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Implementing Cooperative Learning to Enhance Fifth-Grade Students' Science Learning Outcomes: A Classroom Action Research Study

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Abstract

This study aimed to describe the implementation of the cooperative learning model, students' learning activities, science learning outcomes, and the challenges encountered, together with the efforts made to address them, in Grade V at UPTD SD Inpres Lasiana, Kupang City. This study employed Classroom Action Research (CAR), conducted in two cycles, each consisting of planning, action, observation, and reflection. The participants were 30 fifth-grade students, comprising 17 boys and 13 girls. Data were collected through classroom observations and written tests. The observational data were used to examine students' learning activities and the teacher's classroom management, while the written tests measured students' learning outcomes. The findings revealed an improvement in students' learning outcomes following the implementation of cooperative learning. The proportion of students achieving the minimum mastery criterion increased from 50% in Cycle I to 90% in Cycle II, representing a 40-percentage-point improvement. Student participation was also reflected in increased engagement in observation, experimentation, and group work, with the frequency of these activities rising from 23 occurrences in Cycle I to 30 in Cycle II. Nevertheless, the implementation initially encountered challenges related to student participation, group collaboration, and classroom management. These challenges were addressed through improved teacher guidance, motivation, group supervision, and classroom management during Cycle II. Overall, the findings indicate that cooperative learning can support more active student participation and improve science learning outcomes in this classroom context.

Keywords: Cooperative Learning, Science Learning, Student Learning Activities, Learning Outcomes, Classroom Action Research

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INTRODUCTION

The quality of teaching and learning in primary education depends partly on teachers' ability to select instructional approaches that respond to students' learning needs and support meaningful engagement. In Indonesia, discussions about the teaching profession have raised questions about pedagogical competence, instructional quality, and the outcomes of schooling (Kristianto dkk., 2023). In fact, over the past decade, the mass media, especially print media, both daily and weekly, have frequently carried news about teachers. This discourse is multidimensional: academics question pedagogical competence and the relevance of teaching methods, while non-experts—such as parents and industry professionals—focus on the readiness of graduates and professional ethics. Unfortunately, media coverage often emphasizes sensational aspects and negative incidents, which exacerbates a crisis of confidence and leaves teachers in a vulnerable position, with little

recourse to defend themselves (Rani Zulfia Khasanah, 2024). Consequently, this situation underscores an urgent need for teachers to improve and demonstrate their professionalism—for instance, through tangible classroom innovations, such as the implementation of more effective, student-centered learning models designed to enhance educational outcomes, as explored in this study. Ironically, however, many of these reports tend to denigrate the position of teachers, covering both public and private matters, while teachers themselves are barely able to defend themselves (Aminarti et al., 2023)

Businesses/industrialists have also protested against teachers because they consider the quality of graduates unsatisfactory for their companies' interests. To address this, mastery of Natural Sciences (IPA) and technology is crucial. Therefore, it is necessary to prepare people, especially children who will become adults in the future, to recognize, understand, and master science and technology to improve their quality of life. Efforts to prepare for this have indeed been carried out through formal education as stipulated in Law No. 2 of 1989 concerning the National Education System, which states that an introduction to science and technology has been taught since elementary school (Latipun, 2020)

Basic education is an integrated part of the national education system which is a 9-year education held 6 years in elementary school and 3 years in junior high school or equivalent basic education units. Basic education held in elementary schools emphasizes knowledge and skills in reading, writing, and arithmetic, which are basic knowledge and skills that are useful for students according to their age development level and prepare students to follow junior high school education in particular and in producing quality humans, humans who are able to think critically, creatively, logically, and take the initiative in responding to issues in society caused by the impact of developments in science and technology (Martínez dkk., 2024). The essence of primary education (SD) centers on the mastery of foundational skills: reading, writing, and arithmetic. These skills serve as essential "tools" that students must acquire, aligned with their developmental stage; without a grasp of basic literacy and numeracy, students will struggle to absorb more complex knowledge at subsequent levels of education. Beyond preparing students for the transition to junior high school (SMP), primary education carries a broader, long-term mission: the cultivation of high-quality individuals (Baniyah dkk., 2023). This quality extends well beyond mere cognitive ability, encompassing character development and the fostering of higher-order thinking—such as critical, creative, and logical reasoning, as well as the capacity for initiative. Such skills are vital, enabling students—as members of society—to respond to and navigate, with wisdom, the various social issues and challenges that arise from the rapid advancement of science and technology (Utama & Dea, 2023).

Science is a program to instill and develop scientific knowledge, skills, attitudes and values in students as well as a sense of love and respect for the greatness of God Almighty. The general goal of science is for students to understand science concepts, and their relationship to everyday life, have process skills to develop knowledge, ideas about the surrounding environment, be able to apply various science concepts to explain natural phenomena and be able to use simple technology to solve problems found in everyday life. In science teaching, students are expected to be truly active, thus impacting their memory of what they learn, making it last longer. A concept is easier for students to understand and remember if it is presented through appropriate, clear, and engaging procedures and steps. As Confucius stated in (Silberman, 2005)

"What I heard, I forgot
What I see, I remember
What I do, I understand"

These three statements emphasize the importance of active learning so that what is learned at school is not wasted.

Mell Silberman modified and expanded Confucius' statement above into what he called the active learning concept, namely:

"What I heard, I forgot
What I heard and saw, I remember little
What I hear, see, and question or discuss with other people, I begin to understand."
"From what I hear, see, discuss, and apply, I gain knowledge and skills. What I teach to others, I master."

The statement above demonstrates the occurrence of active learning, which is intended to optimize the use of all students' potential, so that all students can achieve satisfactory learning outcomes in accordance with their individual characteristics. To achieve this, education cannot simply be balanced with effective learning; it also requires efficient learning.

Effective learning is learning that can add discourse or new knowledge for students. Meanwhile, efficient learning is learning that can add new knowledge or information for students, learning is fun and excites students during the learning process. Based on these reasons, it is very important for educators to understand the characteristics of the material, students and learning methodology in the learning process, especially related to the selection of learning models. Thus, the learning process will be varied, innovative and constructive in reconstructing knowledge insights and their implementation so that it can increase the activity, creativity, and learning outcomes of students in learning.

Low student learning outcomes are caused by the use of monotonous learning models that lead to boredom and inactivity in science learning activities. Furthermore, if teachers pay little attention to students' learning styles and rarely utilize learning media during the learning process, this will impact student learning outcomes. A lack of attention toward students' learning styles—whether visual, auditory, or kinesthetic—combined with the minimal use of instructional media, creates significant challenges. When teachers rely on a single, uniform approach without accounting for these diverse learning preferences, most students struggle to grasp the material. Furthermore, the absence of engaging instructional media—such as physical props, videos, or digital simulations—makes abstract science concepts even harder to comprehend. The cumulative effect of these factors—a monotonous teaching model, the disregard for individual learning styles, and a lack of instructional media—hinders the transfer of knowledge, ultimately resulting in poor student learning outcomes. Consequently, there is an implicit need for a paradigm shift in teaching: educators should act as creative facilitators capable of designing varied instructional models, understanding the unique characteristics of their students, and effectively utilizing media as a bridge to conceptual understanding. Many ways can be taken to make students more active in the learning process. One example is by changing the learning pattern used so that students have an interest in learning. Interest has a significant influence on learning outcomes, because if the learning material studied does not match the student's interests, the student will not learn well and he will not get satisfaction from the lesson. For a student, achieving good learning outcomes is a source of pride. Students who achieve good learning outcomes will always strive to maintain and improve the learning outcomes they have achieved (Ermelinda Yosefa, 2017)

In order to improve science learning outcomes, teachers must be able to determine a model, because a model is a procedure used to achieve certain goals. The more appropriate the learning model used by teachers in teaching, the more effective the achievement of learning objectives is expected to be. This is the right solution for the reason that the cooperative learning model *is* a learning model that focuses on the thinking patterns or mental processes of children in working together. The relevance of cognitive learning theory in science teaching is explained through constructivism theory.

