 1 Paragraph 1 which defines education as a deliberate and structured process designed to cultivate an engaging learning environment where students are empowered to actively develop their full potential nurturing spiritual strength, self-discipline, character, intellect, moral integrity, and practical skills essential for personal growth and meaningful contribution to society, the nation, and the state." (Yuliani et al., 2024). Optimal learning occurs when students interact dynamically with their learning environment, whether through communication with the teacher, collaboration with peers, or exploration of various learning resources. This mutual interaction creates a more active, meaningful, and directed learning experience (Matona, 2021). However, in reality, the implementation of learning still encounters various challenges. Many students do not participate actively, while the role of the teacher still dominates the learning process. The view that learning is only a process of transferring knowledge from teachers to students is not entirely correct. Learning will be more optimal when learners are actively involved in the process, because their participation plays an important role in significantly improving understanding and learning outcomes (Awaluddin et al., 2023).

One of the common challenges in the learning process is the lack of active participation from learners. A range of elements including stagnant teaching techniques, minimal integration of educational media, poorly executed strategies, and an underwhelming assessment approach contribute significantly to the decline in students' enthusiasm and performance in learning chemistry (Qazaryah, 2019). Chemistry is one of the branches of science that studies facts, concepts, laws, and theories that are very relevant to everyday life. This science focuses on investigating the nature, laws, structure, changes, and principles of matter (Muttakin et al., 2022). Chemistry studies the nature of matter and the changes that occur in it. However, because of its abstract nature, many students have difficulty in understanding and following chemistry learning

well (Sugiyo & Ratih permana sari, 2022).

At MAS Syamsuddhuha, insights gathered from an interview uncovered that students' grasp of chemistry concepts remained quite limited. Evaluation of their daily test performances showed that most learners were still grappling to cross the threshold of the Minimum Mastery Criteria (KKM), which is 83. One of the main factors contributing to this is their limited understanding of the material, which causes difficulties in absorbing and following the learning process optimally. In learning activities, students are more often passive, Merely jotting down notes and passively absorbing the teacher's words, many students struggle to respond when questioned a reflection of their minimal engagement in the learning journey.

To truly address this issue, we need a learning method that sparks curiosity and draws students into the heart of the learning experience itself. One surefire way in the world of learning is to apply the Active Knowledge Sharing strategy. This approach invites learners to actively share knowledge and views with others, creating a dynamic learning ecosystem. By exchanging insights, the understanding of the material not only becomes sharper, but also more embedded in the memory. Strategy is defined as the general patterns of activities of teachers and students in realizing teaching and learning activities to achieve the goals that have been outlined. This strategy is an active learning strategy (Anugrah et al., 2024).

Bechina and Bommen revealed that the concept of Knowledge Sharing is a process in which someone conveys information to another party. In this process, individuals can share their insights and experiences through two-way interactions (Qazaryah, 2019). This strategy facilitates learners' understanding of the material in more depth, encourages collaboration in problem solving, and hones their communication skills (Rukmawati, 2022). This strategy invites learners to utilize their cognitive abilities in the learning process, either to solve problems, find the essence of the material, or link learning to real-world issues (Yeni Suryaningsih, 2023). By considering this background, this study will explore more deeply the effect of active knowledge sharing strategy on cognitive learning outcomes and student learning activities in learning chemical bonds.

2. RESEARCH METHODS

This research applies the pre-experimental method with the Intact Group Comparison design, where one group of students is divided into two subgroups. Half of the group serves as an experimental class that receives treatment, while the other half serves as a control group without treatment. In this study, the experimental class applied the Active Knowledge Sharing learning strategy, while the control class was given learning with an expository approach. The research took place at Syamsuddhuha Senior High School, targeting the entire 11th grade cohort, which comprised 175 students across 7 classes. From this population, two classes were selected as samples: Class XI-4, with 20 students serving as the experimental group and Class XI-3, also with 20 students, assigned as the control group. In this study, the participants were chosen through a purposive sampling technique, wherein the researcher handpicked individuals according to specific criteria aligned with the aims of the investigation. In this way, the selected sample has appropriate characteristics so that it can provide more accurate data. Data were collected through two main channels: first, through test techniques that utilize questions as measuring instruments, and second, through non-test techniques that rely on observation sheets as instruments of observation. Examining evaluation instruments in measuring cognitive achievement cannot be done carelessly. There are several crucial stages that must be passed, namely: (1) Validity test, as a guarantor that each question really measures the aspects that should be tested; (2) Reliability test, which is tasked with ensuring that the measurement results remain consistent even if retested; (3) Difficulty level test, which is calculated from the ratio of students who answer correctly to the total test participants; and (4) Differentiating power test, which serves to sort out how sharply a question is able to identify differences between participants with high and low abilities based on the distribution of correct answers from the superior group. This research employed a sequence of analytical procedures, beginning with assessments of data normality and homogeneity, advancing through hypothesis evaluation, and culminating in the examination of students' cognitive performance and their engagement within the learning experience.

