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EFFICIENCY OF SCAFFOLDING METHOD IN THE LEARNING PROCESS OF MATHEMATICS COMPARATIVE MATERIAL IN GRADE V ELEMENTARY SCHOOL STUDENTS

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Abstract

The conceptual understanding of comparative mathematics remains a significant challenge in elementary education, as students rely heavily on formulaic approaches rather than developing deeper comprehension. This condition highlights the importance of the role of teachers in assisting with learning methods such as *scaffolding.* This study aims to analyze the efficiency of the scaffolding method in improving students' cognitive aspects. Scaffolding can help students improve mathematics learning outcomes and mathematical problem-solving skills and improve the cognitive aspect applied to grade V students in one of the state elementary schools in the Pondok Kacang area. This study uses a descriptive qualitative approach with data collection through observation, interviews, and documentation with data sources of a teacher and 3 grade V students in one of the State Elementary Schools in the Pondok Kacang area. The results of the study on the application of *the scaffolding* method to improving cognitive aspects in students in the context of learning mathematics ratio materials show that the application of *the scaffolding method* is efficient and effective; this can be seen from the improvement of students' cognitive aspects through assisting children in the early stages of their development, applying a multi-level approach, and efforts to follow the characteristics *of scaffolding* when there is an argument between students and teachers. The *scaffolding* method improves students' cognitive aspects by using motivational strategies and associating students' interests with learning assignments. Therefore, the scaffolding method plays a role in developing students' cognitive skills, especially in mathematics.

Keywords: comparison; efficiency; math; scaffolding method

1. Introduction

Learning is an active activity. This is because learning not only puts students at the center of the learning process but also stimulates creativity and problem-solving. Furthermore, using learning methods is essential to optimize the educational process. These strategies can encourage student participation, improve understanding of ideas, and foster critical thinking skills. Article 2 of the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 103 of 2014 concerning Learning in Primary and Secondary Education contains the declaration.

To help students understand the information, teachers can use a variety of tactics, techniques, and approaches. Students gain an indirect understanding of information through various teaching approaches, including lectures, discussions, and project-based learning. Students' skills, particularly in mathematical reasoning, are influenced by the evolution of learning strategies. Mathematics is one of the branches of science that applies logic in the thinking process. As a symbolic science, mathematics will not be helpful without the proper logic of thinking (Pramudita & Anugraheni, 2017).

Based on the experience of researchers in the field, students often do not understand the concept behind the comparison and only enter numbers into the formula to get a solution. Through deep thinking activities, students can analyze their thoughts and those of others to solve problems with rational steps (Cho & Kim, 2020; Li et al., 2024; Hartono et al., 2024; Rachamim et al., 2024; Rezat et al., 2022; Schons et al., 2023; Siller et al., 2023; Walkington et al., 2024; Handayani, 2020).

When students encounter these comparisons and then find it difficult to simplify them again, they must analyze their mistakes further to identify their specific areas of difficulty. Through deep thinking activities, students can analyze their thoughts and those of others to solve problems with rational steps (Handayani, 2020). This information can then be used to improve teaching and learning activities and help students overcome these problems. This is an exciting lesson for practicing mathematics learning in elementary school. When children enter elementary school, their cognitive abilities develop (Sugiyono, 2014). Students will learn to think logically and improve their reasoning skills through mathematics, a formal abstract science that uses symbolic language and is deductive, axiomatic, and abstract. This will help them solve problems in life and the classroom. Therefore, mastery of mathematical concepts is vital. Taught since they entered elementary school (Pradana & Mahendra, 2021)

One of the mathematics subject matter taught in elementary school is scale and comparison material. Scale and comparison materials are pretty tricky for students. This is because students still do not understand how to apply comparison and scale in the form of story questions (Suwarni, 2017) In addition to percentages, map scales and comparing the length of an image with a printed image are other examples of how these comparison materials are used in everyday life. When students encounter these comparisons and then find it difficult to simplify them again, they must analyze their mistakes further to identify their specific areas of difficulty. This information can then be used to improve teaching and learning activities and help students overcome these problems (Septiani et al., 2020)

