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Application Of Active Learning Strategies In Fostering Cognitive And Psychomotor Competence Of Grade V Students In Science Subjects At Elementary School

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Abstract

This study aims to examine the application of active learning strategies in improving the cognitive and psychomotor competencies of grade V students in science subjects at one of the elementary schools in Yogyakarta. The research used a qualitative approach with a case study method. The data collection technique was carried out through direct interviews with three informants, namely a school principal, a teacher, and a student. The research instruments included interview guidelines, voice recording devices, and field notes. The data analysis process was carried out interactively through the stages of data reduction, data presentation, and conclusion drawn. The validity test of the data was carried out through source triangulation and technical triangulation. The results of the study showed that active learning strategies applied through group discussions, simple experiments, and simulations helped improve students' understanding of science concepts and their practical skills. In the cognitive aspect, it showed that students are able to better explain abstract concepts such as the water cycle and food chain. In the psychomotor aspect, the finding showed that students have improved ability to use simple measuring instruments, make observations, and record experimental results systematically. The findings also showed that learning becomes more interactive and fun, increasing students' enthusiasm for learning. Thus, the active learning strategy has proven to be effective in science learning at elementary school level, although it is necessary to adapt the method according to age characteristics and availability of infrastructure.

Keywords: *Active Learning Strategies, Cognitive Competence, Psychomotor Competence, Science Learning, Elementary School.*

INTRODUCTION

As a researcher in the field of basic education, it is important to highlight that cognitive and psychomotor competencies are the two main aspects that greatly determine the success of learning, especially in Natural Science subjects. Cognitive competence includes conceptual understanding and logical thinking skills, while

psychomotor competence deals with practical skills such as conducting experiments and observations. However, many elementary schools still face obstacles such as passive teaching methods and lack of practicum facilities. To overcome this, the active learning strategy is an effective alternative because it encourages active student involvement through discussions, simulations, experiments, and the use of interactive media, so that it can simultaneously improve conceptual understanding and practical skills.

Students' cognitive and psychomotor competencies have a very important role in learning at elementary schools, especially in Natural Sciences subjects (Yuliantika, 2022). Cognitive competence includes students' ability to understand the concepts taught, think critically, and solve problems effectively (Basri, 2019). This is very important in the intellectual development of students, because with a good mastery of concepts, students can relate the knowledge gained to real-world situations. In addition, psychomotor competencies involving physical or practical skills are also one of the main goals in science learning (Marcelina et al., 2024). This skill teaches students to apply the theory that has been learned in experiments or practicum activities, so that the knowledge they have is not only limited to theory, but can be applied in daily life. In other words, improving cognitive and psychomotor competencies will make a direct contribution to the quality of education and students' readiness to face challenges in the future (Meilani et al., 2021) .

Based on observations at many elementary schools, there are still a number of obstacles that hinder the development of students' cognitive and psychomotor competencies (Hutapea & Sitinjak, 2022). Many students have difficulty understanding to the abstract and complex science concepts (Mia et al., 2020). This is often due to less effective learning methods, where students simply receive information passively without being given the opportunity to interact and develop their own understanding (Beautiful, 2024). In addition, limitations in practicum or experimental activities involving psychomotor skills are also an inhibiting factor, because not all schools have adequate facilities to support these activities (Isnaini & Utami, 2020). As a result, students have only a limited understanding of science concepts and are unable to apply their knowledge in practical activities (Hartanti et al., 2024; Scott, S. S. Scott, 2023).

To overcome these problems, a learning approach is needed which can stimulate students' active involvement in the learning process. One of the approaches that is considered effective in fostering cognitive and psychomotor competence is active learning strategy (Maisaroh & Rostrieningsih, 2020; Sitorus et al., 2024). Active learning is an approach that puts students at the center of learning activities, where they are

given the opportunity to engage directly in a variety of activities that encourage them to think critically, discuss, and solve problems creatively (Nyoman et al., 2022). In the context of science learning, this strategy can include activities such as experiments, research projects, group discussions, as well as the use of visual or digital aids that allow students to construct their own knowledge (Muliani et al., 2024). Through active learning, students not only receive information from teachers, but also actively engage in the process and application of that information (Imamah, 2021).

