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IMPROVED CHEMISTRY LEARNING OUTCOMES THROUGH THE JIGSAW COOPERATIVE LEARNING MODEL IN VOCATIONAL SCHOOL

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ABSTRACT

This study aims to improve the chemistry learning outcomes of grade XI students at SMK Jaya Negara Makassar by applying the Jigsaw-type cooperative learning model. This class action research (PTK) was conducted in two cycles, with the research subjects consisting of 20 students of class XI of SMK Jaya Negara Makassar. Each cycle consisted of four stages of activities, namely planning, action implementation, observation, and reflection. Data collection in this study was conducted through observation, tests, and documentation. The data analysis technique used was quantitative analysis, including calculating learning outcome scores, data presentation, and conclusion drawing. The results showed a significant increase in student learning outcomes. The average student score in cycle I was 69.75, while it increased to 86.15 in cycle II. In addition, the percentage of completeness of learning outcomes in cycle I reached 60%, and in cycle II increased to 100%, which showed perfect criteria. Based on this study's results, applying the Jigsaw-type cooperative learning method effectively improves student learning outcomes in chemistry subjects in class XI of SMK Jaya Negara. This research is expected to positively contribute to learning practices in schools and become a reference for further research on cooperative learning models in chemistry education.

Keywords: Cooperative Learning, Jigsaw, Learning Outcomes, Chemistry, Classroom Action Research

INTRODUCTION

This research focuses on improving the chemistry learning outcomes of class XI students at SMK Jaya Negara Makassar by applying the Jigsaw-type cooperative learning model. This learning model has been proven effective in improving learning outcomes in various disciplines, including chemistry, by prioritising cooperation between students in small groups. Previous research shows that using the Jigsaw model can overcome the problem of low student learning outcomes often caused by monotonous and less interactive teaching methods (Gusmayeni et al., 2019; Nurhadi, 2019; Aswirna, 2012).

One of the main challenges in education is students' low motivation and engagement in the learning process. In this context, the Jigsaw-type cooperative learning model offers an innovative solution. By dividing the learning material into small parts that each group member

must learn, students learn from the teacher and their peers. This creates a more dynamic and interactive learning atmosphere, where students feel more responsible for their and their friends' learning (Nurfitriyanti, 2017; Sulhan, 2020). Research shows that students who engage in cooperative learning tend to understand better the material taught and improve their social and collaborative skills (Detri et al., 2018; Yulianti, 2022).

Furthermore, applying the Jigsaw model in chemistry learning is expected to improve the understanding of chemical concepts that students often consider difficult. For example, a study conducted by Aswirna found that applying the Jigsaw model can significantly improve student learning achievement in chemistry subjects (Aswirna, 2012). This is in line with other findings that show that cooperative learning models can improve student learning outcomes at various levels of education and disciplines, including physics and mathematics (Nurhadi, 2019; Sunilawati, 2021; Siregar, 2020). Thus, applying the Jigsaw model at SMK Jaya Negara Makassar is expected to have a similar positive impact on students' chemistry learning outcomes.

In addition, it is essential to note that the Jigsaw learning model focuses on academic outcomes and developing students' social skills. In a collaborative learning environment, students are taught to respect each other, listen, and work together in completing tasks. This is particularly important in the current educational context, where interpersonal skills are becoming increasingly important (Yulianti, 2022; PASINGGI, 2023). Research shows that students who engage in cooperative learning tend to have a more positive attitude towards learning and are better able to adapt to various social situations (Nasruddin & Abidin, 2017).

Although many studies support the effectiveness of the Jigsaw model, there are still challenges in its implementation in the classroom. Teachers must be trained to manage groups well and ensure that every student actively participates in learning. In addition, proper assessment is also needed to accurately measure students' learning outcomes (Puta, 2021; Saldi et al., 2017). Therefore, this study aims to implement the Jigsaw model and evaluate its effectiveness in the specific context of SMK Jaya Negara Makassar.