Teachers need skills in creating an exciting learning environment through learning methods such as scaffolding to achieve the expected learning outcomes. Vygotsky proposed *scaffolding* as an integral aspect of social constructivist learning theory. According to Vygotsky, social origin explains how people learn and grow intellectually; in other words, it comes from the social context and not from within themselves. The scaffolding method enhances students' ability to work together and think critically, which aids in mastery of math topics. One of the new approaches in education is the *scaffolding* method. When students struggle to solve problems independently, teachers may use scaffolding, an adaptive aid, to guide them. One of the teachers who carried out the scaffolding method in mathematics learning at one of the schools in the Pondok Kacang area. Based on the results of observations and pre-research interviews, it is known that the teacher has been applying the scaffolding method for a long time and shows that the method can help students understand and develop mathematical skills.

Other research also shows (Maharani & Subanji, 2018) *Scaffolding* aims to help students overcome challenges while solving math problems through directions and questions. Students can complete assignments and projects and achieve goals beyond their dreams with the support of *scaffolding* (Fadila et al., 2014) According to this definition, *scaffolding* occurs when teachers provide diminishing support to students as they work to complete activities that are above their current abilities (Hidayat et al., 2021) Eventually, students will be able to handle these tasks on their

own. It turns out that *scaffolding* is one of the many therapies that can correct the error. Research shows that using scaffolding to solve comparative math problems is effective for students' thinking processes, particularly for these problems (Dua & Rumerung, 2021)

There are three characteristics of scaffolding according to Van de Pol et al (Suwastini et al., 2021), namely contingency, fading, and transfer of responsibility that occur in the argumentation process between teachers and students. This process is interrelated with scaffolding productivity in the learning process, namely the provision of contingency which has an impact on support that will experience fading and increased responsibility. This productivity is part of the efficiency or success measurement process that will have an impact on the learning process. Through the process of assessing efficiency, it can determine whether the scaffolding method is in accordance with what is planned and produced by a teacher. This efficiency will also have a significant impact on the teacher's reflection process to the next learning.

Many studies have been conducted on the *scaffolding* in mathematics, such as (Cho & Kim, 2020; Hartono et al., 2024; Rachamim et al., 2024; Rezat et al., 2022; Schons et al., 2023; Siller et al., 2023; Walkington et al., 2024). However, previous research has not examined the overall efficiency of applying scaffolding methods in mathematics education, especially in comparison. Therefore, this study has novelties related to scaffolding efficiency and the material chosen to be researched. Furthermore, the purpose of this study is to determine the extent of the efficiency of the scaffolding method in improving cognitive aspects, as well as what scaffolding strategies play a role in the improvement.

2. Method

This research employed a qualitative descriptive approach through an interpretive paradigm to explore and analyze how Efficiency of the scaffolding method in mathematics learning. This process allows researchers to detail the learning process, explore the perspectives of teachers and students, and describe the development of scaffolding characteristics that occur through the process of interviews, observations, and documentation. In more detail, you can see the following:

2.1 Research Subjects

The research subjects comprised one class V teacher and 24 students enrolled in one West Pondok Kacang State elementary school. One of the reasons for choosing this location is because it applies the *scaffolding method* in the process of teaching and learning activities. However, the effectiveness of the strategies used in the learning is not yet known. Of the 24 students, three students were selected purposively based on their level of cognitive ability, namely students with high, medium, and low cognitive abilities. The selection of students aims to get a variety of perspectives regarding the learning process from the perspective of students with different abilities. Students' cognitive abilities are categorized by considering learning outcomes, formative tests, and input from relevant classroom teachers based on the Criterion Referenced Test in that class.

2.2 Data Collection Techniques

The data in this study were collected through three main methods, namely:

Observation: The researcher directly observes the learning process in the classroom. The observation was carried out in a participatory manner, where researchers observed the interaction between teachers and students and paid attention to how students with different cognitive abilities responded to the learning material. The aspects observed include teachers' use of learning methods, student involvement in the learning process, and student interaction dynamics.

