JURNAL KAJIAN PENDIDIKAN DAN CAKRAWALA PEMBELAJARAN

THE IMPLEMENTATION OF COOPERATIVE LEARNING TO IMPROVE SCIENCE LEARNING OUTCOMES ON THE PARTS OF PLANTS AND THEIR FUNCTIONS AMONG FOURTH-GRADE STUDENTS AT SDN 010 MORONG, SUNGAI LALA DISTRICT, INDRAGIRI HULU REGENCY

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Abstract

Background: *Science learning in elementary schools requires instructional strategies that encourage active participation, collaboration, and meaningful understanding of scientific concepts. However, preliminary assessment at SDN 010 Morong indicated that students experienced difficulties understanding plant parts and their functions, with a class average of only 4.3.* ***Objective:*** *This study aimed to improve fourth-grade students' science learning outcomes through the implementation of a cooperative learning model.* ***Method:*** *This study employed Classroom Action Research adapted from the Kemmis and McTaggart model, consisting of planning, acting, observing, and reflecting. The participants were 10 fourth-grade students, comprising five boys and five girls. The research was conducted in two cycles. Data were collected through formative tests, classroom observations, and documentation and analyzed using quantitative and qualitative descriptive techniques.* ***Results:*** *The findings showed progressive improvement in students' science learning outcomes. The class average increased from 4.3 in the pre-cycle to 5.6 in Cycle I and 7.7 in Cycle II. Classical learning mastery also improved from 0% to 20% and finally to 80%, meeting the predetermined success criterion. Improvements were accompanied by more active group discussions, peer assistance, and the use of real plants as concrete learning media.* ***Novelty:*** *This study combines heterogeneous grouping, individual responsibilities, peer support, and direct observation of real plants in teaching plant parts and their functions.* ***Conclusion:*** *Cooperative learning supported improvements in students' science learning outcomes and classroom participation through structured collaboration and concrete learning experiences. The main contribution lies in combining heterogeneous grouping, individual group responsibilities, peer assistance, and direct observation of real plants within the two-cycle classroom action research process. The findings describe improvement in this specific classroom and should not be interpreted as evidence of a general causal effect.*

Keywords: *Cooperative Learning; Science Learning Outcomes; Plant Parts and Functions; Elementary School Students; Classroom Action Research.*

INTRODUCTION

Education is a fundamental foundation for developing human resources through the process of fostering students' knowledge, skills, and character. At the elementary school level, science education plays a strategic role in developing students' understanding of natural phenomena and fostering scientific thinking skills from an early age. Science learning should not focus solely on factual knowledge acquisition but should also encourage active engagement and conceptual understanding. Bartels and Lederman (2022) emphasized the importance of scientific literacy in elementary education. Similarly, Indira et al. (2023) highlighted the relevance of cooperative learning in improving science learning outcomes.

Effective science instruction requires pedagogical strategies that connect scientific concepts with students' concrete learning experiences. However, the implementation of science instruction in elementary schools still faces several challenges, including the dominance of conventional teaching methods, limited classroom interaction, and low levels of student participation. Wahyuningsih et al. (2023) found that cooperative learning produced better outcomes than conventional instruction in the IPAS subject. Marheni (2022) also demonstrated that the implementation of the Student Teams Achievement Divisions (STAD) cooperative learning model could improve elementary school students' science learning outcomes.

These challenges were also identified through preliminary observations of fourth-grade students at SDN 010 Morong, Sungai Lala District, Indragiri Hulu Regency, particularly in science instruction on the parts of plants and their functions. The pre-cycle assessment revealed that the class average score was only 4.3, indicating that students had not yet achieved an adequate understanding of the material. This condition was associated with a teacher-centered instructional approach that relied heavily on lectures and individual assignments. Widiyono et al. (2023) demonstrated the potential of cooperative learning to improve science achievement, while Muawanah (2023) identified an association between cooperative learning, student motivation, and academic achievement at the elementary school level.

Low learning outcomes are not solely related to instructional delivery strategies but also to students' limited opportunities to construct understanding through social interaction. The topic of plant parts and their functions requires students to understand the relationship between plant structures and the functions of each part. Therefore, instruction should provide opportunities for students to observe, identify, discuss, and exchange knowledge. Berliana (2022) suggested that the Team Assisted Individualization (TAI) cooperative learning model has the potential to improve science learning outcomes. Similarly, Fajriah et al. (2024) identified the contribution of the STAD cooperative learning model to improving elementary school students' science achievement.