Active learning allows students to develop critical and analytical thinking skills, as they are faced with problems or situations that require solving and reflection (Anzelina et al., 2024). In addition, by being directly involved in experiments or projects, students can also develop their psychomotor skills (Mulia & Murni, 2022). This skill is important in science learning, as students can learn how to conduct experiments, data processing, and draw conclusions systematically (Nisa et al., 2020). Thus, active learning strategies not only assist students in improving their understanding of science concepts, but also prepare them to face practical challenges they may encounter in everyday life (Wahid et al., 2024).

However, although many studies have shown the effectiveness of active learning in improving cognitive and psychomotor competence, its application at elementary schools, especially in Yogyakarta, still faces various challenges (Nurrita, 2019; Setyosari, 2020). One of the main challenges is the lack of teachers training for implementing this strategy optimally (Hayaturraiyan & Harahap, 2022). Teachers often find it difficult to design learning that combines cognitive and psychomotor aspects in a fun and effective way (Yasmin, 2017). In addition, the limitation of facilities and time at many schools are also obstacles in carrying out active learning involving experiments or projects (Antika et al., 2022). Therefore, it is important to conduct further research on the application of active learning in the context of science learning at elementary schools, to find out the extent to which this strategy can be applied effectively and what obstacles are faced (Mislinawati & Nurmasyitah, 2018).

Previous research on the implementation of active learning strategies at various levels of education have shown very positive results. For example, active learning can improve students' motivation to the learning process and academic outcomes in a variety of subjects, including science (Adinia et al., 2022). Students who engaged in active learning have showed significant improvements in their practical skills, such as in conducting science experiments (Sigli, 2022). However, there is a lack of focused studies which examine how active learning specifically affects the cognitive and psychomotor

competencies of elementary students in science subjects within the local context of Yogyakarta.

The novelty of this study lies in its focus on integrating active learning strategies specifically in science instruction for fifth-grade students at one of elementary schools in Yogyakarta, with an emphasis on the simultaneous development of cognitive and psychomotor competencies as area that remains underexplored in previous research. By conducting this study, new insights are expected to emerge regarding the practical application of active learning in basic education, which contributing to more effective, innovative, and contextually relevant instructional practices in Indonesia. ... inclusive and sustainable transformation of education.

METHODS

This study used a qualitative approach. Qualitative research is the science in which we collect data to answer empirical questions (John W. Creswell, Lincoln, 2016). Qualitative research is also research that emphasizes the aspect of understanding a problem in depth (Fiantika & Maharani, 2022). For research method, this study was carried out through a case study method. The case study method is an empirical method that investigates modern phenomena in real-world situations, especially in problems where the boundary between phenomenon and context may be unclear (Yin, 2018).

This research was conducted in one of the elementary schools in Yogyakarta, at the first semester in the academic year 2024/2025. The informants involved in this study are as follows;

Table 1. Research Participants

No	Code	Status	Age
1	R1	Principal	35 Years
2	R2	Educators	29 Years
3	R3	Learners	11 Years

The data collection procedure started from choosing the type of the interview used in this study, confirming to the participants to conduct an interview, designing the interview questions to be asked, preparing a tool to record answers from participants using mobile phones, and then conducting interviews with participants directly to the intended school. As mentioned, the data collection technique used in this research was interview. Interview is a form of data collection that allows individual participants to provide personal perspectives to interviewers in obtaining information (Creswell, 2016). The type of interview used in this research was one-on-one interview where the researcher can directly observe the participant's body language and hear the

participant's voice directly, as well as build personal relationships that can increase the willingness of the participant to provide the information needed openly (Creswell, J. W., & Poth, 2018).

This study used data analysis techniques including; data condensation, data display, and conclusion drawn. Data condensation is the selection process, focusing on data that appears in interviews. The display is a collection of information that helps to understand what is happening and conduct further analysis by taking action based on understanding. Conclusion drawn is verifying the conclusion that final appears after the data collection is completed (Miles, Huberman, & Saldana, 2014).