In-depth interviews were conducted with a teacher and three selected students. The interviews were conducted semi-structured to gain a more in-depth view of the student's learning experience, the teaching strategies applied by the teachers, and the challenges faced in the learning process. Interviews with students are focused on their experiences during the learning process, specifically related to understanding the material and participation in the classroom. Meanwhile, interviews with teachers aimed to explore learning planning more, the approaches used to accommodate students with different cognitive levels, and teachers' evaluations of the effectiveness of the teaching-learning process.

Data was also obtained by analyzing learning documents, such as learning implementation plans or lesson plans, student assignment results, and teacher assessment records. These documents support the results of observations and interviews and provide a more

comprehensive picture of the learning process in the classroom.

2.3 Data Analysis Techniques

The data obtained was analyzed using an interactive analysis method consisting of several stages, namely:

Data Reduction: Data obtained from observations, interviews, and documentation are selected, sorted, and summarized to focus on information relevant to the research objectives. This stage involves grouping the data according to the themes that emerge during the data collection. The reduced data is presented as narratives, tables, or diagrams to facilitate further understanding and interpretation. The data presentation is carried out so that the relationship between the data can be seen. The researcher drew provisional conclusions verified using various sources based on the data presented. This conclusion is iterative and will be refined along with the data collection and analysis.

Data triangulation is carried out to improve the validity and reliability of the research results, namely comparing and verifying data obtained from various sources (teachers, students, and documents) and through various methods (observation, interviews, and documentation). This triangulation aims to ensure that the research findings reflect the actual situation and are not biased.

3. Results and Discussion

3.1 Results

3.1.1. Efficiency of the application of *the scaffolding* method in improving cognitive aspects in grade V Elementary School students in the context of learning Mathematics comparative material

The findings of this study illuminate several critical aspects of implementing the scaffolding method in mathematical education, particularly in teaching comparative concepts to elementary students. The following are the results of interviews conducted by researchers to teachers related to the application of *the scaffolding* method in improving cognitive aspects in grade V elementary school students in the context of learning Mathematics comparative material:

Table 1. Interview Results about Efficiency Scaffolding

Interview Questions	Interview Results	Explanation of Interview Results
How do you apply the *scaffolding* method in learning comparative material mathematics in grade V?	1. Provide examples and instructions to students. 2. Using concrete objects in everyday life. 3. Give exercises without examples of manipulative objects at the next meeting 4. Assign students with good grades to explain to their friends who do not understand.	Teachers support and assist students gradually, from providing examples and instructions to providing exercises without examples of manipulative objects. This helps students to understand the material more deeply and independently.
What is an indicator of the success of applying *the scaffolding* method in learning comparative mathematics in grade V?	1. Students can improve mathematics learning outcomes. 2. Students can improve their mathematical problem-solving skills. 3. Students can overcome mistakes made in solving math problems.	The *scaffolding method* has proven effective in improving students' cognitive aspects, such as learning outcomes, problem-solving skills, and overcoming mistakes.
How do you assess the effectiveness of scaffolding in learning comparative material mathematics in grade V?	1. Seeing student scores from the evaluation results. 2. Give exercises without examples of manipulative objects at the next meeting. 3. Giving awards to students who have good grades.	Teachers use various ways to assess the effectiveness of the implementation of *the scaffolding* method, such as looking at students' grades, providing exercises without examples of manipulative objects, and giving rewards to students who excel.

According to (Trianto, 2014) *Scaffolding* means providing support to children while they are still developing, gradually reducing that support, and then letting them take on more responsibility when they reach developmental milestones. This is in line with the results of an interview with a grade V teacher of one of the state elementary schools in the Pondok Kacang area who knows how well the *scaffolding method* can improve students' cognitive abilities in the context of comparative mathematics learning.

