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Collaborative Learning Approach on the Junior High School Students' Critical Thinking Skills and Performance in Science

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Abstract*—This study aims to determine the influence of collaborative learning approaches on the critical thinking skills and science performance of junior high school students. Specifically, it seeks to assess the level of collaborative learning practices and examine their relationship with students' level of critical thinking skills and academic performance in science. Furthermore, the study determines whether collaborative learning practices significantly affect students' critical thinking skills and performance. The respondents are Grade 7 students in an Integrated National High School, selected through purposive sampling. This study used a quantitative experimental research design. A researcher-made questionnaire measures collaborative learning practices, critical thinking skills, and academic performance. The gathered data are statistically treated using mean, standard deviation, Pearson r correlation, and t-test. The findings reveal that the respondents demonstrate a very high level of collaborative learning practices in terms of group interaction, shared responsibility, peer support, task cooperation, and decision-making. Likewise, the students exhibit a very high level of critical thinking skills and attain outstanding performance in science. The results show a significant relationship between collaborative learning approach and students' critical thinking skills. However, no significant effect exists between collaborative learning approach and students' performance in science, implying that collaborative learning serves as an effective instructional strategy in enhancing higher-order thinking skills. Further statistical analysis reveals a significant relationship between the collaborative learning approach and students' critical thinking skills, leading to the rejection of the null hypothesis. However, no significant effect is found on academic performance; thus, the hypothesis is accepted. This implies that other factors might also influence students' achievement in science. Based on the findings, science teachers are encouraged to integrate collaborative learning strategies to enhance students' critical thinking skills and employ other approaches to improve students' performance in science. Furthermore, school administrators may provide training programs that equip teachers with diverse and effective teaching approaches. Future researchers are encouraged to investigate other factors that might have influenced academic performance to better understand students' learning outcomes.*

***Keywords*—** *Collaborative Learning Approach, Critical Thinking Skills, Performance in Science, Junior High School Students, Science Education.*

I. INTRODUCTION

The second decade of the twenty-first century had ended, marking a time when education continued to evolve to address the demands of a continuously changing society. Classroom learning is no longer limited to conventional written exercises and objective assessments alone. Instead, it was now emphasized the development of students' higher-order thinking skills and academic performance, both of which were essential in preparing learners to face real-life challenges with competence and creativity.

One teaching practice that has gained importance in contemporary education is collaborative learning, which is believed to strengthen these essential learner competencies. Collaborative learning referred to the process in which two or more students worked cooperatively to accomplish a shared goal or perform a group activity. Smith and MacGregor (2016) further stated that collaborative learning refers to different educational approaches involving shared intellectual activities among students, or between students and teachers. In this approach, learners worked through pair or small group activities to seek understanding, explore solutions, or create meaningful products, promoting academic improvement and social development.

One important benefit of collaborative learning was the enhancement of critical thinking. Critical thinking was regarded as a core ability in modern education, which is important for both academic achievement and daily decision-making. As defined by Moeti et al. (2016), critical thinking involves convergent thinking and the ability to analyze information and produce logical, evidence-based conclusions. Through collaboration, students were encouraged to question ideas, justify reasoning, and consider diverse perspectives, which sharpened their ability to think analytically and reflectively.

Moreover, science achievement, which is the level of understanding and mastery of scientific concepts and processes, was strongly affected by the quality of the classroom environment (Karasubasi and Seyhan, 2023). The collaborative learning approach provided valuable opportunities for students to engage in inquiry-based activities, conduct experiments, and discuss scientific phenomena in depth. Such experiences not only enhanced comprehension but also increased motivation and confidence in learning science. When students worked collaboratively, they applied critical thinking skills to scientific investigations, leading to deeper understanding and improved academic outcomes.

Thus, collaborative learning may be regarded as an important learner-centered approach that contributes to the enhancement of both critical thinking and science achievement

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among the junior high school students. Through group interaction, shared responsibility, peer support, task cooperation, and decision-making, it promoted active engagement and deeper cognitive processing. These processes improved students' abilities in analysis, evaluation, inference, and reasoning, leading to better academic performance. Thus, this study sought to determine the effect of collaborative learning on these variables, highlighting its importance in improving student performance in the field of science.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study aimed to determine the effect of collaborative learning approach on the critical thinking skills and performance of junior high school students in science. In the context of modern education, there was an increasing demand for teaching strategies that not only enhanced academic achievement but also developed students' higher-order thinking skills. Collaborative learning emerged as a promising approach that encouraged active participation, interaction, and shared learning experiences. Hence, this study sought to explore how collaborative learning influenced students' critical thinking abilities and science performance.

Specifically, it Sought to answer the following questions:

1. What is the level of collaborative learning approach on performance of junior high school students in terms of:
   1.1 Group interaction;
   1.2 Shared responsibility;
   1.3 Peer support;
   1.4 Task cooperation; and
   1.5 Decision making?
2. What is the level of junior high school students' critical thinking skills in science in terms of:
   2.1 Analysis skill;
   2.2 Evaluation;
   2.3 Inference skill; and
   2.4 Reasoning and decision-making skills?
3. What is the level of junior high school students' performance in science in terms of:
   3.1 Monthly examination; and
   3.2 Quarterly examination?
4. Is there a significant relationship between collaborative learning approach and junior high school students' critical thinking skills in science?
5. Is there a significant effect between collaborative learning approach and junior high school students' performance in science?