This study will use a classroom action research (PTK) approach to implement and evaluate the Jigsaw-type cooperative learning model. By actively involving students in the learning process, it is expected that the chemistry learning outcomes of grade XIstudents can be significantly improved. This research will also consider other factors that can affect learning outcomes, such as learning motivation and student involvement in the learning process (Ardianik & Sucipto, 2020; Wardani & Wiyasa, 2020). Thus, this research is expected to contribute meaningfully to developing school learning methods, especially in chemistry subjects.

Overall, applying the Jigsaw-type cooperative learning model at SMK Jaya Negara Makassar is expected to be a practical step in improving the chemistry learning outcomes of grade XIstudents. By utilising a more interactive and collaborative approach, students are expected to gain better knowledge and develop social skills that are important for their future lives. This research will provide deeper insight into the effectiveness of the Jigsaw model in Indonesia's education context and provide recommendations for teachers and other educators to implement more innovative and effective learning methods.

METHODS

1. Planning: At this stage, the researcher will design a lesson plan using the Jigsaw model. This plan will consist of the development of teaching materials, the division of student groups, and the determination of clear indicators of success. Researchers will also prepare data

collection instruments, such as a pre-test, to determine student understanding before applying the Jigsaw model (Setiyono et al., 2020; Nurhadi, 2019).

2. Implementation of Action: The research will be conducted in two cycles, each with two meetings. At each meeting, the researcher will apply the Jigsaw learning model, where students will be divided into small groups, and each group will be responsible for learning a specific part of the chemistry material. After that, students will teach each other the material they have learned to other group members (Saenab et al., 2019; SP & Kusmariyatni, 2019; Resmi, 2022).

3. Observation: During the implementation of the action, researchers will conduct observations to record students' interactions, their engagement in learning, and group dynamics. These observations are important to evaluate the effectiveness of the Jigsaw model in improving learning outcomes and student motivation (Suhardiman et al., 2022; Kahar et al., 2020).

4. Reflection: After each cycle, researchers will reflect on the learning process that has been implemented. This includes analysing data on students' learning outcomes obtained from the post-test and feedback from students on their experiences during the learning process. This reflection aims to identify the strengths and weaknesses of the Jigsaw model and plan improvements for the next cycle (Suryaningsih, 2020; Uki & Liunokas, 2021).

A. Data Collection

The data to be collected in this study include:

1. Learning outcomes: Measured through initial and final tests to determine the improvement of students' understanding of chemical concepts.
2. Observation: Notes on student engagement and group dynamics during the learning process.
3. Student feedback: Questionnaires or interviews to obtain students' views on applying the Jigsaw model and its impact on their learning.

B. Data Analysis

The data obtained will be analysed descriptively and quantitatively to comparecompare learning outcomes before and after applying the Jigsaw model. This analysis will also include an evaluation of student observations and feedback to provide a comprehensive picture of the effectiveness of the applied learning model (Trihartoto & Indarini, 2022; Ardyanto, 2022).

By using the PTK method, this research can significantly contribute to improving the learning outcomes of chemistry class X students at SMK Jaya Negara Makassar and provide insight for teachers in applying more effective and interactive learning methods.

RESULTS AND DISCUSSION

Cycle I

Students took the initial test. After everything was done, the teacher divided students into five groups, each with four students, based on the number of students' completeness in the previous test. The teacher formed the Group of Origin and then divided the LKPD with different sub-material into one group, where students studied the sub-material. After a set time, the teacher forms Expert Groups, where students with the same LKS number or submaterial join. Students in the group talk about the material together. The teacher pays attention to the conversation, and then students return to the Home Group to explain the sub-material that the Expert Group has discussed to their friends. In the second meeting, students return to the Home Group to discuss the material the Expert Group discussed. The teacher continued to monitor the group discussions. The teacher then asked one of the group members to present the results

of the debate to test the success of the jigsaw cooperative learning model. The best of the group is given a prize. Students are given guidance to make conclusions. After that, the instructor gave the final exam of the cycle I within thirty minutes. The results of the examination were as follows:

Table 1. Completeness of Learning Outcomes Cycle I

No	Learning Outcomes	Total	Total Percentage (%)
1.	Completed	12	60
2.	Not Completed	8	40
	Total	20	100