The results of interviews, observations (learning process), and documentation evidence (learning implementation plans or lesson plans, student assignment results, and teacher assessment records). Based on the results of interviews with grade V teachers, in improving the cognitive aspect of grade V elementary school students in the context of learning Mathematics, comparative materials use the provision of assistance to students during the early stages of their development and reduce that assistance and provide opportunities for children to take over greater responsibilities as soon as they can do (Damayanti et al., 2022) In the results of the interview with the teacher of class V, according to him, *the scaffolding* carried out by the teacher can be done by asking questions and answering questions after giving examples and continuing to assist. The results of similar interviews also support this, which gives examples that can be done by directly using the units in the comparison, for example, meters/rulers and weights of objects/bodies, as manipulative aids for students. In the results of observation and documentation carried out by the researcher, the researcher found package books and worksheets brought by teachers as teaching materials for the material delivered and supporting media such as meters, rulers, and weight scales.

There are three levels of *scaffolding*, as explained by (Anghileri, 2006). Level 1 *Environmental Provisions* is to organize students, which provides manipulative objects to help students solve problems. Level 2 *Explaining, Reviewing, and Restructuring* is teacher assistance explaining, reviewing, and restructuring in response to student difficulties. Level 3 develops conceptual thinking. Namely, teachers help students develop at the conceptual thinking stage. This is following the findings of the researcher, based on the results of the research by interviewing resource persons, namely class V teachers, stating that to achieve level 1 *Environmental Provisions*, it is possible to use demonstration methods in providing comparative examples, for example, utilizing surrounding objects such as object weight scales, providing sugar, oil, flour with varying sizes of object weights, and to reach level 2 *Explaining, Reviewing, and Restructuring* class V teachers stated that they could do it by giving tests or exercises to find out the extent of students' understanding of the material given, while to reach level 3 developing conceptual thinking, one of the class V teachers, gives examples of objects that exist in daily life such as weight scales, shopping scales or necessities, and basic food materials that they usually encounter in daily life. In the results of observation and documentation carried out by the researcher, the researcher found learning media in the form of scales, meters, and basic food materials used in teaching and learning activities.

Grade V teachers in this research school compile and build learning goals and indicators using scaffolding techniques throughout the learning planning stage. Observational data and documentation corroborate this. Teachers are also responsible for making essential competencies and learning indicators based on observation data. Compliance with rules related to the educational curriculum is a technical part of developing competency standards, essential competencies, and indicators. Following up on previous observations (for two months, namely March and April), the researcher emphasized that the delivery of content by teachers is in line with the objectives and indications he has identified. Data collected from field documentation gives confidence that there is a learning implementation plan, complete with indicators and learning objectives implemented by teachers (Rahayu et al., 2020)

According to (Pol et al., 2010) Explain three scaffolding characteristics when there is an argument between students and teachers: Contingency, *Fading*, and Transfer of responsibility. This follows the researcher's findings in interviewing class V teachers regarding the efficiency of applying *the scaffolding method* in improving cognitive aspects in grade V elementary school students in the context of learning mathematics comparative materials. The results of the researcher's interview with the teacher of grade V were about improving the cognitive aspect of elementary school (SD) students in grade V in the context of learning mathematics comparative material using the characteristics of contingency, *fading*, and transfer of responsibility. In the results of the researcher's interview with grade V teachers, the characteristics of contingency were carried out to improve the cognitive aspect of elementary school (SD)

students in grade V in the context of learning mathematics comparative material, according to (van de Pol et al., 2010) the characteristics of contingency are a strategy chosen depending on the student's weaknesses. According to the teacher of class V, the characteristics of contingency carried out by teachers are identifying specific student needs, such as conducting questions and answers and mentoring.

The characteristic of *fading, according to* (van de Pol et al., 2010), is to stop *scaffolding* to allow students to think or if the student has achieved the expected goal. Based on the research results by interviewing resource persons regarding the efficiency of applying *the scaffolding* method in improving cognitive aspects in grade V elementary school students in the context of learning mathematics, the following comparison material is *fading characteristics*. The teacher of grade V (SK) emphasized that the characteristics of fading need to be done because the 5th-grade students in their thinking stage are already abstract, so examples of manipulative object media are only given to strengthen reasoning or understanding before independent practice. According to (van de Pol et al., 2010), the characteristic of the transfer of responsibility from the teacher to the student refers to the student's cognitive or metacognitive activity or attitude. Based on the findings interviewing the researcher, namely a class V teacher with the initials SK, according to him, the transfer of responsibility can be carried out when the results of the exercises and reports from the students who are assigned to teach other students, say that he already understands and understands the material that has been given. The results of the observations that the researcher found support the idea that the teacher is very good at the material presented, but, of course, it is inseparable from the teacher's efforts in preparing the material and learning concepts that have been made carefully. The findings of the documentation in the field are supportive, that there are sources of material conveyed, namely from student books and worksheets.