II. METHODOLOGY

This study used a quantitative experimental research design. A researcher-made questionnaire measures collaborative learning practices, critical thinking skills, and academic performance. The gathered data are statistically treated using mean, standard deviation, Pearson r correlation, and t-test.

III. RESULTS AND DISCUSSION

This part presented the analysis and interpretation of the data on the extent of the collaborative learning approach as practiced in the science classroom. It focused on how key components such as group interaction, shared responsibility, peer support, task cooperation, and decision-making were observed and experienced by the students.

The gathered data were interpreted through statistical tools such as weighted mean and standard deviation to determine the level and consistency of these practices. The results provided a clear understanding of how collaborative learning supported students' participation and engagement in the learning process.

Level of Collaborative Learning Approach

For this research, the collaborative learning approach was described according to group interaction, shared responsibility, peer support, task cooperation, and decision-making.

The following tables showed the analyzed data, including the indicators, computed mean, standard deviation, descriptive remarks, and verbal interpretations, which became the basis for the discussion of findings.

Furthermore, each table was carefully analyzed to highlight the students' responses and identify patterns in carrying out collaborative learning practices. The interpretation of the data aimed to provide a clearer picture of how these practices influenced students' involvement in classroom activities. Through this, the research was able to present meaningful findings that reflected the actual experiences of the students in the educational process.

Table 1 illustrates the level of the Collaborative Learning Approach in terms of Group Interaction as experienced by the students during science learning activities. This aspect highlights how students communicate, exchange ideas, and actively participate in group discussions to achieve shared learning goals. It further shows how these interactions contribute to students' involvement in the overall learning process.

Table 1. Level of the of Collaborative Learning Approach refers to Group Interaction

Statement My teacher's facilitation of meaningful group interaction during science learning activities…	Mean	SD	Remarks
…explains the importance of active participation in group tasks and discussions	4.96	0.20	Strongly Agree
…demonstrates structured opportunities for students to exchange ideas and perspectives	4.90	0.30	Strongly Agree
…distinguishes students' viewpoints to promote respectful listening and balanced participation	4.92	0.28	Strongly Agree
…checks whether all group members share equal responsibility in completing activities	4.87	0.34	Strongly Agree
…designs a collaborative activity that foster mutual trust and respect within the group	4.92	0.26	Strongly Agree
Weighted Mean		4.91	
SD		0.26	
Verbal Interpretation		Very High	

Respondents strongly agree that their teacher explains the importance of active participation in group tasks and

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discussions while creating organized activities where learners can share opinions and perspectives. They likewise strongly agree that the teacher promotes respectful listening by recognizing students' viewpoints, ensures equal responsibility among group members, and designs collaborative activities that foster mutual trust and respect within the group.

The collaborative learning approach under group interaction obtained a weighted mean of 4.91 and a standard deviation of 0.26, with a verbal interpretation of Very High. These findings indicates that teachers successfully encourage meaningful interaction within groups that strengthen student active participation, collaboration, and shared responsibility. The low variability in responses also implies that learners demonstrated similar perceptions about the quality of collaborative practices implemented in the classroom.

The findings reveal that group interaction remains a significant aspect of the collaborative learning approach. Through structured activities, equal participation, and respectful communication, students are able to engage more effectively in science learning and develop positive interpersonal and collaborative skills.

Table 2 shows the level of the Collaborative Learning Approach in terms of Shared Responsibility. This component focuses on how students equally contribute to group tasks and take accountability for achieving common objectives. It also indicates how students assume accountability and contribute equally to group tasks.

Table 2. Level of the of Collaborative Learning Approach in terms of Shared Responsibility

Statement My teacher's promotion of shared responsibility in group-based science tasks…	Mean	SD	Remarks
…defines the concept of accountability in individual and group tasks	4.92	0.35	Strongly Agree
…assigns defined roles to ensure equitable participation	4.86	0.35	Strongly Agree
…analyzes individual contributions in relation to overall group performance	4.88	0.33	Strongly Agree
…justifies the extent to which success reflects collective effort	4.89	0.31	Strongly Agree
…organizes cooperative structures that align tasks within students' strengths and skills	4.92	0.27	Strongly Agree
Weighted Mean		4.89	
SD		0.30	
Verbal Interpretation		Very High	

Respondents strongly agree that their teacher clearly defines accountability in both individual and group tasks and assigns specific roles to ensure equitable participation. They also strongly agree that the teacher evaluates individual contributions in relation to group performance, emphasizes that success reflects collective effort, and organizes cooperative structures aligned with students' strengths and skills.