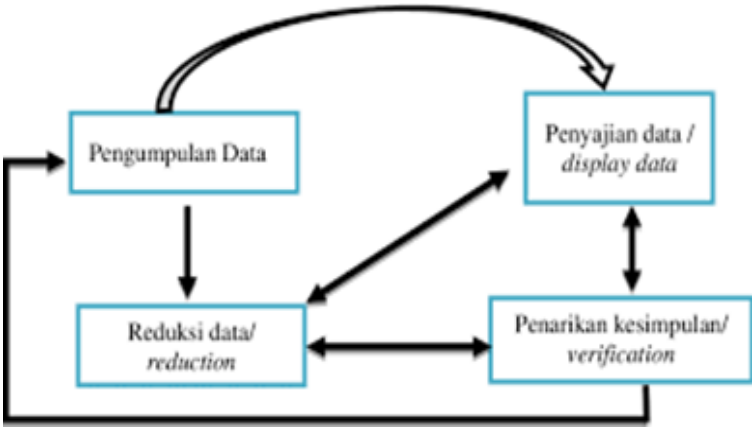


Figure 1. Data Reduction Techniques

RESULTS AND DISCUSSION

1. Results

a. Active Learning Strategies: An Interactive Approach in the Learning Process

Active learning strategies are one method that has been proven to be effective in enhancing student engagement during the learning process. This method requires students to participate directly in learning through activities such as group discussions, simple experiments, collaborative projects, and simulations. The implementation of this strategy in grade V in science subjects at one of the elementary schools in Yogyakarta revealed very positive results.

In the interview section, R2 (educator) explained: "We try to practice learning that makes students directly involved. For example, they learn about the food chain by modeling small ecosystems using simple materials."

This is supported by the principal's observation (R1), which emphasized the

importance of this strategy: "This approach makes students more actively ask questions and discuss. We saw an increase of student enthusiasm during the lessons".

Form those explanation, it can be said that active learning strategy gives students opportunity to not only learn passively through listening, but also put into practice during the learning process. In line with active learning theory, this allows students to internalize information in a more in-depth and relevant way.

b. Fostering Cognitive Competence Through Contextual Learning

Cognitive competence includes the ability of students to understand, analyze, and evaluate information. Active learning strategies play an important role in fostering this competence, especially in science subjects that require an understanding of abstract concepts.

Based on interviews with students (R3), this approach makes the lesson easier to understand: "When we learned about the water cycle, the teacher asked us to create a simple model using images and materials that were around. So, I can imagine the process".

In addition, R2 adds: "This active learning gives students the challenge to think more critically. We often provide case studies, for example, what would happen if one of the components of the ecosystem was lost".

As a result, students show a better understanding of science concepts such as life cycles, changes in substance forms, and ecosystems. This competence is also seen in their ability to answer analytical questions and provide in-depth explanations in group discussions.

c. Development of Psychomotor Competencies through Practical Experiments

Psychomotor competence in science learning includes students' skills in using simple laboratory tools, making observations, and recording results systematically. Active learning strategies support the development of these skills by engaging students directly in the experimental activities.

R2 explains: "When learning about temperature changes, students are asked to use a thermometer to measure the temperature of hot and cold water. This

activity makes them more skilled in using scientific tools".

R3 added: "I was delighted when we were asked to do an experiment. We work in groups to record results and compare them with friends."

The use of tools such as pipettes, measuring cups, and thermometers teaches students how to properly hold and use the tools. R1 notes that this activity also trains students' hand and eye coordination and increases their confidence in facing practical tasks.

2. Discussion

The results of this study show that the application of active learning strategies is proven effective in fostering cognitive and psychomotor competencies of grade V students in science subjects. These findings are in line with some previous research, although there are differences in context and approaches that enrich discussions in this area.

Active learning significantly increases students' motivation towards the learning activities and academic achievement result, including in science subjects (Adinia et al., 2022). The research conducted by Adinia et al., in 2022 uses a quantitative approach and involves junior high school students as subjects. In the context of this study, similar results are found, where active learning strategies have motivated students to better understand science concepts, despite the focus on elementary school students. Compared to this study, the advantage of this study is to emphasis cognitive and psychomotor aspects at the same time, which is less of a concern in Andinia et al.'s research.