In constructivism theory, students actively construct their own knowledge. One form of learning that is oriented towards a constructivist approach is cooperative learning.

Cooperative learning is a learning model that has recently received attention and even recommendations from educational experts because it is suspected to improve the quality of the process and student learning outcomes. The implementation of the cooperative learning model is usually followed by a learning atmosphere that creates more active students, which will have a positive impact on learning outcomes. The cooperative learning model prioritizes cooperation in solving problems to apply knowledge and skills in order to achieve learning objectives. This learning model uses small groups with each group having 4-5 members in a heterogeneous manner. In addition, this model is also very suitable when applied to science lessons and can also be applied in any class, both in higher and lower classes.

The selection of the right model according to the characteristics of students is not easy because what happened as observed by the author in science learning in class V UPTD SD Inpres Lasiana Kupang City is that the learning process carried out is still conventional and one-way, so that it positions students as listeners to teacher lectures, as a result the teaching and learning process is boring which results in students being less active, thus impacting the learning outcomes obtained by students. This can be seen from the total daily scores of students, obtained from four tests with a percentage of completion of 42.5% of the total 30 students who took the test (for more details can be observed in appendix 27 page 174). Therefore, to overcome these problems, especially in improving student learning outcomes, the application of a cooperative learning model based on cognitive learning theory, in teaching science in elementary schools is a solution to solving problems related to student learning outcomes in science learning in class V UPTD SD Inpres Lasiana Kupang City.

METHOD

Research Design

This study employed a descriptive classroom action research (CAR) design to improve science learning through the implementation of a cooperative learning model in Grade V at UPTD SD Inpres Lasiana, Kupang City, Indonesia. Classroom action research was selected because the study focused on improving an existing instructional practice through systematic action, observation, and reflection. The research examined the implementation of cooperative learning, students' learning activities, students' learning outcomes, the difficulties encountered during implementation, and the efforts undertaken to address those difficulties.

The study combined descriptive qualitative interpretation with descriptive quantitative analysis. Qualitative descriptions were used to explain classroom activities, implementation challenges, and instructional adjustments, while quantitative summaries were used to examine student activity frequencies, teacher classroom-management observations, test scores, and learning mastery. Accordingly, the study did not rely exclusively on qualitative data: numerical indicators were also used to monitor progress across the action-research cycles.

The research followed four stages: planning, action, observation, and reflection. These stages were repeated across two cycles, following the classroom action research framework presented by Muckromin and Fatoni (2022). The four stages were interconnected. Planning established the instructional activities and assessment procedures; action involved implementing the cooperative learning model; observation documented student participation, teacher classroom management, and learning outcomes; and reflection used the collected evidence to identify difficulties and determine the improvements required in the subsequent cycle.

Research Setting and Participants

The research was conducted at UPTD SD Inpres Lasiana, Kupang City, Indonesia. The participants were 30 fifth-grade students, comprising 17 boys and 13 girls. The class was selected because preliminary classroom observations indicated that science instruction was predominantly teacher-centred and that students' participation and learning outcomes required improvement.

Before the intervention, records from four daily assessments indicated a learning-mastery rate of 42.5%. This preliminary evidence provided the practical basis for introducing cooperative learning and monitoring changes in student participation and achievement. The study focused on the existing class rather than selecting participants randomly, consistent with its classroom-improvement purpose.

Research Procedures

The research was conducted in two cycles. Each cycle comprised planning, action, observation, and reflection. Each cycle involved two classroom meetings, with a planned duration of 2 × 35 minutes per meeting. The instructional content concerned soil formation and rock weathering, supported by learning materials and practical activities involving rocks, nails, pictures, and student worksheets.

Cycle I

Planning. The researcher prepared two lesson plans and specified the learning materials, competency standards, learning objectives, indicators, classroom activities, teaching media, student worksheets, time allocation, and evaluation procedures. Observation and test instruments were also prepared to document student participation, teacher classroom management, and learning outcomes.

Action. The researcher implemented the cooperative learning model in the science lessons. Students worked in groups on the planned learning tasks, including reading materials, discussing questions, conducting observations or practical activities, sharing ideas, and responding to classmates. The instructional activities were designed to provide opportunities for students to participate actively rather than rely solely on teacher explanation.

Observation. Classroom observations documented student learning activities and the teacher's management of cooperative learning. Student learning outcomes were assessed using written tests. The observation records and test results were then examined to identify areas of progress and difficulties requiring further attention.

Reflection. The evidence from Cycle I was reviewed to determine whether the implementation needed improvement. The reflection identified challenges including uneven participation in group tasks, the dominance of some students, limited interaction among students, differences in motivation and guidance, and difficulties managing instructional time. These observations informed adjustments to the next cycle.

Cycle II

Planning. The instructional plan was revised in response to the reflection on Cycle I. The improvements focused on strengthening student guidance and motivation, monitoring group participation more consistently, supporting students who experienced difficulties, and improving the management of classroom time.

Action. The researcher implemented the revised cooperative learning activities during the two meetings in Cycle II. Students continued to engage with science materials and group tasks, while the teacher provided guidance intended to support more balanced participation and completion of the learning activities.

Observation. Student activity, teacher classroom management, and learning outcomes were observed and recorded using the study instruments. The evidence was examined in relation to the observations and assessment results from Cycle I.

Reflection. The results of Cycle II were reviewed to determine whether the classroom-improvement criteria had been achieved. The study used a minimum individual mastery

score of 65 and a target of at least 75% of students achieving mastery at the class level. The research was concluded after Cycle II because the reported class-level mastery rate reached 90%, exceeding the stated target.

Data Collection and Research Instruments

Data were collected through classroom observation and written tests. Observation was used to document student activities and teacher classroom management during the implementation of cooperative learning. Written tests were used to assess student learning outcomes at the end of each cycle.

Three instruments were used.

1. Student learning-activity observation instrument. This instrument recorded the frequency of observed student activities during the lessons. The activity categories included reading learning materials; discussing or asking questions within groups; asking the teacher questions; conducting observations, experiments, or other assigned work; responding to classmates' questions or opinions; and expressing ideas. The records were used to identify the most frequently observed activities and compare activity patterns across cycles.

2. Teacher classroom-management observation instrument. This instrument was used by an observing colleague to assess the teacher's implementation of cooperative learning. The assessed areas included lesson preparation, the introduction and presentation of learning materials, organization and monitoring of groups, guidance and feedback, evaluation, closing activities, time management, questioning techniques, and classroom atmosphere. The instrument used a four-point rating scale: 4 = very good, 3 = good, 2 = sufficient, and 1 = poor. The observations provided evidence for reflecting on instructional implementation and identifying aspects requiring improvement.

3. Student learning-outcome tests. Written tests, comprising subjective and objective items, were used to assess students' understanding of the science material. The results were summarized as class mean scores and the proportion of students achieving the minimum mastery criterion. A score of 65 or above was classified as individual mastery, while class-level mastery was defined as at least 75% of students meeting that criterion. The original manuscript reports that data were reduced to retain information relevant to the research questions and that the resulting data were discussed with colleagues and experts. These procedures supported the review and interpretation of the evidence. For methodological clarity, the manuscript should specify which colleague or expert reviewed which data, what criteria were used, and how differences in interpretation were resolved. Consultation with colleagues or experts should not be described as data triangulation unless the process involved a clearly explained comparison of evidence from different sources, methods, or perspectives.

Data Analysis

The data were analysed descriptively to examine student learning activities, teacher classroom management, and student learning outcomes across the two cycles. The analysis was aligned with the study's objectives and did not involve inferential statistical testing.