The level of collaborative learning approach in terms of shared responsibility obtained a weighted mean score of 4.89 with a standard deviation of 0.30, with a verbal interpretation of Very High. This indicates that teachers effectively promote accountability and equitable participation among students during group-based science tasks. The relatively low standard deviation further implies consistency in students' perceptions.
The findings indicate that shared responsibility is a key element of collaborative learning approach. Through clear roles and accountability, students are able to contribute meaningfully and develop a strong sense of responsibility toward group success. This collaborative structure not only reinforces individual accountability but also strengthens interdependence, where each member's contribution directly influences the overall group outcome. Consequently, such an environment promotes discipline, commitment, and deeper engagement in learning tasks, ultimately enhancing both individual and collective academic performance.

Table 3 shows the level of the Collaborative Learning Approach in terms of Peer Support. This aspect refers to how students assist, encourage, and support one another during learning activities. It further reflects how students assist and encourage one another to enhance understanding.

Table 3. Level of the of Collaborative Learning Approach in terms of Peer Support

Statement My teacher's support of peer-assisted learning during science class interactions…	Mean	SD	Remarks
…describes the value of sharing learning materials and resources among peers	4.92	0.28	Strongly Agree
…uses peer-assisted strategies during science learning activities	4.88	0.33	Strongly Agree
…compares instances where collaboration enhances understanding	4.88	0.32	Strongly Agree
…evaluates the impact of encouragement and reinforcement on students' confidence	4.90	0.30	Strongly Agree
…creates a classroom environment that promotes teamwork and mutual support	4.92	0.27	Strongly Agree
Weighted Mean		4.90	
SD		0.28	
Verbal Interpretation		Very High	

Respondents strongly agree that their teacher emphasizes the value of sharing learning materials and resources and utilizes peer-assisted strategies during science activities. They also strongly agree that collaboration enhances understanding, encouragement builds confidence, and the classroom environment promotes teamwork and mutual support.

The level of collaborative learning in terms of peer support attained a weighted mean of 4.90 and a standard deviation of 0.28, with a verbal interpretation of Very High. This indicates that peer-assisted learning is strongly practiced and contributes to students' confidence and understanding in science. The low standard deviation in responses also reflects that learner shared similar views regarding the effectiveness of peer support.

The findings indicate that peer support remains an important aspect of collaborative learning. Through encouragement, resource sharing, and teamwork, learner become more confident and gain better understanding of scientific concepts and classroom lessons.

Table 4 presents the level of the Collaborative Learning Approach in terms of Task Cooperation. This component focuses on how students work together efficiently to accomplish assigned activities. It also demonstrates how

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students work together efficiently to accomplish assigned tasks.

Table 4. Level of the of Collaborative Learning Approach in terms of Task Cooperation

Statement My teacher's guidance in task cooperation during science activities…	Mean	SD	Remarks
…outlines procedures for working collaboratively to complete assigned tasks	4.93	0.26	Strongly Agree
…implements cooperative strategies during group science activities	4.90	0.34	Strongly Agree
…guides students coordinate roles and responsibilities during collaboration	4.91	0.29	Strongly Agree
…evaluates the effectiveness of idea-sharing and resource distribution	4.90	0.30	Strongly Agree
…constructs structured teamwork processes that ensure fair task allocation	4.94	0.24	Strongly Agree
Weighted Mean		4.91	
SD		0.27	
Verbal Interpretation		Very High	

Respondents strongly agree that their teacher provides clear procedures for collaborative work and implements cooperative strategies during science activities. They also strongly agree that the teacher guides coordination of roles, evaluates idea-sharing and resource distribution, and ensures fair task allocation through structured teamwork processes.

The level of collaborative learning approach in terms of task cooperation obtained a weighted mean of 4.91 with a standard deviation of 0.27, and was verbally interpreted as Very High. This indicates that teachers effectively guide students in working together to accomplish tasks efficiently and fairly. The low standard deviation reflects responses are closely aligned, showing similar perceptions among respondents.

The findings indicate that task cooperation is an essential component of collaborative learning. Through structured processes and guided coordination, students are able to work productively and achieve shared goals in science.

This coordinated effort ensures that tasks are completed efficiently while maximizing each member's contribution. It also enhances students' ability to organize, manage time, and align individual efforts with group objectives. As a result, task cooperation contributes to improved learning outcomes and more effective group performance in science activities.

Table 5 presents the level of the Collaborative Learning Approach in terms of Decision-Making. This aspect highlights how students analyze options, share ideas, and come to agreements during group activities. It further shows how students participate in making group decisions and selecting appropriate solutions.

Respondents strongly agree that their teacher explains the steps in group decision-making and facilitates discussions before reaching conclusions. They also strongly agree that diverse perspectives are considered, conclusions are based on logical reasoning and shared evidence, and opportunities are provided for students to reach consensus through dialogue.

The level of collaborative learning approach in terms of decision making obtained a mean score of 4.92 with a standard deviation of 0.26, and was verbally interpreted as Very High. This indicates that teachers effectively involve students in meaningful decision-making processes during scientific tasks. The low standard deviation implies consistent agreement among respondents.