One alternative for addressing these challenges is the implementation of cooperative learning. This model engages students in small learning groups where they construct knowledge through collaboration, discussion, individual accountability, and mutual support in achieving learning objectives. Nurhasanah et al. (2026) demonstrated that cooperative learning can support

improvements in elementary school students' IPAS learning outcomes. Meanwhile, Yarasyimah et al. (2025) reported that cooperative learning supported by audiovisual media has the potential to enhance student engagement, motivation, and conceptual understanding.

Previous studies have demonstrated the contribution of cooperative learning models to improving science and IPAS learning outcomes through various approaches, including STAD, TAI, Picture and Picture, and Think-Pair-Share. Sari et al. (2025) examined the effectiveness of the Think-Pair-Share cooperative learning model in teaching the human respiratory system, whereas Putri et al. (2025) investigated the use of Picture and Picture in IPAS instruction. Nevertheless, these studies have not specifically examined the implementation of cooperative learning in teaching plant parts and their functions at SDN 010 Morong. The specific learning material and school context therefore provide the research focus and contextual contribution of this study. Accordingly, the gap addressed here is not the absence of cooperative learning research, but the limited documentation in the cited studies of its classroom implementation for the specific topic of plant parts and their functions in this school context. This study therefore provides contextual evidence on how group responsibilities, peer support, and direct observation of real plants were incorporated into successive classroom action cycles.

Based on the identified empirical problems and previous research, this study aims to improve students' science learning outcomes through the implementation of a cooperative learning model in teaching the parts of plants and their functions. The study was conducted with fourth-grade students at SDN 010 Morong, Sungai Lala District, Indragiri Hulu Regency, Indonesia. Specifically, this study seeks to transform the previously teacher-centered instructional process into a more participatory learning environment through group activities while progressively improving students' learning achievement through systematically implemented classroom actions.

METHODS

This study employed Classroom Action Research (CAR) to improve the instructional process and enhance students' science learning outcomes through the implementation of a cooperative learning model. The research design was adapted from the Kemmis and McTaggart spiral model, which consists of four stages: planning, acting, observing, and reflecting. The study was conducted at SDN 010 Morong, Morong Village, Sungai Lala District, Indragiri Hulu Regency, Riau Province, Indonesia, during the second semester of the 2025/2026 academic year, from May to June 2026.

The research subjects comprised all 10 fourth-grade students at SDN 010 Morong, consisting of five male and five female students. The subjects were selected using purposive sampling based on the actual classroom conditions, considering students' low science learning outcomes, differences in academic abilities, and the need to improve instruction on the parts of plants and their functions. All students participated in the instructional interventions and were

divided into two heterogeneous groups, each consisting of five students with diverse gender compositions and academic abilities.

Data were collected through tests, observations, and documentation. The test instrument consisted of a formative written assessment comprising eight multiple-choice questions and two short-answer essay questions. The questions were developed based on learning indicators covering roots, stems, leaves, flowers, fruits, and the structures and functions of plant parts. Observations were conducted using rating-scale assessment sheets to evaluate student activities and teacher performance, completed by a fellow teacher serving as a research collaborator. Documentation included pre-cycle assessment records, instructional materials, group worksheets, students' written work, and photographs of classroom activities.

The intervention was implemented in two cycles, each consisting of four stages: planning, acting, observing, and reflecting. The research data were analyzed using quantitative and qualitative descriptive techniques. Quantitative analysis was conducted on students' test scores to examine improvements in learning outcomes across the pre-cycle, Cycle I, and Cycle II. The analysis involved comparing class average scores and the percentage of students achieving classical learning mastery. Individual mastery was determined based on a minimum score of 7.5, while classical mastery was achieved when at least 80% of students met this criterion. Meanwhile, qualitative analysis was used to describe student learning activities and teacher performance during the implementation of the cooperative learning model based on observation findings. The results were subsequently classified into four categories: excellent, good, fair, and poor. In Cycle I, students worked in two heterogeneous groups of five using picture media and worksheets to discuss the material and report group findings. Following reflection on unequal participation, Cycle II introduced clearer individual group responsibilities, additional teacher assistance, and real plants for direct observation.

RESULTS AND DISCUSSION

RESULTS

This classroom action research was conducted in two cycles to improve fourth-grade students' science learning outcomes on plant parts and their functions through cooperative learning at SDN 010 Morong, Sungai Lala District, Indragiri Hulu Regency. The study involved 10 students, comprising five boys and five girls. Findings are presented across three stages: the pre-cycle, Cycle I, and Cycle II. Data came from formative tests and classroom observations documenting student activities and teacher instructional practices overall.