Table 1 shows that 12 students achieved learning completeness with a percentage of 60%, and eight students achieved learning completeness with 40%. Cycle 1 student learning outcomes are still less than expected, a classical completeness of 75%. Consequently, a second cycle must be implemented to improve student learning outcomes. The results of students' observations about learning include that the class was a little crowded or noisy during group discussions, some students remained silent when the teacher explained the material, and some students were less active in group learning, including students who only played with their friends. Some students cheated because they were not confident in their abilities. The observation of teacher activities showed that the teacher was still less than optimal in conditioning a conducive classroom; the teacher actively observed the discussion in the school by going around when students were talking in groups; the teacher still lacked incentives for students to participate in active activities; and the teacher still failed to manage time effectively and efficiently. Lesson observations must be made to improve learning outcomes. One way to do this is to increase students' motivation to be more active and cooperate in group discussions. When learning occurs, the teacher's gaze contacts the students, not just on groups or individuals. This aims to improve students' understanding of the topic being learnt. Improve classroom management for learning and time utilisation.

Cycle II

The teacher divides the students into five initial groups, with four students each. In one group, the teacher divides the LKPD into different sub-materials, and students study the sub-materials. After the deadline, the teacher divided the students into Expert Groups. Students with the same LKPD number or submaterial join a new group called Expert Group. Students in the group talk about the material together. The teacher supervises the conversation. Students then return to their original groups and explain or present the submaterial discussed to their friends. At the next meeting, students return to their home groups and discuss the material they have discussed. The teacher continues to monitor the group discussions. To test the success of the jigsaw cooperative learning model, the teacher asks group members to present the results of the debate. The teacher gives fantastic encouragement to students to learn and provides rewards. Students finish the material with the teacher. Afterwards, the teacher gives the final exam (End of Cycle II Test) within thirty minutes. The results include:

Table 2. Completion of Cycle II Learning Outcomes

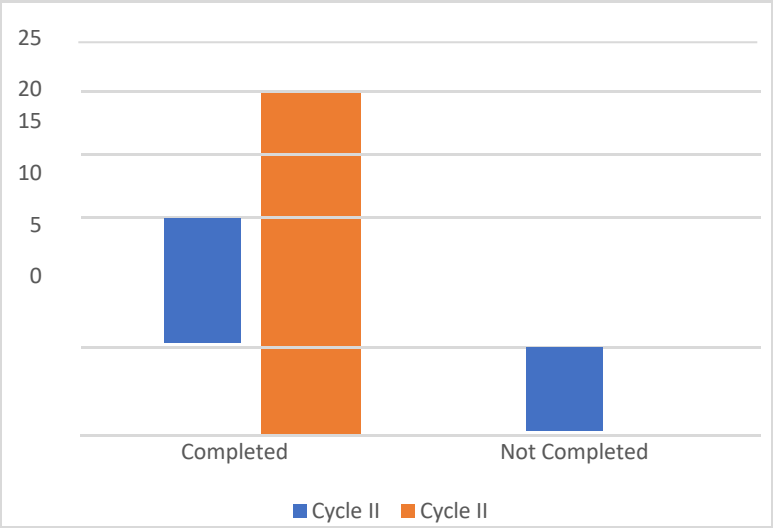
No	Learning Outcomes	Total	Total Percentage (%)
1.	Completed	20	100
2.	Not Completed	0	0
	Total	20	100

An analysis of the percentage of completeness of student learning outcomes in Cycle I and Cycle II can be found in the table below.

Table 3. Percentage of student learning completeness in Cycle I and Cycle II

No	Cycle	Completed	Not Completed	% Percentage
1.	Cycle I	12	8	60
2.	Cycle II	20	0	100

In addition, student learning outcomes from cycle I to II can be seen more clearly in Figure 1.



Figue 1. Comparison of Cycle 1 and Cycle 2 Learning Outcomes

CONCLUSION

T Based on the data description and research analysis, the physics learning outcomes of class XI SMA Cendrawasih students can be improved using the jigsaw cooperative learning model. The increase in test scores in Cycle II compared to Cycle I shows the students' learning completeness. Although there are obstacles with jigsaw cooperative learning, requiring a lot of time and a slightly crowded classroom atmosphere when each group gives their presentation, the teacher must know how to plan the teaching so that the material is conveyed as well as possible.

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