A grade V teacher at one of the elementary schools in Pondok Kacang developed a learning assessment as part of the scaffolding strategy learning planning stage. Based on an interview with one of the teachers of grade V, he stated that his students have reached a certain level of understanding when they achieve a higher score than the minimum completeness criteria. This is 70 percent of the students in his class, and more than half of them will be able to demonstrate this understanding at the next meeting by completing the exercise without using manipulative objects.

The results of a similar interview also support this that one of the teachers of class V, assigned several students who had good grades, to explain to their friends who did not understand the comparison material, because with the language used, the students were much better understood by other students because they were usually afraid to ask further questions to the teacher. The researcher found the results of observation and documentation as support, that teachers gave congratulations, lively applause and gave praise as motivation to students.

The efficiency of the application of *the scaffolding* method in improving cognitive aspects in grade V elementary school students in the context of mathematics learning, especially in comparative materials, can be seen from several research findings that show that the support and assistance provided by teachers gradually has a significant impact on students' understanding and independent ability. This *scaffolding* method involves providing clear examples and instructions at the beginning of learning, where the teacher actively guides students through the learning process using various tools such as manipulative objects (Basri & Arsal, 2022) In the early stages, students are given concrete examples to see and manipulate to build a solid comparison understanding. As time passed and students' comprehension increased, teachers gradually reduced this help, moving students to more abstract exercises without examples of manipulative objects. This gradual strategy is designed to develop students' independence by directing them to apply the knowledge and skills they have acquired independently (Cahyo, 2013)

Research shows that this *scaffolding* method improves student learning outcomes and develops problem-solving skills and the ability to overcome mistakes (Sudarman & Linuhung, 2017) When students learn through this step-by-step process, they not only memorize concepts, but also learn how to apply them in a variety of situations, which improves their critical and analytical thinking skills. Additionally, when students are allowed to work without the aid of manipulative objects, they are encouraged to use more complex and creative problem-solving strategies. This contributes to improving a more in-depth cognitive aspect, where students not only understand the comparative material but can also apply it in different and more challenging contexts.

The effectiveness of the implementation of the *scaffolding* method is also evaluated in various ways by teachers. One is assessing student grades, which significantly improve after applying this

method. Exercises given without the help of manipulative objects are also an important measuring tool, as they show the extent to which students can understand and apply the concepts they have learned independently. In addition, giving awards to outstanding students is also an additional motivation that encourages students to continue to strive and improve their abilities.

This award serves as a recognition of students' achievements and a motivator that strengthens confidence and encourages them to learn further. The whole approach shows that the *scaffolding* method is efficacious in improving students' cognitive aspects and developing the independence, motivation, and problem-solving skills essential in Mathematics learning.

Based on the researcher's research on the results of an interview with one of the classroom teachers, he applied three theories (Trianto, 2014). According to him, *this scaffolding* will aim to train children to be independent after getting adequate assistance. The next theory (Anghileri, 2006) explains scaffolding in 3 levels. Level 1 (*Environmental Provisions*) Organizes students and provides manipulative aids to help them solve problems. Level 2 (*Explaining, Reviewing, and Restructuring*) teachers provide explanations, reviews, and restructuring in response to students' difficulties. Level 3 (Developing Conceptual Thinking) teachers help students develop conceptual thinking. By going through these three levels, *scaffolding* is effective in supporting students' understanding and cognitive development.

The last theory (van de Pol et al., 2010) explains three characteristics of *scaffolding* when there is an argument between students and teachers: 1. Contingency, the strategy chosen depends on the student's weaknesses. 2. *Fading*, stopping *scaffolding* to allow the student to think or if the student has achieved the expected goal. 3. Transfer of responsibility, which refers to cognitive or metacognitive activities or student attitudes, is the transfer of responsibility from teachers to students.