1. Preliminary Assessment

The preliminary assessment was conducted in early May 2026 to identify students' initial achievement in science before the cooperative learning model was implemented. Instruction at this stage relied mainly on teacher explanations and individual assignments. The assessment involved ten fourth-grade students at SDN 010 Morong, consisting of five boys and five girls. The

results indicated that students had not achieved the established minimum mastery criterion of 7.5, providing a baseline for evaluating subsequent instructional improvement.

As presented in Table 1, students' preliminary scores ranged from 3.0 to 6.0, with a total score of 43.0 and a class mean of 4.3. None of the ten students reached the minimum mastery criterion of 7.5; therefore, classical mastery was 0%. These findings indicate that students' understanding of plant parts and their functions remained limited before the intervention. Figure 1 illustrates the difference between the baseline class mean and the required mastery criterion here.

Table 1. Students' Science Learning Outcomes in the Preliminary Assessment

Student	Gender	Score	Achievement
S1	Male	4.0	Not Mastered
S2	Male	6.0	Not Mastered
S3	Male	3.0	Not Mastered
S4	Male	4.5	Not Mastered
S5	Male	5.5	Not Mastered
S6	Female	3.0	Not Mastered
S7	Female	4.0	Not Mastered
S8	Female	4.5	Not Mastered
S9	Female	4.5	Not Mastered
S10	Female	3.5	Not Mastered
Total		43.0	
Mean		4.3	
Mastery		0%	

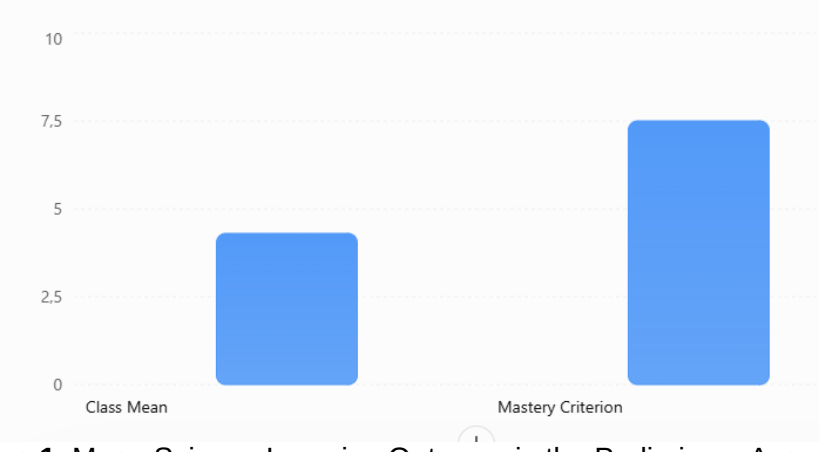


Figure 1. Mean Science Learning Outcome in the Preliminary Assessment

2. Cycle I

Cycle I was implemented in mid-May 2026 by organizing students into two heterogeneous groups of five. The teacher introduced cooperative activities supported by picture media and student worksheets. Students were expected to discuss the learning material, complete assigned tasks, and share their group findings. During implementation, however, participation was not evenly distributed. Some students dominated the discussions, while others contributed less frequently. These observations became the basis for revising instructional procedures in the following cycle.

Table 2 shows that students' scores in Cycle I totaled 56.0, producing a class mean of 5.6. Two students achieved scores of 7.5, while the remaining eight students did not meet the minimum mastery criterion. Accordingly, classical mastery reached 20%. Although the mean increased from 4.3 during the preliminary assessment to 5.6, the target of 80% classical mastery remained unmet at the end of the intervention cycle. Therefore, the instructional intervention continued to Cycle II.

Table 2. Students' Science Learning Outcomes in Cycle I

Student	Gender	Score	Achievement
S1	Male	6.5	Not Mastered
S2	Male	5.5	Not Mastered
S3	Male	7.5	Mastered
S4	Male	5.0	Not Mastered
S5	Male	5.0	Not Mastered
S6	Female	6.0	Not Mastered
S7	Female	5.0	Not Mastered
S8	Female	7.5	Mastered
S9	Female	4.5	Not Mastered
S10	Female	3.5	Not Mastered
Total		56.0	
Mean		5.6	
Mastery		20%	