3. RESULTS AND DISCUSSION

3.1 Results

Based on the graph of cognitive learning outcomes obtained from both samples, the posttest value for the experimental class was 72.5, while for the control class a value of 56.2 was obtained. It can be concluded that for experimental classes or classes that are given treatment have higher posttest results than classes that are not given treatment. The value of student learning activities for two meetings is summed up to get the final result, here is a table of the average student learning activity.

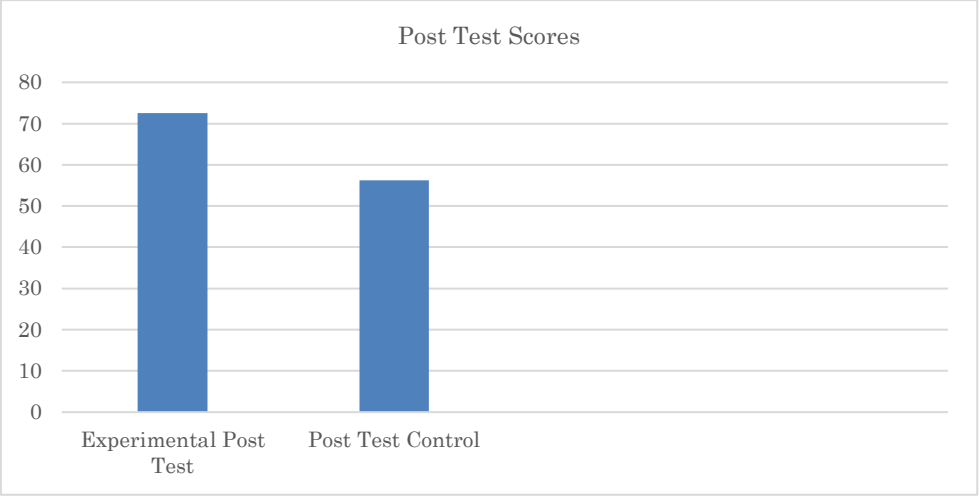

Figure 1. Results of Post Test

Based on the diagram below, there is a difference in the average percentage of achievement for each indicator of student learning activity for experimental and control classes.

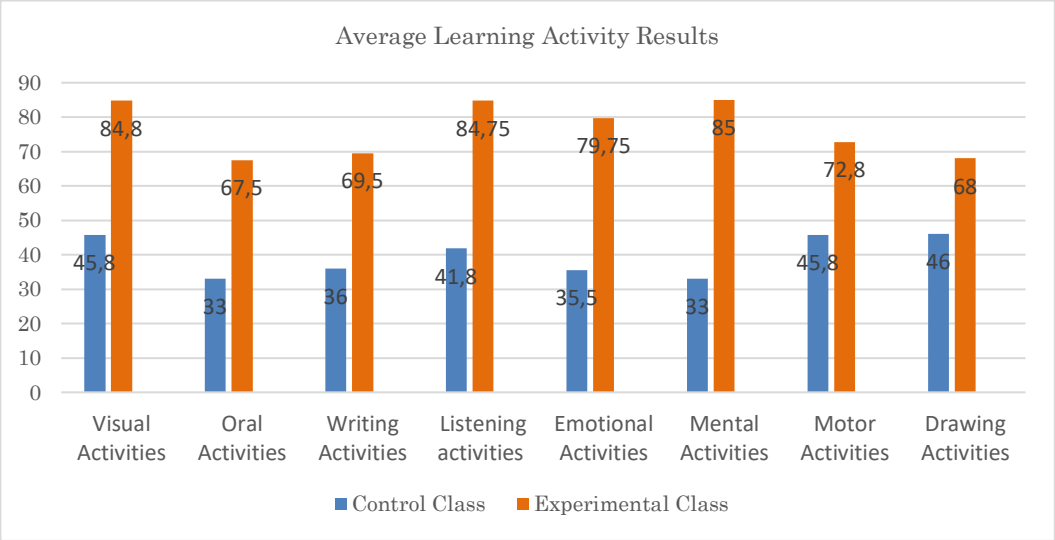

Figure 2. Learning Activity Results

3.1.1 Prerequisite Testing

a. Normality Test

Data normality was tested using the Shapiro-Wilk technique which was analyzed using SPSS software version 21. The results of the normality test for cognitive learning outcomes can be seen in table 1, while for the normality of student learning activities can be seen in **Table 2**.

Table 1. Normality Test of Cognitive Learning Outcomes

	Class	Statistic	Df	Sig	Distribution
Post Test	Experiment	.940	20	.240	Normal
	Control	.914	20	.075	Normal

Table 2. Normality Test of Learning Activity

	Class	Shapiro-Wilk		
		Statistic	Df	Sig
Learning Activity Observation Results	Average observation of experimental class	.908	Df	.058
	Average observation of control class	.918	Df	.092

b. Homogenity Test

Homogeneity testing in this study used the Oneway Anova test. Homogeneity testing was carried out on posttest data and student learning activities which can be seen in **Table 3** and **Table 4**.