Table 5. Level of the of Collaborative Learning Approach in terms of Decision-Making

Statement My teacher's involvement of students in decision-making related to scientific tasks…	Mean	SD	Remarks
…states the steps involved in group decision-making	4.93	0.25	Strongly Agree
…demonstrates discussion strategies before reaching conclusions	4.90	0.34	Strongly Agree
…contrasts diverse perspectives presented during deliberations	4.88	0.32	Strongly Agree
…defends conclusions based on logical reasoning and shared evidence	4.95	0.21	Strongly Agree
…generates opportunities for students to reach consensus through dialogue	4.93	0.25	Strongly Agree
Weighted Mean		4.92	
SD		0.26	
Verbal Interpretation		Very High	

The results show that decision making is a strong aspect of collaborative learning. Through guided discussions, critical thinking, and consensus- building, students are able to develop reasoning skills and actively participate in group decisions.

Level of Junior High School Students' Critical Thinking Skills in Science

In this study, the level of Junior High School Students' Critical Thinking Skills in Science refers to Analysis; Evaluation; Inference; and Reasoning and Decision-Making. The results are presented in the table, which includes the statements, mean, standard deviation, remarks, and verbal interpretation.

Table 6 presents the level of Junior High School Students' Critical Thinking Skills in Science in terms of Analysis. This pertains to students' ability to examine information, identify relationships, and understand complex concepts. It also highlights how students examine and organize information to better understand concepts.

Table 6. Level of Junior High School Students' Critical Thinking Skills in Science in terms of Analysis

Statement When analyzing scientific information, data, and problems, I can…	Mean	SD	Remarks
…identify the main ideas and supporting details before forming conclusions	4.95	0.22	Strongly Agree
…apply learned concepts to examine information carefully	4.90	0.29	Strongly Agree
…differentiate complex problems into manageable components	4.85	0.36	Strongly Agree
…justify relationships and patterns among specific concepts	4.92	0.27	Strongly Agree
…organize information into coherent explanations	4.90	0.29	Strongly Agree
Weighted Mean		4.90	
SD		0.27	
Verbal Interpretation		Very High	

Respondents strongly agree that they can identify main ideas and supporting details before forming conclusions and apply learned concepts to examine information carefully.

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These indicates that students process information in a logical and systematic manner. This also showed that they were capable of connecting prior knowledge with new information during analysis. In addition, students reported that they can break down complex problems into manageable parts, explain relationships among concepts, and organize information into coherent explanations.

The level of critical thinking skills in terms of analysis obtained a mean of 4.90 with a standard deviation of 0.27, and was verbally interpreted as Very High. This indicates that students are actively engaged in analyzing scientific information and demonstrate strong analytical thinking skills. The low standard deviation indicates closely aligned responses among the participants, showing a consistent application of analytical skills across different learning tasks.

The results indicate that analysis is a well-developed component of students' critical thinking skills. Through identifying, organizing, and examining information, students are able to process scientific concepts effectively.

This skill helps students break down complex ideas into simpler parts for better understanding. It also allows them to recognize patterns and relationships within scientific data. As a result, students become more confident in explaining concepts and solving science-related problems.

Table 7 show the level of Junior High School Students' Critical Thinking Skills in Science in terms of Evaluation. This involves the ability to assess information, judge its accuracy, and reflect on learning. It further reflects how students assess information and make judgements based on evidence.

Respondents strongly agree that they can recognize the strengths and weaknesses of ideas and use criteria to assess the effectiveness of group strategies. They also strongly agree that they can determine whether conclusions are supported by sufficient evidence, appraise the quality of outputs, and revise their work to improve performance.

Table 7. Level of Junior High School Students' Critical Thinking Skills in Science in terms of Evaluation

Statement When evaluating ideas, procedures, and outcomes in scientific activities, I can…	Mean	SD	Remarks
…recognize the strengths and weaknesses of different ideas or solutions	4.92	0.28	Strongly Agree
…use criteria to measure the effectiveness of group strategies	4.85	0.35	Strongly Agree
…determine whether conclusions supported by sufficient evidence	4.91	0.29	Strongly Agree
…appraise the quality of work produced	4.90	0.30	Strongly Agree
…revise outputs to enhance group or individual performance	4.92	0.28	Strongly Agree
Weighted Mean		4.90	
SD		0.28	
Verbal Interpretation		Very High	

The level of critical thinking skills in terms of evaluation obtained a mean score of 4.90 with a standard deviation of 0.28, and was verbally interpreted as Very High. This indicates that students are capable of critically assessing ideas, processes, and outputs in scientific activities. The low standard deviation indicates closely aligned responses among participants, reflecting a consistent level of evaluation skills across the respondents. This further indicated that students consistently applied evaluative skills when examining scientific tasks and outputs. It also showed that they were able to maintain objective judgment when assessing the quality of their work and that of others. Furthermore, it reflected their ability to use evidence-based reasoning in making informed evaluations.

The findings indicate that evaluation is a strong component of students' critical thinking skills. Through assessing evidence, judging quality, and improving outputs, students demonstrate reflective and critical judgment skills.