Student learning activities

The frequency of each observed activity was tabulated for the classroom meetings. The percentage of a particular activity was calculated by dividing its frequency by the total frequency of all recorded activities and multiplying the result by 100:

$$P = \frac{n}{N} \text{ x } 100\%$$

Information:

P = percentage sought

n = frequency of occurrence

N = total frequency (Adapted from Arikunto (in (Hartanti dkk., 2025))

Teacher classroom management

The classroom-management scores were summarized by calculating the mean rating for each assessed aspect across the relevant meetings. The average scores were interpreted using the categories reported in the original manuscript:

- 3.50–4.00: Very good
- 2.60–3.49: Good
- 1.70–2.59: Sufficient
- 0.00–1.69: Poor

These ratings were used to describe the quality of implementation and identify aspects that required adjustment between cycles

Student learning outcomes

Student learning outcomes were summarized using the class mean score and the percentage of students achieving individual mastery. The class mean was calculated by dividing the total scores obtained by all students by the number of students:

1. Test result data, this data is analyzed using the formula:
   a. class average

$$X = \frac{\sum xi}{n}$$

Information:

X = class average

$\sum xi$ = total value of all students

n = total number of students

   b. Learning completion.

$$P = \frac{n}{N} \text{ x } 100\%$$

Information:

P = percentage of completion

n = number of frequencies that have completed learning

N = total number of students (Arikunto (in (Hartanti dkk., 2025))

A student is considered to have completed their studies if they obtain a grade of 65 or above.

RESULT AND DISCUSSION

The accuracy of data to answer the proposed problems, both theoretically and empirically, is very important in research. This chapter will describe the application of the cooperative learning model in Natural Sciences (IPA) learning. Data from observations regarding student learning activities during the implementation of the cooperative learning model, data on teacher abilities in managing cooperative learning, and student learning outcomes, along with their analysis and calculations, are presented in detail. Obstacles encountered during the process of implementing the cooperative learning model and efforts made to overcome them will be described so that the objectives of this research are truly achieved.

A. Research result

1. Data and Data Analysis Cycle I

a. Planning

The first cycle of learning planning consists of two lesson plans. The components of the lesson plans include: time, competency standards, core competencies, indicators, learning objectives, learning activities, materials, media and learning resources, and evaluation.

1) Time
The time allocation for each meeting is 2 x 35 minutes. The first meeting (I) is planned for Monday, February 10, 2025, at 1-2 pm and the second meeting (II) is planned for Thursday, February 13, 2025, at 1-2 pm.
2) Competency standards
The competency standards to be achieved are: understanding the changes that occur in nature and their relationship to the use of natural resources.
3) Basic competencies
Describe the process of soil formation due to weathering
4) Indicators of Competence Achievement

a) Meeting I

Knowledge/Products : (1) explain the process of soil formation due to rock weathering; (2) mention the types of rocks that make up the earth's crust: (3) describing the properties of rocks. *Process* : (1) identifying the properties of rocks. *Social skills* : (1) communicating: presenting, asking questions, discussing and giving opinions.

b) Meeting II

Knowledge/ Product: (1) explain the causes of rock weathering; (2) state the factors causing rock weathering.
Process : (1) observing images of types of weathering on rocks. *Social skills* : (1) communicating: presenting, asking questions, discussing and giving opinions.

5) Learning objectives

a) Meeting I

Knowledge/Product : (1) without opening a book, students can explain the process of soil formation correctly; (2) by being given pictures of the types of rocks that make up the earth's crust, students can name the types of rocks that make up the earth's crust correctly; (3) by being given the types of rocks, students can describe the properties of rocks correctly. *Process:* (1) by being given LKS 01 and tools and materials (nails and types of rocks), students can identify the properties of rocks correctly. *Social skills* : (1) by being actively involved in KBM, students can communicate correctly which includes presentations, asking questions, and giving opinions.

b) Meeting II

Knowledge/Product : (1) by being given pictures of rock weathering, students can explain the causes of rock weathering according to the pictures; (2) by being given pictures of rock weathering, students can mention the factors of rock weathering correctly. *Process* : (1) by being given LKS 02, students can mention the factors of rock weathering. *Social skills* : (1) by being actively involved in KBM, students can communicate correctly which includes presentations, asking questions, and giving opinions.

6) Learning Activities
Learning activities in cycle I were carried out in two meetings. For more details on learning activities in cycle I, please see appendices 1 and 2.
7) Materials, Media and Learning Resources
The learning materials are sorted based on the Natural Sciences (IPA) curriculum. The selected learning material is soil formation. The media used are rocks, nails, and pictures. The learning resources used are IPA salingtemas 5, written by Azmiyawati, Choiril, et al. and enjoy learning Natural Sciences for grade V, written by Rosytawati. S, et al.
8) Evaluation
evaluation includes process assessment and outcome assessment. Process assessment refers to students' learning activities during the learning process. Outcome

assessment is conducted to determine students' ability to understand the material they have learned.

b. Implementation

The implementation of cycle I consists of two meetings. The time allocation used for each meeting is 2 x 35 minutes. Meeting I was held on Monday, February 10, 2025, at 07.00 – 08.10 WIB with teaching materials on Types of Rocks. Meeting II was held on Thursday, February 13, 2025, at 07.00 – 08.10 WIB with teaching materials on the process of soil formation due to rock weathering.

c. Observation and Evaluation

1. Observation

a. Student learning activities

Data from observations of student learning activities during the implementation of the cooperative learning model were obtained from observational data using observation instruments, where this data is expressed in a concise percentage and describes the most dominant aspects during the learning activities. Data on student learning activities during the learning activities can be seen in Table I.

Table 1. Student learning activity data during the implementation of the model cooperative learning at meetings I and II

N	Observed Aspects	Cycle I		Amount	Average	Percentage(%)
		P. I	P. II			
1	Reading learning materials	8	9	17	8.5	19.1
2	Discuss/ask questions among group members	9	13	22	11	24.7
3	Ask the teacher	7	7	14	7	15.7
4	Carrying out activities (observations, experiments or work)	11	12	23	11.5	25.8
5	Responding to friends' questions or opinions	4	4	8	4	8.9
6	Put forward ideas	2	3	5	2.5	5.6
Total Frequency				89		

Caption: (Source: Field Data 2025)

P. I = Meeting I

P. II = Meeting II

From Table 4.1 above, it can be seen that the most prominent student learning activity from all aspects observed in cycle I was carrying out activities (observation, experimentation or work) with the number of frequencies that appeared from two meetings as many as 23 times or 25.8% of the total frequency that appeared for all aspects observed. Although in the second meeting there had been an improvement in several aspects, this was still an obstacle for teachers. Where there were still many students who were not used to the learning model used, in addition, when dividing groups, students did not want to join friends who they considered less capable, this condition caused the classroom atmosphere to be less than optimal.

b. Learning management

ability to manage cooperative learning was observed by colleagues. The results of the observation of learning management were obtained from observation data using observation instruments. The observation score categories for teacher ability consisted of four assessment criteria, namely: Very Good (score 4), Good (score 3),

Sufficient (2), and Poor (1). Data on learning management by teachers can be seen in Table 4.2.