Experiment-based learning as a form of active strategy is able to improve students' practical skills, such as the use of laboratory tools (Sigli, 2022). This research supports the findings in the current study, where students show significant improvements in psychomotor competencies, such as the ability to use thermometers and conduct experimental observations. However, Sigli research highlights technical skills more than the integration between theoretical and practical understanding. This research adds a new dimension by connecting practical activities directly to the concepts learned, so that psychomotor competencies do not stand alone.

One of the novelties of this research is the application of active learning strategies that are adapted to the local context, namely one of elementary schools in

Yogyakarta. This study integrates a variety of methods, such as group discussions and simple experiments, that are relevant to the characteristics of primary school students. Previous research has tended to focus more on junior high or high school students, stated that active learning methods are considered easier to implement due to higher student maturity levels (Suyadi & Widodo, 2019). This aligns emphasize the importance of adjusting learning strategies to the developmental stage and environmental conditions of elementary school students, particularly through contextual and hands-on activities (Batubara et al., 2024)

In addition, this study provides a new perspective by describing how active learning strategies can be applied to develop students' psychomotor skills in a limited learning environment. R2 (educator) explained that the experiment was carried out using simple materials such as water, plastic cups, and thermometers, which showed that the success of this strategy does not require complete laboratory facilities. A low-resource environment does not necessarily hinder the implementation of active learning strategies, especially when teachers creatively use available materials to engage students in meaningful learning experiences (Shobirin et al., 2024)

Freeman et al. confirms that the implementation of active learning is directly proportional to improve student performance in various fields of science, technology, engineering, and mathematics when compared to traditional lecture-based teaching methods (Brod, 2021). The importance of students' active participation in the learning process has also been recognized by other researchers, such as Prince, who has noted that active learning can strengthen knowledge retention as well as encourage critical thinking and problem-solving skills (Theobald et al., 2020). Furthermore, in a study conducted by Deslauriers et al., it has found that active involvement in the classroom not only improves students' feelings of the learning process, but also has a real impact on actual learning outcomes, which is very important to avoid misunderstandings about the effectiveness of the teaching methods used (Deslauriers et al., 2019). These findings suggests that deeper conceptual achievement can be achieved when students are actively engaged in the learning experience.

While many previous studies have supported the effectiveness of active learning strategies, this study emphasizes the importance of adapting methods to the students' educational levels and environment. The findings of this study have indicated that students become more skilled at critical thinking and team work activities. Thus, it has confirmed that these strategies provide broader benefits than simply improving

academic grades.

In addition, the results of the interviews shows that this strategy increases students' confidence in answering questions and completing practical tasks (Ramadhan, 2022). This confirms the view that active learning not only has an impact on the cognitive aspect but also on the social-emotional development of students. This contribution provides a strong argument for the importance of maintaining active learning strategy in science teaching, particularly at the elementary school level.

Compared to previous research, this study makes a significant contribution in integrating active learning with the context of basic education. Nonetheless, this study does not aim to negate previous findings, but complements the perspective by providing evidence that this strategy can be successfully applied to younger age students in a low-resource environment. This contribution confirms that active learning is a flexible and relevant approach to different levels of education and learning environment conditions

CONCLUSION

The application of active learning strategies in science subjects at Elementary School, Yogyakarta, has proven to be effective in improving students' cognitive and psychomotor competencies. Learning that actively engages students through experimentation, discussion, and the use of simple learning media, can help students understand science concepts and improve their practical skills. However, this study has limitations, such as the limited sample which only involving one school and focusing on one subject. Therefore, further research is recommended to expand the scope of the site and explore the long-term impact and application of active learning in other subjects.

This research also shows the importance of external factors such as school policies and the role of parents in supporting the implementation of active learning. For this reason, future research can further explore the influence of these factors on learning outcomes. By expanding the scope and duration of the research, it is hoped that it can produce a more comprehensive understanding on the effectiveness of active learning strategy and also the challenges in its application at various educational contexts.

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