Table 3. Homogeneity Test of Cognitive Learning Outcomes

		Levene Statistic	df1	df2	Sig.
Score	Based on Mean	1.063	1	38	.309
	Based on Median	1.004	1	38	.323
	Based on Median and with adjusted df	1.004	1	37.988	.323
	Based on trimmed mean	1.060	1	38	.310

Table 4. Homogeneity Test of Learning Activities

		Levene Statistic	df1	df2	Sig.
Score	Based on Mean	.146	1	38	.705
	Based on Median	.200	1	38	.657
	Based on Median and with adjusted df	.200	1	37.607	.657
	Based on trimmed mean	.165	1	38	.687

c. Hypothesis Test

To test the hypothesis in this study, the t test was used with the help of SPSS software through the independent sample t-test test. Hypothesis testing was carried out on test results and student learning activities. The results of testing the hypothesis of cognitive learning outcomes obtained a probability value or sig 0.000 <0.05 so that H0 is rejected and Ha is accepted, while for the results of testing the hypothesis of learning activities obtained a probability value or sig 0.000 <0.05 so that H0 is rejected and Ha is accepted.

3.2 Disscusion

This study involved two groups with different treatments, namely the experimental class using the Active Knowledge Sharing strategy and the control class applying conventional learning methods. The purpose of this study was to determine the extent to which the Active Knowledge Sharing strategy affects students' understanding of Chemical Bonding material in class XI of Syamsuddhuha SMAS. Learning outcomes in this study were measured based on two aspects, namely cognitive and student learning activities. There were differences in the learning process between the two classes. The experimental class showed a higher level of activeness and interest in participating in learning, while the control class tended to experience monotonous learning, where the teacher only explained the material without any significant interaction, so that many students felt bored and sleepy. In this study, class XI 4 served as the experimental class, while class XI 3 as the control class. Assessment of learners' cognitive outcomes was conducted through a posttest to measure their understanding after the implementation of the Active Knowledge Sharing strategy in the experimental class, while the control class used a conventional strategy. Learning activities were assessed during two sessions by two observers. Normality test using Shapiro-Wilk in SPSS 21 showed that the data was normally distributed with a posttest significance value of 0.240 (experimental class) and 0.075 (control class). The homogeneity test with One-Way ANOVA resulted in a significance value of 0.309 (> 0.05), so both classes have the same variance.

The posttest results showed that the Active Knowledge Sharing strategy had a positive impact on learning outcomes. The average value of the experimental class was 72.5, higher than the control class which was only 56.25. This advantage is due to active interaction in group discussions that increase students' understanding. In contrast, the control class that still used conventional methods tended to be less interesting, causing learners to be passive and less motivated. The t-test on cognitive aspects showed a significance value of 0.000 (<0.05), so Active Knowledge Sharing was proven to have an effect on students' cognitive outcomes. This strategy encourages active engagement, reflection, and teamwork, thus improving understanding and memory. In addition, the self-efficacy factor also plays a role in successful learning, where learners' beliefs in their abilities affect their interest and learning outcomes. Another factor that influences learning achievement is self-efficacy, which is learners' belief in their ability to complete tasks. High self-efficacy can increase interest in learning, while lack of confidence can be an obstacle in the learning process (Muliaman et al., 2022) .

Learning activity data was obtained from an observation sheet that included 8 indicators, namely visual, oral, writing, listening, emotional, mental, motor, and drawing. The percentage of learning activities in the experimental class was higher than the control class, with the highest indicators in visual, listening, and mental activities (68%), while in the control class

it only ranged from 26%-37%. The implementation of the Active Knowledge Sharing strategy in the experimental class increased learning activities significantly compared to the conventional method in the control class. This strategy encourages active involvement of learners, creates an interactive learning environment and improves understanding of the material. In contrast, the conventional one-way method in the control class made learners less motivated and passive.

Hypothesis testing with Independent Sample T-test showed a significance value of 0.000 (<0.05), which means the Active Knowledge Sharing strategy has a significant effect on learning activities. This strategy gives students more opportunities to argue, ask questions, and interact, thus increasing motivation and teamwork in the learning process. This is in line with previous research which shows that learning activities develop through collaboration in knowledge sharing and problem solving, making learning more enjoyable and effective. This strategy provides greater opportunities for learners to express their opinions, both in answering questions, asking questions to the teacher, and interacting with peers during learning. In addition, they can collaborate in sharing knowledge, which also increases their motivation and activeness in the learning process (Fitria et al., 2020) . Learning activities can develop through teamwork in solving problems, both within a team and between teams (Harahap, 2022).

4. CONCLUSION

Drawing from the analysis of data collected in this study, which explored the influence of the Active Knowledge Sharing strategy on students' cognitive performance and learning engagement, the following key insights were revealed: The implementation of the Active Knowledge Sharing strategy significantly enhanced students' cognitive learning outcomes, as evidenced by a posttest average score of 72.5 in the experimental group, compared to 56.2 in the control group. Additionally, the strategy positively impacted students' learning activities, with the experimental group achieving an average observation score of 75.22%, notably higher than the control group's 40.47%.

RECOMMENDATION

It is recommended that active knowledge sharing strategies be applied in the learning process to improve students' cognitive learning outcomes and learning activities, especially in chemical bonding material.

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AUTHOR'S CONTRIBUTIONS

All authors discussed the results and contributed to from the start to final manuscript.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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