Table 2. Cooperative learning management data at meetings I and II

No	Rated aspect	Mark		Average
		P. I	P. II	
I	OVERALL TEACHER PREPARATION	4	4	4
II	IMPLEMENTATION			
	A. Introduction			
	1. Motivating students	2	3	2.5
	2. Conveying learning objectives	3	4	3.5
	3. Conducting transactions	4	4	4
	B. Core activities			
	1. Presenting the main material that supports group learning tasks by means of demonstrations or texts	4	4	4
	2. Organize students into study groups			
	3. Guide students to work on worksheets or make observations	4	4	4
	4. Supervise each group in turn	3	4	3.5
	5. Providing assistance to groups experiencing difficulties	3	4	3.5
	6. Encourage and guide students in carrying out cooperative skills	3	4	3.5
	a. Ask a question			
	b. Answering questions/responding	3	3	3
	c. Convey ideas/opinions			
	d. Taking turns and sharing tasks			
	7. Providing recitation/feedback			
	8. Guide students to make summaries			
	9. Conduct an evaluation	3	4	3.5
		3	3	3
		4	4	4
	C. Closing			
	1. Determine the group with the best performance	4	4	4
	2. Announcing recognition/awards	4	4	4
III	TIME PROCESSING	3	3	3
IV	TEACHER'S QUESTIONING TECHNIQUE	3	4	3.5
V	CLASS ATMOSPHERE			
	1. Student- centered	3	4	3.5
	2. Enthusiastic students	3	3	3
	3. Enthusiastic teacher	4	4	4
Amount		71		
Average		3.55		

Caption: (Source: Field Data 2025)

P. I = Meeting I

P. II = Meeting II

From Table 2, it can be seen that the average learning management by teachers in cycle I was 3.55 with very good criteria, and the overall teacher preparation aspect obtained an average value of 4 or with very good criteria. The implementation of preliminary activities in the aspect of; motivating students obtained an average value of

2.5 or with sufficient criteria, conveying learning objectives obtained an average value of 3.5 or with very good criteria, and conducting transactions obtained an average value of 4 or with very good criteria. Implementation of core activities aspects of presenting the main material that supports group learning tasks by means of demonstrations or texts obtained an average value of 4 or with very good criteria, organizing students in study groups obtained an average value of 4 or with very good criteria, guiding students to work on LKS or conducting observations obtained an average value of 3.5 or with very good criteria, supervising each group in turns obtained an average value of 3.5 or with very good criteria, providing assistance to groups that have difficulty obtaining an average value of 3.5 or with very good criteria, encouraging and guiding the implementation of cooperative skills by students obtained an average value of 3 or with good criteria, providing recitation/feedback obtained an average value of 3.5 or with very good criteria, guiding students to make summaries obtained an average value of 3 or with good criteria, and conducting evaluations obtained an average value of 4 or with very good criteria. Implementation of closing activities, aspects; determining the group with the best performance , obtaining an average score of 4 or with very good criteria, and announcing recognition/awards for obtaining an average score of 4 or with very good criteria. Time management obtained an average score of 3 or with good criteria, teacher questioning techniques obtained an average score of 3.5 or with very good criteria. Class atmosphere aspects; student- centered obtained an average score of 3.5 or with very good criteria, enthusiastic students obtained an average score of 3 or with good criteria, and enthusiastic teachers obtained an average score of 4 or with very good criteria. Teachers' abilities in managing learning in cycle I have not run optimally. This can be seen from several aspects that obtained scores with sufficient criteria.

2. Evaluation

To determine the extent to which students have mastered the material taught, an evaluation of learning outcomes is conducted at the end of each cycle. The evaluation data for learning outcomes from Cycle I can be seen in Table 3. below.

Table 3. Data on evaluation of learning outcomes in cycle I

No	Student Name (Initials)	Gender	Score	T/TT
1	L.W	L	20	TT
2	A. I	L	30	TT
3	AA S	L	60	TT
4	D. P. R	L	80	T
5	D. A	P	70	T
6	F. K	L	40	TT
7	F. P. A	P	70	T
8	P. A. S	L	80	T
9	M. F	P	40	TT
10	M. K	P	60	TT
11	N. R. A	P	60	TT
12	N. F	L	80	T
13	N. I	P	70	T
14	N. M. L	P	70	T
15	P. H	L	70	T
16	R. W. N	L	80	T
17	R. D. S	L	40	TT

18	R. W. A	L	30	TT
19	S. I. A	L	90	T
20	S. W	P	40	TT
21	S. W	P	60	TT
22	T. P	P	70	T
23	T. A. D	P	60	TT
24	Y. F	L	50	TT
25	V. S	L	70	T
26	N. K	P	70	T
27	K. R. R	L	50	TT
28	R. D. P. B	L	80	T
29	A. P. Y. P	P	20	TT
30	D. E. L	L	70	T
Jumlah Nilai			1780	T=15
Class average			59.3	TT=15

Description : (Source: Field Data 2025)

M/F = Male/Female

T = Completed

TT = Not Completed

From Table 3, it can be seen that the average class in cycle I was 59.3 and it is known that the number of students who obtained scores above the minimum completeness criteria or ≥ 65 was 15 students, and the number of students who obtained scores below the minimum completeness criteria or < 65 was 15 students. When compared to the minimum completeness criteria of 65, there were 15 students in the class who had not achieved individual completeness or classical completeness. Therefore, the researcher must carry out a second cycle to improve it.

d. Reflection

Based on the results of observations regarding student learning activities, and learning management by teachers, as well as the results of the final evaluation of cycle I which are not optimal. Therefore, there are several things that become studies and improvements for teachers (researchers) in an effort to improve the learning process in the next meeting, namely; the learning model applied by researchers has not run well, which causes a lack of interaction between students and students, as well as between students and teachers; class management has not run well so that the learning process is not optimal; the provision of motivation and guidance is not evenly distributed so that students appear inactive or passive; when working on LKS or making observations in groups, it is still dominated by certain students; in addition, student participation in learning is still very lacking. The time given to work on LKS has also not been able to be appreciated by students.

The steps for improvement that must be taken for the next cycle are: teachers must optimize the process of implementing the cooperative learning model, thus creating interaction between students and students and students with the teacher. Teachers must motivate students to learn, so that the learning process can run optimally. Teachers must convey learning objectives clearly, so that students know what will be learned in the upcoming meeting. Teachers must guide students when working on worksheets or making observations so as not to create an atmosphere that can disrupt the learning process. Teachers must explain the importance of learning in groups so that students do not feel embarrassed when joining friends who have more abilities. Teachers must encourage and guide the implementation of cooperative skills by students so that the learning process shows students actively and interact with each other in asking questions, answering questions, responding to

questions, expressing ideas, taking turns, and sharing tasks related to the results of observations and the results of discussions with other groups. Teachers must take turns supervising each group when making observations or working on worksheets so that it is not dominated by certain students. Providing recitation/feedback in learning activities so that the classroom atmosphere is not boring is an aspect that teachers must also improve. In addition, teachers must also involve students in making summaries of learning outcomes. Time management during learning activities, as well as questioning techniques, are aspects that teachers must improve in the next cycle.

2. Data and Data Analysis Cycle II

a. Planning

Based on the results of reflections on cycle I, in an effort to improve the learning process in cycle II related to student learning activities, teacher management of learning, and student learning outcomes, the cycle II learning plan consists of two learning plans. The components of the learning plan include: time, competency standards, basic competencies, indicators, learning objectives, learning activities, materials, media and learning resources, and evaluation.

1) Time

The time allocation for each meeting is 2 x 35 minutes. The first meeting (I) is planned for Monday, March 10, 2025, at 1-2 pm and the second meeting (II) is planned for Thursday, March 13, 2025, at 1-2 pm.

2) Competency standards

The competency standards to be achieved are: understanding the changes that occur in nature and their relationship to the use of natural resources.

3) Basic competencies

Identifying soil types

4) Indicators of Competence Achievement

a) Meeting I

Knowledge/Product: (1) explain the meaning of soil; (2) mention the types of soil; (3) describe the parts of soil. *Process:* (1) observe the parts of soil. *Social skills* : (1) communicate: present, ask questions, discuss and express opinions.

b) Meeting II

Knowledge/ Product: (1) explain the meaning of erosion (soil erosion); (2) state the causes of erosion; (3) state the impacts of erosion; (4) explain how to prevent erosion. *Process* : (1) conduct experiments on the causes of erosion (soil erosion). *Social skills* : (1) communicate: present, ask questions, discuss and express opinions.