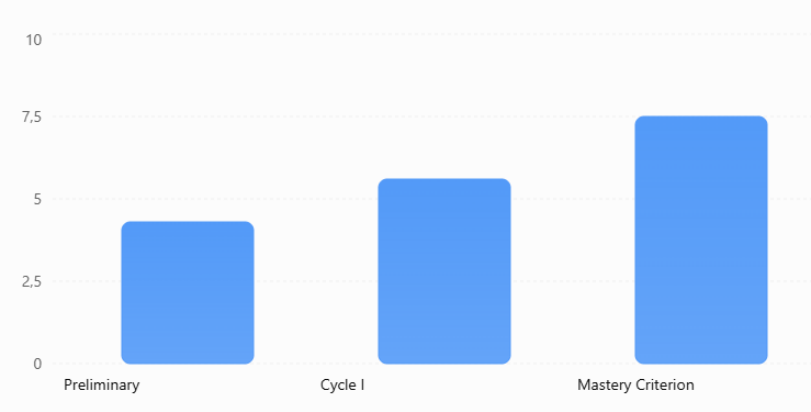


Figure 2. Comparison of Mean Scores in the Preliminary Assessment and Cycle I

The observations during Cycle I identified several aspects requiring improvement. Group responsibilities had not been distributed evenly, and confident students often dominated tasks. Some students, particularly those who were less active, needed additional guidance to participate in discussions. The teacher also needed to provide clearer explanations and allow more time for students to examine the learning materials. These findings informed the next cycle, particularly the use of individual group roles and more concrete instructional media.

3. Cycle II

Cycle II was conducted from late May to early June 2026, following revisions based on the Cycle I observations. The teacher assigned clearer responsibilities to group members and provided additional assistance during collaborative activities. Real plants were introduced as concrete learning media so students could observe plant parts and discuss their functions. The

revised activities encouraged peer assistance, more balanced participation, and opportunities for students to explain their understanding through group discussion and worksheet completion.

As reported in Table 3, the total score in Cycle II was 77.0, corresponding to a class mean of 7.7. Eight students achieved scores of at least 7.5, while two students remained below the criterion. Classical mastery therefore increased to 80%, meeting the predetermined success indicator. The results show substantial clear improvement compared with both the preliminary assessment and Cycle I. Figure 3 presents the increase in the class mean across the three assessment stages.

Table 3. Students' Science Learning Outcomes in Cycle II

Student	Gender	Score	Achievement
S1	Male	8.5	Mastered
S2	Male	7.5	Mastered
S3	Male	8.5	Mastered
S4	Male	7.5	Mastered
S5	Male	7.0	Not Mastered
S6	Female	8.0	Mastered
S7	Female	7.5	Mastered
S8	Female	9.0	Mastered
S9	Female	7.5	Mastered
S10	Female	6.0	Not Mastered
Total		77.0	
Mean		7.7	
Mastery		80%	

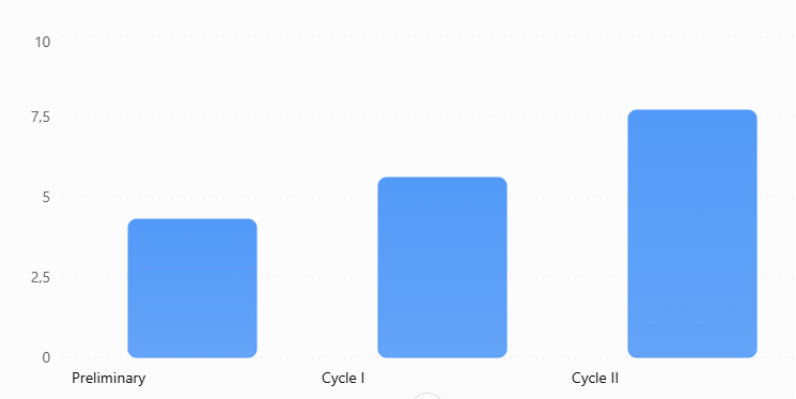


Figure 3. Mean Science Learning Outcomes Across the Three Assessment Stages

The Cycle II observations also indicated changes in students' classroom participation. Students were more involved in group discussions, assisted peers in completing tasks, and showed greater confidence when explaining their findings. The use of real plants helped students connect scientific concepts with observable objects more effectively overall. Although two students had not reached the minimum mastery criterion, the class-level success indicator was achieved. On this basis, the classroom action research was concluded after Cycle II.