3.1.2. Scaffolding strategies that play a role in improving cognitive aspects in elementary school (SD) students

The scaffolding strategy is an essential pedagogical approach in improving cognitive aspects in Grade V Elementary School students, as shown by research that observes the role of teachers as facilitators in helping students achieve Zone Progressive Development (ZPD). In education, *scaffolding* is a technique in which teachers temporarily support students during the learning process until they can complete tasks or understand concepts independently.

The following are the results of interviews conducted by researchers to teacher related to *scaffolding strategies* that play a role in improving cognitive aspects in Grade V Elementary School students:

Table 2. Interview Results about Scaffolding Strategies

Interview Questions	Interview Results	Explanation of Interview Results
How is *the scaffolding* strategy applied in learning?	The teacher provides initial assistance through instructions, encouragement, examples, or steps in working on the problem. This assistance is tailored to the needs of students.	Teachers act as facilitators who help students achieve their ZPD.
What are the benefits of *scaffolding strategies* for students?	Improve students' reading and writing skills.	Students feel motivated and supported to learn independently.
How is the learning evaluation done to determine the effectiveness of *the scaffolding* strategy?	Teachers and students provide examples of how teachers use manipulative objects and other methods to help students understand concepts.	The evaluation is done through observation, documentation, and interviews with teachers and students.
What do students think of *scaffolding strategies*?	Students feel happy and easy to understand the subject matter with *scaffolding strategies*.	Scaffolding *strategies* help students learn actively and interactively.

This study reveals that teachers act as mediators who support students through various stages of learning, adjust the level of support based on the individual needs of students, and gradually reduce the assistance as students' competencies increase. This strategy includes using open-ended questions, clear instructions, and constructive feedback. All of them are designed to guide students toward a deeper understanding and better problem-solving skills.

Based on the results of interviews with class V teachers, the theory of scaffolding strategies

improves students' cognitive aspects. Class V teachers with the initials SK, *scaffolding strategies* in improving cognitive aspects in students are divided into 2, namely:

3.1.2.1. Provides Motivation

Class V (SK) teachers provide motivation; namely, by providing exciting tools, students will feel more interested and motivated to learn because they can directly interact with the learning material. Interviews with fifth-grade students (AA), revealed that teachers use necessities and body scales as examples of manipulative objects to help students better understand the concepts discussed in class.

The results of interviews with other grade V students, namely SQ, according to him, the provision of examples of tools in the form of weight scales, necessities, and meters made it easier to understand the lesson directly. Not only that, a class V student with the initials TS, based on the results of the interview, said that learning with the same scale that is weighed, such as rice, flour, sugar, and oil, is very helpful because when we shop, we will know how much it weighs.

The researcher found from the observation that students showed increased active participation during the learning process, and teachers gave positive feedback, such as stating to students that they already understood this concept well and then allowing them to try to apply it in different contexts. The documentation results showed that the researcher found that the tasks collected by students improved the quality of analysis and problem-solving.

3.1.2.2. Associate student interests with learning assignments

According to the grade V teacher, encouraging students to take cognitive responsibility can be done by giving exercises with manipulative objects in the previous meeting and negating them at the next meeting. This is evidenced by the results of interviews with class V AA students, who stated that they feel independent and can also practice directly related to the materials taught. According to a class V student with the initials SQ, he feels independent, can practice it, and feels helped when the teacher reduces the use of manipulative objects in learning. Another support is based on the results of interviews with class V students with the initials TS. According to him, the association of interests and learning tasks is beneficial when we have understood the material being studied; when the teacher explains, it is a sign of this.

Based on the results of the observations made by the researcher, the researcher found that teachers associate learning concepts with students' interests. When learning comparative mathematics, teachers use manipulative tools to help students' conceptual thinking in the early stages and reduce it along with students' understanding. This is in line with the results of the documentation obtained by the researcher, which shows that the teacher provided manipulative aids such as weight scales/ necessities, meters, rulers, and necessities such as rice, sugar, and flour to demonstrate. Then, students were allowed to solve the given problems.