5) Learning objectives

a) Meeting I

Knowledge/Product : (1) without opening a book, students can explain the meaning of soil correctly; (2) by being given pictures of soil types, students can name the types of soil according to the pictures; (3) by being given pictures of soil layers, students can name the parts of soil correctly. *Process:* (1) by being given LKS 03 and tools and materials (aqua glass, wooden stirrer, soil from the garden or field, water) students can observe the parts of the soil. *Social skills* : (1) by being actively involved in KBM, students can communicate correctly which includes presentations, asking questions, and giving opinions.

b) Meeting II

Knowledge/Product : (1) without opening a book, students can explain the meaning of erosion (soil erosion) correctly; (2) without opening a book, students can mention the factors that cause erosion correctly; (3) without opening a book, students can mention the impacts of erosion correctly; (4) without opening a book, students can

describe ways to prevent erosion correctly. *Process* : (1) by being given LKS 04 and tools and materials (boxes from Aqua bottles, water, clay or similar, sand, Aqua glasses) students can explain the causes of erosion (soil erosion). *Social skills* : (1) by being actively involved in KBM, students can communicate correctly which includes presentations, asking questions, and giving opinions.

6) Learning Activities
Learning activities in cycle II were carried out in two meetings. For more details on learning activities in cycle II, please see appendices 3 and 4.

7) Materials, Media and Learning Resources
The learning materials are sorted based on the Natural Sciences (IPA) curriculum. The learning materials selected are soil formation. The media used are aqua glasses, wooden stirrers, soil, water, boxes from Aqua bottles, clay or similar, sand. The learning resources used are IPA salingtemas 5, written by Azmiyawati, Choiril, et al. and enjoy learning Natural Sciences for grade V, written by Rosytawati. S, et al.

8) Evaluation
Learning evaluation includes process assessment and outcome assessment. Process assessment refers to students' learning activities during the learning process. Outcome assessment is conducted to determine students' ability to understand the material they have learned.

b. Implementation

The implementation of cycle II consists of two meetings. The time allocation used for each meeting is 2 x 35 minutes. Meeting I was held on Monday, March 10, 2025, at 07.00 – 08.10 WIB with teaching materials on the Composition and Types of Soil. Meeting II was held on Thursday, March 13, 2025, at 07.00 – 08.10 WIB with teaching materials on soil erosion.

c. Observation and Evaluation

1. Observation

a. Student learning activities
Data on observations of student learning activities during the implementation of the cooperative learning model were obtained from observational data using observation instruments. This data is expressed as a summary percentage of the total frequency for all observed aspects and describes the most dominant aspects during the learning activities. Data on student learning activities during the learning activities can be seen in Table 4.4.

Table 4. Data on student learning activities during the implementation of the cooperative learning model at meetings I and II

No	Observed Aspects	Cycle II		Amount	Average	Percentage (%)
		P. I	P.			
1	Reading learning materials	11	13	24	`12	19.3
2	Discuss/ask questions among group members	13	15	28	14	22.5
3	Ask the teacher	9	10	19	9.5	15.3
4	Carrying out activities (observations, experiments or work)	14	16	30	15	24.1
5	Responding to friends' questions or opinions	5	7	12	6	9.6
6	Put forward ideas	5	6	11	5.5	8.8
Total Frequency				124		

Caption: (Source: Field Data 2025)
P. I = Meeting I
P. II = Meeting II

From Table 4, it can be seen that the most prominent student learning activity of all aspects observed in cycle II is carrying out activities (observation, experimentation or work) with the number of frequencies that appeared from two meetings as many as 30 times or 24.1% of the total frequency that appeared for all aspects observed. This shows that student learning activities during the learning process in cycle II increased when compared to cycle I. The other five aspects also experienced a fairly good increase in frequency in cycle II, both meetings I and II. This happened because students were able to adapt to the learning model used by the teacher (researcher).

b. Learning management

The teacher's (researcher's) ability to manage cooperative learning was observed by colleagues. The results of the observation of learning management were obtained from observation data using observation instruments. The observation score category for teacher ability consisted of four assessment criteria, namely: Very Good (score 4), Good (score 3), Sufficient (2), and Less (1). Data on learning management by teachers can be seen in Table 4.5.

Table 5. Cooperative learning management data at meetings I and II

No	Rated aspect	Mark		Average
		P. I	P. II	
I	OVERALL TEACHER PREPARATION	4	4	4
II	IMPLEMENTATION			
	A. Introduction			
	1. Motivating students	4	4	4
	2. Conveying learning objectives	4	4	4
	3. Conducting transactions	4	4	4
	B. Core activities			
	1. Presenting the main material that supports group learning tasks by means of demonstrations or texts	4	4	4
	2. study groups			
	3. Guide students to work on worksheets or make observations	4	4	4
	4. Supervise each group in turn	4	4	4
	5. Providing assistance to groups experiencing difficulties	4	4	4
	6. Encourage and guide students in carrying out cooperative skills	4	4	4
	a. Ask a question			
	b. Answering questions/responding	3	4	3.5
	c. Convey ideas/opinions			
	d. Taking turns and sharing tasks			
	7. Providing recitation/feedback			
	8. Guide students to make summaries			
	9. Conduct an evaluation	4	4	4
		4	4	4
		4	4	4
	C. Closing			
	1. Determine the group with the best performance	4	4	4
	2. Announcing recognition/awards	4	4	4
III	TIME PROCESSING	3	4	3.5
IV	TEACHER'S QUESTIONING TECHNIQUE	4	4	4

V	CLASS ATMOSPHERE 1. Student- centered 2. Enthusiastic students 3. Enthusiastic teacher	 4 4 4	 4 4 4	 4 4 4
Amount		79		
Average		3.95		

(Source : Field Data 2025)

From table 5 it can be seen that the teacher's ability to manage learning has been going very well. This is seen in the management of learning by teachers who obtained an average score of 3.95 in cycle II or with very good criteria, and several aspects that were of concern from the implementation of actions in cycle I have been improved by the teacher (researcher). Where the overall teacher preparation obtained an average score of 4 or with very good criteria. The implementation of preliminary activities aspects; motivating students obtained an average score of 4 or with very good criteria, conveying learning objectives obtained an average score of 4 or with very good criteria, and conducting transactions obtained an average score of 4 or with very good criteria. The implementation of core activities aspects; presenting the main material that supports group learning tasks by means of demonstrations or texts obtaining an average score of 4 or with very good criteria, organizing students in study groups obtaining an average score of 4 or with very good criteria, guiding students to work on LKS or conducting observations obtaining an average score of 4 or with very good criteria, supervising each group in turn obtaining an average score of 4 or with very good criteria, providing assistance to groups that have difficulty obtaining an average score of 4 or with very good criteria, encouraging and guiding the implementation of cooperative skills by students obtaining an average score of 5 or with very good criteria, providing recitation/feedback obtaining an average score of 4 or with very good criteria, guiding students to make a summary obtaining an average score of 4 or with very good criteria, and conducting an evaluation obtaining an average score of 4 or with very good criteria.