Table 8 presents the level of Level of Junior High School Students' Critical Thinking Skills in Science in terms of Inference. This refers to the ability to draw conclusions and make logical interpretations from information. It also shows how students draw logical conclusions from given data and observations. It further indicates how students connect prior knowledge with new information to form meaningful insights. Moreover, it reflects their ability to interpret evidence and arrive at reasoned conclusions during scientific tasks.

Respondents strongly agree that they can identify conclusions based on evidence and predict outcomes using prior knowledge. These responses indicated that students were able to use available information to form logical predictions. They also strongly agree that they can infer patterns and relationships, support conclusions with logical evidence, and compose well-supported explanations from gathered information. This showed that students were capable of synthesizing information to generate meaningful interpretations.

Table 8. Level of Junior High School Students' Critical Thinking Skills in Science in terms of Inference

Statement When interpreting data, observations, and evidence in science lessons, I can…	Mean	SD	Remarks
…identify conclusions based on the information and evidence	4.96	0.19	Strongly Agree
…predict possible outcomes using prior knowledge	4.90	0.29	Strongly Agree
…infer patterns and relationships within data or observations	4.87	0.34	Strongly Agree
…support conclusions using logical and relevant evidence	4.94	0.24	Strongly Agree
…compose well-supported explanations derived from gathered information	4.96	0.20	Strongly Agree
Weighted Mean		4.93	
SD		0.24	
Verbal Interpretation		Very High	

The level of critical thinking skills in terms of inference attained a weighted mean of 4.93 with a standard deviation of 0.24, verbally interpreted as Very High. This indicates that students demonstrate a very strong ability to interpret data and draw logical conclusions in science. This further indicated that students consistently applied inference skills across different scientific tasks. The low standard deviation reflects consistency in responses. It also reflected that student shared

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similar levels of competence in making inferences from given data.

The findings indicate that inference is a highly developed skill in students. By interpreting evidence and forming logical conclusions, students are able to demonstrate deeper understanding of scientific concepts. These findings also highlighted that student were able to connect ideas effectively to support their conclusions. This further showed that students were capable of applying inference skills in analyzing scientific situations accurately.

Table 9 presents the level of Junior High School Students' Critical Thinking Skills in Science in terms of Reasoning and Decision-Making. This refers to the ability to analyze situations and make logical judgements. It further demonstrates how students apply logical thinking in sol ving problems and making decisions. Respondents strongly agree that they can consider different alternatives before making decisions and solve problems using relevant knowledge. They also strongly agree that they can compare possible consequences, critique decisions using evidence, and improve solutions after reflection. These findings showed that students had good awareness of their thinking and were able to adjust their ideas when solving science problems.

Table 9. Level of Junior High School Students' Critical Thinking Skills in Science in terms of Reasoning and Decision-Making

Statement In developing my reasoning and decision-making skills in science-related tasks, I can…	Mean	SD	Remarks
…list different alternatives before making a decision	4.93	0.25	Strongly Agree
…solve problems using relevant knowledge	4.86	0.35	Strongly Agree
…compare potential consequences of different options	4.92	0.28	Strongly Agree
…critique decisions using clear reasoning and evidence	4.94	0.24	Strongly Agree
…reconstruct solutions after reflecting on their effectiveness	4.92	0.27	Strongly Agree
Weighted Mean		4.91	
SD		0.26	
Verbal Interpretation		Very High	

The level of critical thinking skills in terms of reasoning and decision-making attained a weighted mean of 4.91 with a standard deviation of 0.26, verbally interpreted as Very High. This indicates that students are actively engaged in applying reasoning skills and making informed decisions in science-related tasks. The low standard deviation implies consistency in perceptions. This also showed that most of the students had similar responses and experiences.

The findings indicate that reasoning and decision-making are strong aspects of students' critical thinking. Through evaluating options, applying knowledge, and reflecting on outcomes, students are able to make sound and evidence-based decisions in scientific contexts. This showed that the teaching methods used in class helped students think clearly and make better decisions.

Level of Junior High School Students' Performance

In this study, the level of Junior High School Students' Performance refers to Monthly Examination (First Monthly and Second Monthly) and Quarterly Examination.

The level of Junior High School Students' Performance is presented in the following table, which shows the raw score, frequency, percentage, mean, standard deviation, and verbal interpretation.

The Table 10 shows the Junior High School Students' Performance in terms of Monthly and Quarterly Examinations. These assessments reflect both students' continuous learning progress and their overall mastery of scientific concepts. The monthly examination measures students' understanding of recently discussed lessons, while the quarterly examination evaluates their ability to integrate and apply knowledge over a long period. It also provides a basis for comparing short-term learning outcomes with cumulative academic performance. Furthermore, it highlights how consistent assessment practices contribute to a more comprehensive evaluation of students' achievement in science.