This study also highlights that students who learn with *a scaffolding* approach feel more motivated and supported in independent learning. This motivation arises because students feel valued and cared for, which increases their confidence to try new things and take risks in learning. Additionally, when students feel comfortable enough to speak, ask questions, and engage in class discussions, they are more likely to do so. This method not only improves students' cognitive knowledge, but also fosters essential communication and social skills.

Evaluation of the effectiveness of *the scaffolding* strategy was carried out through the triangulation method, namely direct observation, documentation of the learning process, and in-depth interviews with teachers and students. Observation allows researchers to see firsthand the interaction between teachers and students and how support is provided and received. Documentation, such as diaries and student work, provides an overview of the student's learning progress. Meanwhile, interviews with teachers and students provide deep insights into their subjective experiences and perceptions of the *scaffolding* process. Through this evaluation, it can be concluded that *scaffolding* strategies help students learn actively and interactively and build a strong foundation for long-term learning.

In grade V of elementary school, *scaffolding* is very relevant because students are transitioning from learning through direct instruction to more independent and critical learning. With the help of *scaffolding*, students gain new knowledge and skills and learn how to manage their learning, develop critical thinking strategies, and become more confident in their problem-solving abilities. Therefore, *scaffolding* is vital in optimizing students' cognitive potential adaptively and responsively to individual needs, ultimately creating a more effective and holistic learning environment.

3.2 Discussion

After the data analysis stage, data interpretation was based on research findings on the efficiency of *the scaffolding method* in the learning process of comparative mathematics materials for grade V elementary school students. Based on the findings of data analysis conducted on teachers and students of grade V, the following can be stated about the effectiveness of *the scaffolding approach* in helping grade V elementary school students understand mathematics comparison material. Classroom teachers have an essential role in improving students' cognitive aspects. To improve the cognitive aspect of students, teachers apply several efforts, namely providing assistance in the early stages of student learning, providing leveling in the *scaffolding method*, and following the characteristics *of scaffolding* when there is an argument between students and teachers.

Efforts to assist in the early stages of student learning involve a gradual learning process carried out by teachers, the use of manipulative aids, and a gradual reduction of assistance while giving greater responsibility to students. This systematic approach shows that *scaffolding* can improve students' independence and understanding of the concept of comparison. Efforts to provide leveling in the scaffolding method of grade V teachers, applying a graded approach in teaching the concept of mathematical comparison that effectively improves students' understanding. At level 1, he uses demonstrations with surrounding objects; at level 2, he gives tests to measure and review students' understanding; and at level 3, he introduces examples from everyday life to develop students' conceptual thinking.

Efforts should be made to follow scaffolding characteristics when there is an argument between students and teachers. The *scaffolding method* applied by grade V teachers in one of the Pondok Kacang State Elementary Schools effectively improves the cognitive aspects of students in learning comparative mathematics by implementing three main characteristics of scaffolding under the theory (van de Pol et al., 2010): *contingency*, *fading*, and *transfer of responsibility*. Regarding contingency characteristics, teachers identify students' needs and adjust teaching strategies through questions, answers, and mentoring. Fading characteristics are applied by reducing assistance as students begin to understand concepts, allowing them to think independently, given that students in grade V are already at the abstract thinking stage. Finally, the transfer *of responsibility characteristic* is carried out by transferring learning responsibilities to students, for example, through self-practice and teaching assignments among students to ensure their understanding.

According to (Fadilla, 2014), assisting students can be in the form of hints, brief explanations to solve problems in the form of solving steps, giving examples, and encouragement, being able to do things on their own. Research shows that *the scaffolding* method improves student learning outcomes and develops problem-solving skills and the ability to overcome mistakes. Through this gradual process, students memorize concepts and learn to apply them in various situations, improving their critical and analytical thinking skills. When students work without the help of manipulative objects, they are encouraged to use more complex and creative problem-solving strategies, which contributes to improving deeper cognitive aspects. Students not only understand the comparative material but are also able to apply it in different and more challenging contexts.