Implementation of closing activities, aspects; determining the group with the best performance obtaining an average score of 4 or with very good criteria, and announcing recognition/awards obtaining an average score of 4 or with very good criteria. Time management obtained an average score of 3.5 or with very good criteria, teacher questioning techniques obtained an average score of 4 or with very good criteria. Class atmosphere aspect; student- centered obtained an average score of 4 or with very good criteria, enthusiastic students obtained an average score of 4 or with very good criteria, and enthusiastic teachers obtained an average score of 4 or with very good criteria. The observational data on teacher performance in Cycle II, which achieved an "excellent" rating across nearly all aspects—closing activities, questioning techniques, classroom atmosphere, and enthusiasm—can be explained theoretically as follows. First, the closing activities—identifying the best-performing group and providing recognition—represent an application of the Positive Reinforcement theory and the principle of "positive interdependence" within cooperative learning, which effectively motivates students to sustain their academic and collaborative performance. Second, the teacher’s effective questioning techniques align with Constructivist theory and Vygotsky’s concept of "scaffolding," where well-crafted questions stimulate higher-order thinking skills (HOTS) and assist students in constructing their own understanding. Third, effective time management reflects the application of the principles of momentum and pacing in classroom management, which keep the rhythm of instruction dynamic and prevent boredom. Fourth, a student-centered classroom atmosphere indicates the teacher’s successful transition into the role of a facilitator, granting students learning autonomy in accordance with the principles of humanistic psychology. Finally, the high level of

enthusiasm displayed by both the teacher and the students can be explained through the theory of "emotional contagion," wherein the positive energy and spirit exhibited by the teacher spread to the students, fostering an inclusive, vibrant, and enjoyable classroom climate. The synergy among these aspects serves, theoretically, as a primary catalyst for achieving optimal learning outcomes.

2. Evaluation

To determine the extent to which students have mastered the material taught, an evaluation of learning outcomes is conducted at the end of each cycle. The learning outcome evaluation data for Cycle II can be seen in Table 6.

Table 6. Data on evaluation of learning outcomes in cycle II

No	Student Name (Initials)	Type Sex	Score	T/TT
1	L.W	L	89	T
2	A. I	L	71	T
3	AA S	L	70	T
4	D. P. R	L	80	T
5	D. A	P	89	T
6	F. K	L	61	TT
7	F. P. A	P	69	T
8	P. A. S	L	90	T
9	M. F	P	73	T
10	M. K	P	81	T
11	N. R. A	P	93	T
12	N. F	L	64	TT
13	N. I	P	99	T
14	N. M. L	P	100	T
15	P. H	L	79	T
16	R. W. N	L	66	T
17	R. D. S	L	83	T
18	R. W. A	L	74	T
19	S. I. A	L	74	T
20	S. W	P	77	T
21	S. W	P	100	T
22	T. P	P	84	T
23	T. A. D	P	82	T
24	Y. F	L	61	TT
25	V. S	L	80	T
26	N. K	P	93	T
27	KR R	L	76	T
28	RDP B	L	80	T
29	APY P	P	73	T
30	DE L	L	95	T
Jumlah Nilai			2406	T=27
Class average			80.2	TT=3

Caption: (Source: Field Data 2025)

M/F = Male/Female

T = Completed

TT = Not Completed

The evaluation data presented in Table 6 indicate that the implementation of the cooperative learning model in Cycle II yielded highly satisfactory results. This is evidenced

by an increase in the class average to 80.2, reflecting an improvement in the collective understanding of the subject matter compared to the previous cycle. At the individual level, 27 students (90%) achieved scores equal to or higher than the Minimum Mastery Criterion (KKM) of 65, while only 3 students (10%) remained below this threshold. Measured against the KKM standard of 65, these results demonstrate that 90% of the students in the class have achieved mastery, both individually and collectively. This 90% figure exceeds the established class-wide mastery standard (a minimum of 75%); therefore, it can be concluded that the cooperative learning model is effective in addressing the learning needs of the majority of students and has successfully resolved the issue of low science learning outcomes among fifth-grade students at UPTD SD Inpres Lasiana, Kupang City.

d. Reflection

Based on the results of observations regarding student learning activities, and learning management by teachers, as well as the results of the final evaluation of cycle II. The researcher reflected back to see the weaknesses that occurred that must be corrected in the next cycle. However, based on the increase in student learning activities and the progress of teacher abilities in learning management, as well as the achievement of learning outcomes that have met the minimum and classical completion criteria of 90% of students have completed, the researcher concluded that the implementation of the *Cooperative learning model* in class V has been successful and satisfactory. Thus the researcher concluded not to continue to the next cycle.

This quote describes the final reflection stage in cycle II which is the basis for decision making in this Classroom Action Research (CAR). Based on the results of comprehensive observations of student learning activities, teacher performance in managing learning, as well as the results of the final evaluation of cycle II, researchers continue to carry out self-evaluations to identify weaknesses that may still remain. However, empirical data shows very positive results, where there is an increase in student learning activities, progress in teachers' abilities in classroom management, and achievement of the criteria for completeness of learning outcomes with 90% of students declared classically complete. This figure of 90% has exceeded the specified threshold for classical completeness (minimum 75%), so that the implementation of the cooperative learning model in class V is considered successful and satisfactory. Therefore, the researcher decided not to continue the action to the next cycle, because all research success indicators had been fulfilled optimally and the research objectives had been achieved. A student is considered to have completed their studies if they obtain a score of 65 or above. This is the criterion for completion in the learning process, considering three main factors within an educational institution: the level of student ability or engagement, supporting factors or infrastructure, and the complexity of the material used. Meanwhile, classical completion is achieved if at least 75% of students in the class have completed their studies.

Based on the results of the final evaluation of cycle I in Table 4.3, it is known that the number of students who obtained scores below the minimum completeness criteria or < 65 is 15 students and the number of students who obtained scores above the minimum completeness criteria or ≥ 65 is 15 students. When compared to the minimum completeness criteria of 65, there are 15 students in the class who have not achieved individual completeness or classical completeness. Meanwhile, the most prominent student learning activity of all aspects observed in cycle I is carrying out activities (observation, experimentation or work) with a frequency of 23 times or 25.8% of the total frequency that appears for all aspects observed. This is because the learning model applied by the researcher has not run well, which causes a lack of interaction between students and students, as well as between students and teachers; class management has not run well so that the learning process is not optimal; the provision of motivation and

guidance is not evenly distributed so that students appear inactive or passive; when working on LKS or making observations in groups, it is still dominated by certain students; in addition, student participation in learning is still very low. The time given to work on the LKS has not been appreciated by students.

Based on the results of the reflection on cycle I, the efforts to improve the learning process in cycle II have been implemented well by the teacher. This can be seen from the results of the final evaluation of cycle II in Table 4.6, where the number of students who obtained scores above the minimum completion criteria or ≥ 65 was 27 students, and the number of students who obtained scores below the minimum completion criteria or < 65 was 3 students. When compared to the minimum completion criteria of 65, 90% of the class has completed both individually and as a class. In addition, the most prominent student learning activity of all aspects observed in cycle II was carrying out activities (observation, experimentation or work) with a frequency of 30 times or 24.1% of the total frequency that appeared for all aspects observed. This shows that student learning activities during the learning process in cycle II increased when compared to cycle I. The other five aspects also experienced a fairly good increase in frequency in cycle II, both in meetings I and II.

The increase in learning outcomes of fifth-grade students at the UPTD SD Inpres Lasiana by 40% in cycle II, is certainly because the teacher (researcher) implemented the cooperative learning model very well. The increase in student learning outcomes in science learning with the material of soil formation shows that the cooperative learning model is very good to be used in the learning process in the classroom, which has been running conventionally and placing students as listeners to the teacher's lecture.

This is in line with the advantages of cooperative learning put forward by Sanjaya in (Nurdin & Riyanti, t.t.), that through cooperative learning students do not rely too much on teachers, but can increase confidence in their ability to think for themselves, find information from various sources, and learn from other students; cooperative learning can develop the ability to express ideas or ideas verbally and compare them with the ideas of others. Cooperative learning can help children to respect others and be aware of all their limitations and accept all differences; cooperative learning can help empower each student to be more responsible in learning; cooperative learning is a strategy that is quite effective in improving academic achievement as well as social skills, including developing self-esteem, positive interpersonal relationships with others, developing time management skills, and positive attitudes towards school (Maharani & Julian, 2024); through cooperative learning can develop students' ability to test their own ideas and understanding, receive feedback. Students can practice problem-solving without fear of making mistakes, as decisions are the responsibility of their group (Amin, 2023); cooperative learning can improve students' ability to use information and abstract learning skills to become concrete (real); and interactions during cooperative learning can increase motivation and stimulate thinking. This is useful for the long-term educational process.