Table 10. Level of Junior High School Students' Performance in Science in terms of First and Second Monthly Examination

Raw Score	1st monthly examination		Descriptive Equivalent	2nd monthly examination		Descriptive Equivalent
	Frequency (f)	Percentage %		Frequency (f)	Percentage %	
33-40	208	82.54	O	234	92.86	O
25-32	44	17.46	VS	18	7.14	VS
17-24	0	0	S	0	0	S
9-16	0	0	F	0	0	F
1-8	0	0	NI	0	0	NI
Weighted Mean			35.52			35.95
SD			2.96			2.47
Verbal Interpretation			Outstanding			Outstanding

The data reveal that in the first monthly examination, the majority of students, comprising 208 (82.54%), obtained scores within the 33–40 range, which is verbally interpreted as Outstanding. Meanwhile, 44 (17.46%) students fell under the 25–32 range, interpreted as Very Satisfactory. No students were recorded under the lower performance categories.

Similarly, in the second monthly examination, a higher number of students, totalling 234 (92.86%), achieved scores within the Outstanding range, while only 18 (7.14%) students were categorized as Very Satisfactory. As in the first examination, no students fell under the satisfactory, fair, or needs improvement levels.

A comparison of the two examinations indicates an improvement in student performance, reflected in the higher percentage of students classified under the Outstanding category and the decrease in those under Very Satisfactory. This trend is further supported by the increase in the mean score from 35.52 in the first monthly examination to 35.95 in the second monthly examination, along with a decrease in standard deviation from 2.96 to 2.47, indicating more consistent student performance.

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Overall, both examinations yielded a verbal interpretation of Outstanding, suggesting that students demonstrated a high level of mastery of the science concepts. This indicates that students were able to effectively apply their knowledge and skills in various assessment tasks. The observed improvement and consistency in performance may imply that the instructional approach, particularly the use of collaborative learning, contributed positively to enhancing students' academic achievement in science.

The Table 11 presents the level of Junior High School Students' Performance in terms of Quarterly Examination. This assessment reflects the students' overall understanding and mastery of lessons covered over a long period. It measures how well students are able to integrate and apply the knowledge and skills they have learned in science. It also indicates the extent to which students retain and utilize concepts in more complex learning situations. Moreover, it reflects their ability to demonstrate higher-level thinking skills in comprehensive assessments.

The majority of the respondents, comprising 240 students (95.24%), obtained scores within the 49–60 range, verbally interpreted as Outstanding, while only 12 students (4.76%) fell under the Very Satisfactory level. No students were recorded in the lower performance categories such as Satisfactory, Fair, or Needs Improvement. This showed that most students reached a high level of performance in the quarterly test. It also showed that only a few students were below the highest level.

Table 11. Level of Junior High School Students' Performance in Science in terms of Quarterly Examination

Raw Score	Frequency (f)	Percentage (%)	Descriptive Equivalent
49-60	240	95.24	Outstanding
37-48	12	4.76	Very Satisfactory
25-36	0	0	Satisfactory
13-24	0	0	Fair
1-12	0	0	Needs Improvement
Weighted Mean		54.36	
SD		3.31	
Verbal Interpretation		Outstanding	

The overall performance attained a mean score of 54.36 with a standard deviation of 3.31, verbally interpreted as Outstanding. This indicates that students demonstrated excellent performance and a high level of mastery of the science competencies covered for the quarter. The standard deviation suggests that while scores are slightly more dispersed compared to the monthly examinations, overall performance remains consistently high. This showed that students understood the lessons well during the quarter. It also showed that their scores had small differences but were still generally high.

The findings indicate that Junior High School students achieved outstanding academic performance in the Quarterly Examination, reflecting strong retention of knowledge and effective learning throughout the grading period. This showed that students were able to retain and apply the concepts they learned overtime. In addition, students demonstrated the ability to apply their knowledge in answering different types of test questions.

Significant Relationship between the Collaborative Learning Approach and the Junior High School Students' Critical Thinking Skills in Science

In this study, the level of the of Collaborative Learning Approach refers to Group Interaction; Shared Responsibility; Peer Support, Task Cooperation; and Decision Making. Meanwhile, the Junior High School Students' Critical Thinking Skills in Science refers to Analysis Skill; Evaluation; Inference Skill; and Reasoning and Decision-Making Skills. These variables were used to measure how students interact and think during science learning activities. Each component provided data on students' participation and thinking skills inside the classroom.

The Significant Relationship between the Collaborative Learning Approach and the Junior High School Students' Critical Thinking Skills in Science is presented in the following table, which shows the Multiple Regression Analysis using Pearson Product Moment Correlation Coefficient or Pearson-r, p-value, and number of respondents. These statistical tools were used to determine whether a relationship exists between the two variables. The results also provide a basis for understanding how collaborative learning influences students' thinking skills as well as the strength and direction of the relationship between variables. Furthermore, this analysis helps determine whether the findings are statistically significant and not due to chance.

In addition, the Pearson-r value indicates the degree of correlation between the variables. A higher positive coefficient suggests a stronger relationship between collaborative learning and critical thinking skills. The p-value is used to test the level of significance of the results. These statistical measures collectively support the interpretation of the study's findings.