The effectiveness of *the scaffolding* method is also evaluated in various ways by teachers. One is the assessment of student grades, which significantly improves after applying this method. Practice without the help of manipulative objects becomes a vital measuring tool, showing the extent to which students can understand and apply concepts independently. Awarding outstanding students is another motivation, encouraging students to keep striving and improving their abilities. Students' confidence and motivation to continue learning are supported by this award, which recognizes their achievements. According to Jean Piaget's theory of cognitive development, children learn best when actively involved in understanding the world around them, which means they constantly adapt and absorb new information (Ningsih, 2014). Furthermore, according to (Cahyo, 2013), the advantages of *the scaffolding strategy* are to motivate and associate students' interests with learning tasks. Overall, this technique shows that the *scaffolding* method improves students' cognitive characteristics and helps them acquire essential skills for learning math, such as independence, motivation, and problem-solving abilities.

Academic success, learning motivation, critical thinking skills, and student independence are some indications that show the effectiveness of *the scaffolding* method in the classroom. Scientific studies have shown that students' conceptual understanding and capacity to apply information in many circumstances can be improved using *well-*

designed scaffolding. Students who participate in hands-on learning better understand mathematical ideas than students who participate in *scaffolding* (Lestari & Andriani, 2019) In this study, students who engaged in *scaffold-based* learning tended to better cope with complex tasks and showed higher resilience to failure. This efficiency is also enhanced by the ability of teachers to tailor the level of support to the individual needs of students, thus avoiding situations where there is too much or too little help. Additionally, consistent implementation of *scaffolding* can build a more inclusive learning environment where students feel supported and motivated to take intellectual risks. *In the long term, scaffolding also contributes to developing metacognitive skills, allowing students to organize and supervise their* learning process. Thus, the efficiency of *the scaffolding* method can not only be seen in short-term learning outcomes and in forming a mindset that supports lifelong learning.

The researcher saw from interviews with class V teachers and students that scaffolding strategies that improve the cognitive aspects of students applied by class V teachers (Cahyo, 2013) have proven to be effective. When teachers motivate students using attractive aids such as food scales, scales, and meters, students are more interested and motivated to learn. Students with the initials AA, SQ, and TS stated that using manipulative tools helps them understand the material more efficiently, supported by increased active student participation, positive feedback from teachers, and improved quality of analysis and problem-solving in student assignments. In addition, teachers succeeded in associating students' interests with learning tasks by giving exercises with manipulative objects at the initial meeting and reducing them at subsequent meetings to encourage cognitive independence. Students feel more independent and able to practice the material taught, as expressed by students with the initials AA, SQ, and TS.

According to this study, students who use *the scaffolding* method in learning report higher motivation and support when working independently. Students feel this drive when they know their teachers genuinely care about them, which improves and encourages them to take intellectual risks. As a result of a positive and engaging learning environment, children are more likely to speak up, ask questions, and engage in class discussions. Students' social and communication skills are strengthened along with their cognitive understanding by using this method.

The evaluation of the effectiveness of *the scaffolding* strategy was carried out through the triangulation method, namely direct observation, documentation of the learning process, and in-depth interviews with teachers and students. Observation allows researchers to see firsthand the interaction between teachers and students and how support is provided and received. Documentation, such as diaries and student work, provides an overview of the student's learning progress. Meanwhile, interviews with teachers and students provide deep insights into their subjective experiences and perceptions of the *scaffolding* process. Through this evaluation, it can be concluded that *scaffolding* strategies help students learn actively and interactively and build a strong foundation for long-term learning

4. Conclusion

Based on the results of the above research regarding the analysis of the efficiency of the scaffolding method in the learning process of comparative material mathematics in grade V elementary school students, the research can be concluded:

The application of the scaffolding method in improving cognitive aspects is concluded to be efficient through assisting children during the early stages of their development, applying a multi-level approach in teaching the concept of comparison mathematics, and efforts to follow the scaffolding character when there is an argument between students and teachers.

The scaffolding strategy that plays a role in improving the cognitive aspect of grade V elementary school students is using a motivational strategy and associating students' interests with learning assignments.

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