The implementation of the cooperative learning model has been proven to increase student learning activities. In Cycle I, the most prominent activity aspect was "carrying out activities (observation, experimentation, or work)" with a frequency of 23 times (25.8%). In Cycle II, the frequency of this activity increased to 30 times (24.1%), and all other aspects of learning activities (reading, discussing, asking questions, responding, and expressing ideas) also experienced an even increase. This increase is in line with the theory of active learning (Active Learning) proposed by Silberman (2005) in the manuscript, which states that "What I do, I understand." Through the cooperative model, students are no longer positioned as passive listeners to the teacher's lecture, but are directly involved in the process of discovering concepts (Constructivism). The dominant observation and experimentation activities indicate that students have become the main

subjects in learning, so that the material learned (such as rock types and soil formation processes) can be retained longer in their memories. The teacher's ability to manage cooperative learning shows a positive trend from Cycle I to Cycle II. The average learning management score in Cycle I was 3.55 (good criteria), and increased to 3.95 (very good criteria) in Cycle II. This improvement was the result of a deep reflection stage in Cycle I. In the initial cycle, the teacher (researcher) still faced obstacles in terms of motivating students (score 2.5), time management, and questioning techniques. In Cycle II, the teacher managed to improve these by providing more even motivation, guiding students to work on the LKS in turns, and optimizing group division. This proves that CAR as a reflective cycle (planning, implementation, observation, reflection) is effective in improving teacher pedagogical practices in the classroom. The teacher does not only play a role as a material deliverer, but has succeeded in becoming a good facilitator and class manager.

The successful implementation of the cooperative model was not without challenges, particularly in Cycle I. The main challenges were a conventional learning culture that made students rigid, as well as students' refusal to join with friends who were considered "less capable." In Vygotsky's theory of social development, this is related to the Zone of Proximal Development (ZPD), where students initially feel uncomfortable interacting with friends of different ability levels. The teacher's efforts—such as giving rewards, praise, motivating, and intensive guidance—proved to be able to break the ice. The teacher also encouraged social skills such as asking questions, responding to opinions, and taking turns. In Cycle II, these challenges were successfully overcome. Students were able to adapt, interactions between students were active, and the learning process became more lively. This confirms that the success of the cooperative model is highly dependent on the teacher's role in managing group dynamics and building an inclusive classroom climate.

Although the results of this study indicate a highly positive impact, the researchers candidly acknowledge several limitations that warrant careful consideration. The first limitation concerns scope and generalizability; the study was conducted in only one class (fifth grade) and focused on a very specific science topic—soil formation and erosion—meaning the findings cannot be directly generalized to other populations, schools, or subjects without accounting for contextual differences. The second limitation relates to the duration of the study; the limited timeframe, spanning only two cycles, required the teacher to move quickly in fostering cooperative skills among the students, which means that the habituation of such collaborative attitudes may not necessarily persist permanently in the long term. Consequently, the researchers recommend further studies to examine the effectiveness of this instructional model across a broader scope—such as in different subjects or grade levels—to ensure the validity and sustainability of its impact within the educational landscape.

DISCUSSION

The findings of this classroom action research demonstrate that implementing a cooperative learning model was associated with improvements in students' learning activities, classroom management, and science learning outcomes in Grade V at UPTD SD Inpres Lasiana, Kupang City. The class average increased from 59.3 in Cycle I to 80.2 in Cycle II, while the proportion of students achieving the minimum mastery criterion (KKM) of 65 increased from 50% to 90%. These results indicate that the intervention was accompanied by substantial improvement in students' mastery of science content, particularly the topics of rock weathering, soil formation, soil composition, and erosion. Nevertheless, because the study employed classroom action research without a control group, the improvement should be interpreted as an outcome observed during the

implementation of the intervention rather than conclusive evidence that cooperative learning alone caused the change.

The improvement in achievement was accompanied by changes in students' classroom participation. The frequency of observation, experimentation, and task-related activities increased from 23 occurrences in Cycle I to 30 in Cycle II. Meanwhile, the teacher's learning-management score increased from 3.55 to 3.95 on the four-point assessment scale. These parallel developments suggest that improvements in instructional organization and students' opportunities to participate may have contributed to the observed learning progress. In Cycle I, some students were reluctant to work with peers perceived as less capable, and group activities were sometimes dominated by particular students. Following reflection, the teacher strengthened motivation, guidance, group supervision, and the distribution of responsibilities. By Cycle II, the students had become more accustomed to the cooperative learning procedures. The findings therefore highlight the importance of instructional facilitation and the gradual development of collaborative classroom routines.

The novelty of this study lies primarily in its context-specific and practice-oriented contribution to elementary science education. Rather than examining learning achievement in isolation, the research documents the relationship between changes in classroom practices, student participation, teacher facilitation, and learning outcomes across two reflective action cycles. The study also illustrates how classroom action research can help teachers identify implementation barriers and revise their instructional practices in response to observed student needs. Although cooperative learning has been widely investigated, this study provides a locally grounded account of how its implementation can be refined in a fifth-grade classroom in Kupang City. Its contribution should therefore be understood as contextual and implementation-focused, rather than as the introduction of a wholly new cooperative learning theory or model.

The improvement observed in this study is consistent with international research indicating that collaborative instructional approaches can support academic learning when students are given structured opportunities to exchange ideas and work toward shared learning goals. Fung and Liang (2023), in their study of more than 200 primary school students across three schools in Hong Kong, found that combining collaborative group work with mind mapping was more effective for science achievement than using either approach independently. Their findings support the interpretation that meaningful interaction and the organization of scientific information can reinforce one another. In the present study, students worked with concrete materials, conducted observations and experiments, and discussed science concepts in groups. Although the intervention did not include mind mapping, both studies emphasize the educational value of connecting active participation with structured learning tasks.

The findings also correspond with the broader evidence synthesized by Vembye et al. (2024), whose systematic review and meta-analysis examined collaborative models of instruction and student achievement. Their analysis of 76 studies reported a positive average effect of collaborative instruction compared with single-taught controls, although the estimated effect was moderate and varied across studies. This evidence supports the potential value of collaborative approaches while also cautioning against assuming that every implementation will produce the same results. The increase in mastery from 50% to 90% in the present study is encouraging, but it cannot be directly compared with a standardized meta-analytic effect size because the present research used classroom action cycles and descriptive indicators rather than a controlled experimental design.

More specifically, Yaşar et al. (2024) examined cooperative learning in science education through a mixed-meta-method approach combining a review of previous research with quantitative synthesis. Their work provides a relevant broader basis for understanding the potential contribution of cooperative learning to academic achievement

in science. Similarly, Liu et al. (2024), in a systematic review of collaborative learning in primary science education, highlighted the importance of personal, behavioral, and environmental factors in understanding collaborative learning outcomes. Together, these studies support the view that learning achievement should be interpreted alongside the learning processes and classroom conditions through which it develops. The present study adds a classroom-level illustration of this relationship by documenting changes in student activity and teacher management alongside the improvement in test results.

Research on collaborative inquiry also provides a useful comparison. Song et al. (2022) investigated primary students' mobile collaborative inquiry-based learning behaviors in science and used learning analytics to examine patterns associated with different levels of performance. Their study highlights the importance of understanding what students actually do during collaborative learning, rather than evaluating only the final achievement score. This perspective is relevant to the present findings because observation, experimentation, discussion, questioning, and responding to peers were explicitly recorded as indicators of student activity. However, the two studies differ in their learning environments and analytical approaches: Song et al. focused on mobile-supported collaborative inquiry and learning analytics, whereas the present study examined teacher-guided cooperative learning through classroom observation and action research.