The Table 12 shows the Significant Relationship between the Collaborative Learning Approach and the Junior High School Students' Critical Thinking Skills in Science. The data presented helped explain the connection between classroom practices and students' critical thinking development. It also determines whether the observed relationship is statistically meaningful. Furthermore, it provides insight into how collaborative strategies may be associated with the enhancement of students' thinking skills. This supports the idea that collaborative learning can positively influence academic performance in Science.

Table 12 presents the test of significant relationship between the collaborative learning approach and Junior High School students' critical thinking skills in science across four domains. Using Pearson Product–Moment Correlation with 252 respondents, the analysis determined whether collaborative learning practices are significantly associated with students demonstrated critical thinking skills.

The results reveal that not all dimensions of collaborative learning show statistically significant relationships with critical thinking skills. Shared responsibility exhibits significant positive relationships with analysis, evaluation, and reasoning and decision-making, while peer support is significantly associated with analysis. Task cooperation demonstrates significant correlations with analysis and

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reasoning and decision-making, and decision-making shows significant relationships with analysis, evaluation, and inference, all at $p < 0.05$. On the other hand, group interaction did not show significant relationships with any domain of critical thinking at $p > 0.05$. These findings imply that when students are held accountable, supported by peers, guided in cooperative tasks, and involved in decision-making, they tend to exhibit higher levels of analytical, evaluative, inferential, and reasoning skills.

Table 12. Significant Relationship Between the Collaborative Learning Approach and the Junior High School Students' Critical Thinking Skills in Science

Collaborative Learning Approach		Junior High School Students' Critical Thinking Skills in Science			
		Analysis	Evaluation	Inference	Reasoning and Decision-Making
Group Interaction	Pearson Correlation	0.013	0.070	0.018	0.026
	Sig. (2-tailed)	0.833	0.268	0.776	0.678
	N	252	252	252	252
Shared Responsibility	Pearson Correlation	0.133*	0.132*	0.092	0.173*
	Sig. (2-tailed)	0.035	0.036	0.147	0.006
	N	252	252	252	252
Peer Support	Pearson Correlation	0.165*	0.017	0.005	0.035
	Sig. (2-tailed)	0.009	0.784	0.941	0.579
	N	252	252	252	252
Task Cooperation	Pearson Correlation	0.136*	0.074	0.022	0.133*
	Sig. (2-tailed)	0.031	0.244	0.725	0.035
	N	252	252	252	252
Decision Making	Pearson Correlation	0.141*	0.129*	0.148*	0.063
	Sig. (2-tailed)	0.026	0.040	0.019	0.318
	N	252	252	252	252

The findings indicate that collaborative learning operates selectively as a reinforcing system where specific dimensions shared responsibility, peer support, task cooperation, and decision making contribute meaningfully to developing students' critical thinking skills. While not all aspects of collaborative learning are equally influential, structured implementation of these key dimensions can enhance students' higher-order thinking, problem-solving, and decision-making abilities in science, thereby supporting more effective and engaged learning outcomes. This shows the importance of guiding students properly during group activities. It also highlights the need for teachers to focus on key practices that improve thinking skills. These results show that effective collaboration can lead to better learning outcomes in science.

Significant Effect between the Collaborative Learning Approach on the Junior High School Students' Performance in Science

In this study, the level of the of Collaborative Learning Approach refers to Group Interaction; Shared Responsibility; Peer Support, Task Cooperation; and Decision Making. Meanwhile, the Junior High School Students' Performance refers to Monthly Examination (First Monthly and Second Monthly) and Quarterly Examination. These variables were used to measure students' participation and academic performance in science. Each component provided data on how students performed in both regular and major assessments. This framework allowed a more systematic evaluation of both instructional practices and learning outcomes. The integration of these variables also ensured that a comprehensive analysis different dimensions of student performance.

The Significant Effect between the Collaborative Learning on the Junior High School Students' Performance in Science is revealed in the following table, which shows the Multiple Regression Analysis using t-Test, with the computed t-value (t-cal), p-value, number of observations or respondents, and critical t-value (t-crit) or constant. These statistical results were used to determine if collaborative learning had a direct effect on students' performance.

The Table 13 shows the Significant Effect between the Collaborative Learning Approach on the Junior High School Students' Performance in Science. The results helped explain how different collaborative learning practices affected students' test scores. Furthermore, it provides a clearer understanding of how collaborative learning influences students' academic performance in science.

Table 13. Significant Effect between the Collaborative Learning Approach on the Junior High School Students' Performance in Science

Collaborative Learning Approach		Junior High School Students' Performance		
		Monthly Examination		Quarterly Examination
		First Monthly	Second Monthly	Quarterly Examination
Group Interaction	t-value	1.183	-0.344	-0.101
	Sig. (2-tailed)	0.238	0.731	0.920
	N	252	252	252
Shared Responsibility	t-value	0.799	-2.082*	-0.208
	Sig. (2-tailed)	0.425	0.038	0.835
	N	252	252	252
Peer Support	t-value	-0.605	-0.850	-0.024
	Sig. (2-tailed)	0.546	0.396	0.981
	N	252	252	252
Task Cooperation	t-value	0.328	-0.302	-0.073
	Sig. (2-tailed)	0.743	0.763	0.942
	N	252	252	252
Decision Making	t-value	0.394	1.131	1.131
	Sig. (2-tailed)	0.694	0.259	0.259
	N	252	252	252

Table 13 presents the test of significant effect between the collaborative learning approach and Junior High School students' performance in science across three assessment periods: first monthly examination, second monthly examination, and quarterly examination. This quantitative analysis strengthens the interpretation of instructional effectiveness in science education. Using a t-test with 252

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respondents, the analysis determined whether collaborative learning practices significantly affect students' performance in science.