4. Summary of Learning Outcomes

Table 4 summarizes the development of science learning outcomes across the preliminary assessment, Cycle I, and Cycle II. The class mean increased from 4.3 to 5.6 and then to 7.7. The

number of students achieving the minimum mastery criterion rose from zero to two and then to eight. Correspondingly, classical mastery increased from 0% to 20% and finally to 80%. These results indicate progressive improvement during cooperative learning implementation in this classroom setting overall. The improvement in test performance occurred alongside the classroom changes recorded in the observations: participation was uneven in Cycle I, whereas Cycle II showed more active discussion, peer assistance, and greater confidence in explaining findings. These observation findings are descriptive and should be interpreted as accompanying changes rather than as independently measured effects.

Table 4. Summary of Students' Science Learning Outcomes

Assessment Stage	Class Mean	Students Achieving Mastery	Classical Mastery
Preliminary Assessment	4.3	0	0%
Cycle I	5.6	2	20%
Cycle II	7.7	8	80%

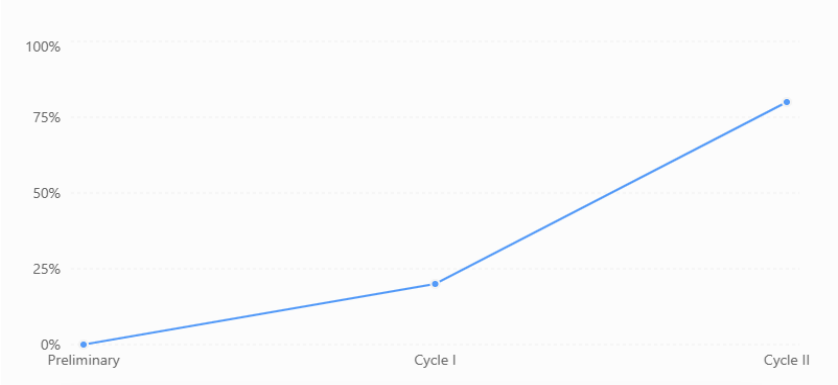


Figure 4. Development of Classical Mastery Across the Assessment Stages

Figure 3 displays the increase in the class mean across the preliminary assessment, Cycle I, and Cycle II. Figure 4 presents the development of classical mastery, while Figure 5 shows the percentage of students achieving the minimum mastery criterion. The increase coincided with clearer group responsibilities, teacher guidance, and the use of real plants as concrete media.

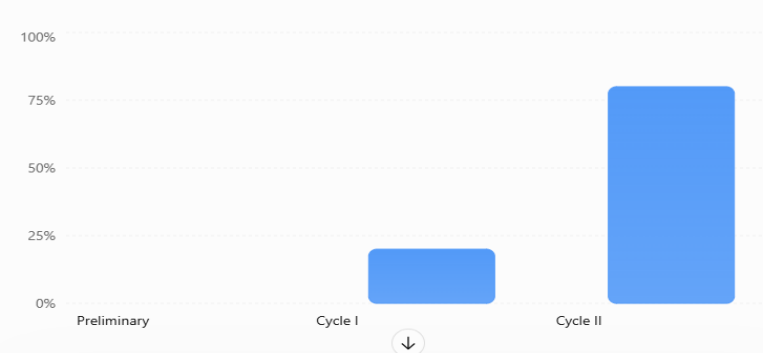


Figure 5. Percentage of Students Achieving the Minimum Mastery Criterion

DISCUSSION

1. Implementation of Cooperative Learning and Changes in Student Learning Activities

The improvement in science achievement suggests that shifting from teacher-centered instruction to cooperative learning created opportunities for student participation. Heterogeneous

groups enabled learners to exchange information, discuss concepts, and receive peer support. These processes are relevant to elementary science, where understanding develops through engagement. Saputra, Parisu, and Gazali (2023) reported improved science outcomes through the Two Stay Two Stray model. Siswati et al. (2023) likewise found that Think Pair Share supported critical thinking and science achievement.

Nevertheless, cooperative learning did not automatically ensure equal participation. During Cycle I, some students dominated discussions, while others contributed less actively. This finding highlights the need for clear group responsibilities, balanced task distribution, and teacher guidance. Saputra (2023) examined a learning game to encourage interest in elementary science, while Nurtianingsih et al. (2023) reported positive outcomes associated with TGT and NHT. These studies reinforce the importance of designing activities that engage students through structured interaction.

2. Improvement in Science Learning Outcomes through Cooperative Learning

The increase in scores from the preliminary assessment to Cycle II indicates that continuous instructional improvement accompanied by cooperative activities may support students' understanding of science concepts. Progress involved group organization, peer explanation, individual participation, and opportunities to revisit material collaboratively. Nurmianti et al. (2024) reported improved primary science outcomes through the STAD cooperative model. Similarly, Irwan et al. (2026) described improved elementary science achievement after implementing STAD through classroom action research, supporting instructional refinement.