Further evidence of the potential value of cooperative learning comes from the 2025 meta-analysis by the authors of *The Effect of Cooperative Learning toward Mathematics Achievement of Primary Students*. Based on 30 empirical studies, the review reported a positive pooled effect on primary students' mathematics achievement, while also identifying substantial variation across the included studies. Although mathematics is not the same subject as science, this review is relevant because it concerns the same broad educational stage and examines academic achievement as an outcome of cooperative learning. Its findings reinforce the argument that cooperative learning has potential across curricular areas, but its effectiveness should be interpreted in relation to the particular instructional model, subject matter, and implementation conditions.

Differences between the present study and previous research should be interpreted in relation to the methodological and contextual characteristics of each investigation. For example, Fung and Liang (2023) used a quasi-experimental comparison involving different combinations of collaborative learning and mind mapping, whereas the present study used two cycles of classroom action research without a control group. Likewise, research using mobile collaborative inquiry or other structured cooperative learning models may involve different technologies, task designs, assessment instruments, and student interaction patterns. Differences in intervention duration, prior student achievement, teacher experience, group composition, and the complexity of learning materials may also influence the magnitude of observed outcomes. Consequently, the increase in mastery in this study should not be interpreted as evidence that the particular implementation is more effective than the approaches examined in other studies. Rather, it illustrates how a locally adapted intervention can be refined through observation and reflection.

The development between Cycle I and Cycle II also suggests that the initial challenges were not necessarily evidence of the failure of cooperative learning itself. Students initially experienced difficulties adapting to group work, and some resisted working with peers whom they perceived as less capable. Unequal participation and the dominance of particular group members further limited the intended benefits of collaboration. Following reflection, the teacher increased motivational support, provided more consistent guidance, supervised groups more systematically, and encouraged students to share tasks and communicate their ideas. The subsequent improvement suggests that familiarity with the learning procedures and more deliberate classroom

management may be important conditions for successful implementation. This interpretation is consistent with the broader literature emphasizing that collaborative learning outcomes depend on instructional design and the quality of classroom implementation, rather than on grouping students alone.

Theoretically, the findings are compatible with constructivist perspectives that view learning as an active process in which students develop understanding through engagement with learning materials, prior knowledge, and social interaction. The activities undertaken in this study allowed students to observe natural phenomena, conduct simple experiments, discuss findings, and communicate explanations. These experiences provided opportunities to connect scientific information with concrete observations. The findings also support the active-learning perspective discussed in the manuscript: students may have more opportunities to develop understanding when they do more than listen to teacher explanations. However, the present study did not directly test constructivism or active learning as separate theoretical variables. The contribution is therefore interpretive: the observed changes are consistent with these perspectives and illustrate their potential relevance to elementary science instruction.

Practically, the findings suggest that teachers should design cooperative learning activities with explicit learning objectives, manageable group tasks, clear responsibilities, and sufficient opportunities for every student to participate. Group composition should be planned carefully, and teachers should monitor whether particular students dominate discussions or practical work. The experience of Cycle I indicates that simply assigning students to groups does not automatically produce effective collaboration. Teachers need to model respectful communication, explain the purpose of working with peers of different abilities, provide timely assistance, and encourage students to ask questions, respond to classmates, and share responsibility for completing tasks. Practical materials, observation worksheets, and simple experiments can also help connect science concepts to experiences that students can examine directly.

For schools and education policymakers, the findings provide a practical rationale for supporting professional development in student-centered instruction and reflective teaching. Training should extend beyond introducing cooperative learning procedures to include classroom management, formative assessment, inclusive group facilitation, and strategies for ensuring individual accountability. School leaders can support implementation by providing suitable teaching materials, opportunities for peer observation, and time for teachers to evaluate and refine their lessons. Nevertheless, because the present study was conducted in a single classroom, its findings should inform contextual experimentation and professional reflection rather than be treated as sufficient evidence for a universal policy mandate.

Several limitations should be considered when interpreting the findings. First, the study involved only 30 fifth-grade students from one elementary school in Kupang City and focused on a limited range of science topics, particularly soil formation and erosion. The findings may therefore not be generalizable to other schools, grade levels, student populations, or subject areas. Second, the intervention consisted of two cycles comprising four classroom sessions. This period was sufficient to document short-term changes during implementation but not to determine whether the observed improvements or collaborative behaviors would be sustained over time. Third, the study did not include a control group or a separate comparison class. Other influences, including students' growing familiarity with the content, repeated exposure to assessment, and changes in teacher practice, may have contributed to the observed improvement. Because the teacher also served as the researcher, the observation and evaluation process may have been subject to researcher-related bias, despite the use of observation instruments and colleague involvement.

Future research should examine cooperative learning across multiple schools, grade levels, and science topics to determine the extent to which the findings can be reproduced in different educational settings. Longer interventions and follow-up assessments would help establish whether improvements in achievement and collaborative behavior are sustained. Studies using quasi-experimental or experimental comparison groups could also provide stronger evidence about the contribution of cooperative learning relative to conventional instruction or other active-learning approaches. In addition, future investigations could examine student-level participation, individual accountability, peer interaction, motivation, and conceptual understanding to identify the processes most closely associated with learning gains. Combining achievement tests with classroom observations, student interviews, and independently assessed learning artifacts would further strengthen the interpretation of findings and help teachers develop more inclusive and effective cooperative learning practices.

CONCLUSION

The findings demonstrate that the implementation of cooperative learning through two classroom action research cycles was accompanied by improvements in student engagement, teacher classroom management, and academic achievement. These results highlight the potential of collaborative learning arrangements to address the limitations of teacher-centered instruction by providing students with more opportunities to participate actively, exchange ideas, conduct observations, and construct understanding through interaction with their peers. The improvement in the learning process was reflected in the increased frequency of students' participation in observation, experimentation, and group-based activities, which rose from 23 occurrences in Cycle I to 30 in Cycle II. This finding suggests that cooperative learning provided opportunities for students to become more actively involved in science learning rather than relying primarily on teacher explanations. In addition, the teacher's average classroom management score increased from 3.55 (good) in Cycle I to 3.95 (very good) in Cycle II. This improvement indicates the importance of systematic instructional planning, classroom supervision, equitable guidance, and continuous reflection in facilitating effective collaborative learning. The findings also suggest that the effectiveness of group-based instruction depends not simply on placing students in groups but on ensuring that each student receives appropriate support and opportunities to contribute. A substantial improvement was also observed in students' science learning outcomes. The class average increased from 59.3 in Cycle I to 80.2 in Cycle II. Similarly, the proportion of students achieving the minimum mastery criterion of 65 increased from 50% (15 students) to 90% (27 students), representing an improvement of 40 percentage points. The final achievement exceeded the predetermined classical mastery criterion of 75%, providing evidence that the classroom intervention met its intended learning outcome. These results suggest that opportunities for peer interaction, collaborative problem-solving, and active engagement may support students' understanding of science concepts in the classroom investigated. Nevertheless, the implementation process initially encountered several challenges, including limited student participation, reluctance to collaborate with certain peers, unequal contributions within groups, and difficulties in classroom management. These challenges were addressed through improved teacher motivation, more intensive guidance, systematic group supervision, and opportunities for students to ask questions, respond to opinions, and express ideas. This experience emphasizes that successful cooperative learning requires both appropriate instructional structures and the teacher's capacity to facilitate positive group dynamics. This study is limited by its focus on 30 students in one fifth-grade classroom, its application to science learning, and its relatively short duration of two cycles. The absence of a comparison group also limits the attribution of observed improvements exclusively to the intervention. Future research should investigate

cooperative learning across different schools, grade levels, and subject areas, using longer intervention periods and complementary research designs to examine the sustainability of learning gains. Overall, this study provides context-specific evidence that cooperative learning, supported by reflective teaching practices and responsive classroom management, can contribute to more active participation and improved science learning outcomes.

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