The results reveal that most dimensions of collaborative learning group interaction, peer support, task cooperation, and decision making do not show a statistically significant effect on students' performance in the monthly and quarterly examinations. The exception is shared responsibility, which exhibits a significant negative effect on the second monthly examination ($t = -2.082$, $p = 0.038$). This indicates that when roles and accountability within group tasks are not optimally managed, students' performance may be adversely affected. Overall, while collaborative learning practices are valuable for engagement and critical thinking, their direct impact on measurable examination performance appears limited and may depend on how well responsibility and accountability are structured within the learning environment.

The findings indicates that collaborative learning operates more effectively as a mechanism for promoting higher-order thinking and engagement rather than consistently enhancing exam performance. This highlights the need for instructional refinement in implementing group-based learning strategies. Educators should focus on optimizing shared responsibility and clear task allocation to maximize potential benefits for student achievement, while continuing to leverage collaboration to foster critical thinking and cooperative learning skills. In doing so, collaborative learning can serve as a transformative approach that not only enriches academic outcomes but also cultivates lifelong skills essential for personal and professional growth.

IV. Conclusion and Recommendations

Collaborative learning demonstrates a significant relationship with students' critical thinking skills. The findings reveal that key components of collaborative learning—such as shared responsibility, peer support, task cooperation, and decision-making—are significantly associated with various dimensions of critical thinking, including analysis, evaluation, inference, and reasoning. This indicates that structured collaborative practices promote deeper cognitive engagement and enhance higher-order thinking skills. However, group interaction alone does not significantly contribute, suggesting that interaction must be purposeful and cognitively demanding. Based on these findings, the hypothesis regarding the relationship between collaborative learning and critical thinking is rejected.

Collaborative learning does not significantly influence students' academic performance in science. However, its impact varies depending on classroom implementation. Despite students demonstrating overall outstanding academic performance, the results show no consistent significant effect of collaborative learning on examination outcomes. This indicates that academic performance may be influenced by other factors such as prior knowledge, instructional alignment, or assessment design. Notably, the negative effect observed in shared responsibility highlights the potential drawbacks of poorly structured group work, particularly when accountability mechanisms are lacking. Therefore, the hypothesis on the effect of collaborative learning on academic performance is accepted.

Based on the drawn conclusions resulted to the following recommendations:

School administrators may provide professional development programs that prepare teachers with effective strategies in implementing collaborative learning, including classroom management, facilitation techniques, and assessment alignment. They should also support policies that promote active, student-centered learning environments. By fostering a culture of continuous improvement, administrators empower teachers to refine their practices and adapt to diverse student needs. Such initiatives not only enhance instructional quality but also cultivate classrooms where collaboration and engagement thrive as essential components of learning.

Teachers may adopt structured collaborative learning strategies by clearly defining roles, responsibilities, and expected outputs to ensure meaningful participation and enhance students' critical thinking skills. Instructional activities should promote higher-order thinking skills such as analysis, evaluation, inference, and reasoning. Teachers are also encouraged to align collaborative activities with assessment methods by incorporating performance-based and process-oriented evaluations, while continuously monitoring group dynamics to ensure equitable participation. By integrating reflective practices, educators can help students assess both individual contributions and collective outcomes, reinforcing accountability and shared responsibility. Such approaches not only deepen subject mastery but also cultivate transferable skills essential for lifelong learning and professional collaboration.

Students may actively participate in collaborative tasks by taking responsibility for their roles and contributing meaningfully to group objectives. They should develop communication, cooperation, and accountability to ensure equal participation and achieve shared goals. Through these practices, learners cultivate critical thinking and problem-solving skills that extend beyond the classroom. Such engagement also nurtures confidence and resilience, preparing students to collaborate effectively in academic and real-world contexts.

Future researchers may to investigate additional variables that may influence academic performance, such as motivation, prior knowledge, learning styles, and assessment methods. Further studies may also explore the long-term effects of collaborative learning through longitudinal designs and use larger, more diverse samples. Additionally, future research may examine hybrid instructional approaches that combine collaborative learning with other strategies to determine their effects on academic performance. Exploring these dimensions can provide a more comprehensive understanding of how collaborative learning interacts with individual and contextual factors. Such investigations may also yield insights into best practices for tailoring instructional approaches to diverse learner populations. Ultimately, these studies can contribute to evidence-based policies that strengthen both teaching effectiveness and student achievement across educational settings.

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