The Cycle II results illustrate the importance of reflection in classroom action research. Revisions addressed weaknesses identified during Cycle I, particularly unequal task distribution and limited opportunities for direct observation. Real plants enabled students to examine structures and relate visible features to their functions. Parisu, Saputra, and Lasisi (2025) discussed integrating science literacy and character education in elementary science. Their work provides a conceptual basis for connecting science learning with meaningful, contextual, and responsible engagement. The larger increase between Cycle I and Cycle II (from a mean of 5.6 to 7.7, and from 20% to 80% classical mastery) occurred after the instructional revisions. Because the revisions were introduced together, the present data cannot determine the separate contribution of clearer group roles, additional teacher guidance, or real-plant observation.

3. The Role of Social Interaction and Concrete Media in Science Learning

The improvement may be understood through the relationship between social interaction and concrete learning experiences. Peer support allowed students to explain ideas in accessible language, ask questions, and clarify misunderstandings during group work. Saputra et al. (2024a) discussed the role of elementary science education in developing critical thinking. Nurtianingsih et al. (2023) examined cooperative structures that organize student participation. Together, these perspectives help explain why discussion and shared responsibility may support conceptual learning in classrooms.

The findings can also be interpreted through Vygotsky's Zone of Proximal Development, which emphasizes learning with guidance from more capable others. In this classroom, support occurred through peer discussion and teacher assistance. Real plants connected verbal explanations with observable features, making the topic more tangible. Saputra et al. (2024b) examined environmental learning in science education, while Parisu et al. (2025) discussed science literacy in elementary schools. These studies support meaningful, experience-based science instruction in context. This interpretation is consistent with the classroom observations, but the study did not directly measure the mediating processes described by the theory. The Zone of Proximal Development therefore serves as an explanatory framework for the observed peer and teacher support, rather than as a separately tested variable.

4. Theoretical and Practical Implications of the Study

Theoretically, this study suggests that cooperative learning can support science achievement when group collaboration is combined with individual accountability and direct learning experiences. Its implementation requires purposeful group management, appropriate learning resources, and reflection across instructional cycles. Apriliani et al. (2026) examined cooperative learning in relation to scientific attitudes and science outcomes among fourth-grade students. Their focus complements this study by highlighting that science learning involves academic achievement and students' engagement with scientific activities overall.

Practically, elementary teachers may organize heterogeneous groups, assign clear responsibilities, use accessible objects from the surrounding environment, and ensure that every student contributes. This study offers a classroom-based example involving plant parts and their functions at SDN 010 Morong. However, its findings should be interpreted within classroom action research. The small sample and absence of a comparison group limit broad causal conclusions; further studies across schools and student populations are needed to examine transferability elsewhere.

CONCLUSION

Main Findings: This study found that implementing the cooperative learning model improved fourth-grade students' science learning outcomes on plant parts and their functions at SDN 010 Morong. The class average increased from 4.3 in the pre-cycle to 5.6 in Cycle I and 7.7 in Cycle II. Classical learning mastery also increased from 0% to 20% and finally to 80%, achieving the predetermined success criterion. **Research Contribution:** This study contributes to elementary science education by providing classroom-based evidence of cooperative learning implementation through heterogeneous grouping, individual responsibilities, peer support, and the use of real plants as concrete learning media. The approach connects collaborative learning activities with direct observation of scientific objects. **Theoretical and Practical Implications:** The findings highlight the importance of social interaction, individual accountability, teacher guidance, and concrete learning experiences in elementary science instruction. Practically, teachers can implement cooperative learning by organizing heterogeneous groups, distributing responsibilities

fairly, facilitating peer assistance, and using environmental resources to support students' understanding of scientific concepts. **Research Limitations:** This study was limited to 10 fourth-grade students in one elementary school and involved two classroom action research cycles. The absence of a comparison group also limits the generalization of the findings and does not establish causal effects beyond the research context. **Future Research Directions:** Future studies should involve larger and more diverse student populations, examine cooperative learning across different science topics, and compare various cooperative learning models. Further research may also investigate the relationship between cooperative learning, scientific literacy, critical thinking, and student collaboration in elementary education. The results should be understood as evidence of improvement within the participating class during the action cycles; the design does not establish that cooperative learning alone caused the improvement or that the findings will apply to other schools.

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