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THE INFLUENCE OF GROUP DISCUSSION ON STUDENTS' LEARNING OUTCOMES IN INTEGRATED SCIENCE IN PUBLIC JUNIOR SCHOOLS (JS) IN BOMET CENTRAL, KENYA

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Abstract

Group discussion is a collaborative learning strategy in which students work together to enhance understanding, solve problems, and develop critical thinking skills. In line with the emphasis on learner-centered pedagogies under the Competency-Based Education (CBE) framework, this study adopted a mixed-methods research design to investigate the influence of group discussion on students' problem-solving skills in Integrated Science in public Junior Schools in Bomet Central Sub-County, Kenya. The study was conducted in 26 public Junior Schools and involved 30 Integrated Science teachers. Additionally, classroom observations were conducted in five schools, and focus group discussions (FGDs) were held with 40 Grade Nine learners selected from the participating schools. Data were collected using questionnaires, classroom observations, focus group discussions, and document analysis. The study found that group discussion positively influenced students' problem-solving skills, with 96.67% of teachers reporting observable improvement. These findings were further supported by classroom observations, focus group discussions, and document analysis, which confirmed that learners shared ideas, compared explanations, and generated solutions to scientific problems during group discussions. However, the effective implementation of group discussion was hindered by challenges, including inadequate teaching and learning resources, large class sizes, limited teacher facilitation, and unequal participation among learners. The findings suggest that group discussion, when supported by effective teacher guidance, enhances students' problem-solving skills, critical thinking, and understanding of Integrated Science concepts.

Keywords: *Group discussion, problem-solving skills, Integrated Science, Junior Secondary Schools, Competency-Based Education.*

Introduction

The overall importance of quality education lies in its transformative capacity to foster individual growth and social progress. Education is not only about content delivery but also a system designed to help learners reach their full potential (UNESCO, 2024). Thus, quality education is pedagogically and developmentally sound, enabling learners to become active and productive members of society. It is supported by three key pillars: qualified teachers, the use of quality teaching and learning resources and the establishment of safe, inclusive and supportive learning environments (UNESCO, 2024).

Because of todays' rapidly changing world, which demands knowledgeable and competitive skills at the international level, there is a growing need for a shift in teaching methods (Sikhakhane et al., 2020). Traditional teaching methods are increasingly viewed as inadequate for developing critical thinking, problem-solving and collaborative skills required in the twenty-first century because they are mainly teacher-centered and focus primarily on content delivery and syllabus coverage (Eskiyurt & Özkan, 2024). Consequently, education systems are increasingly adopting learner-centered instructional approaches that actively engage learners in the teaching and learning process.

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Science education plays a vital role in fostering curiosity, innovation, and technological advancement by enabling learners to understand the natural world and contribute to scientific and technological development (Royal Society of Chemistry, 2024). Integrated Science is one of the learning areas offered at the Junior School level under Kenya's Competency-Based Education (CBE) curriculum. It integrates concepts such as Biology, Chemistry, Physics, and Earth and Space Science to enable learners to develop scientific knowledge, inquiry skills, practical competencies and problem-solving abilities required in everyday life and future STEM learning (Kenya Institute of Curriculum Development (KICD), 2024). Furthermore, Integrated Science provides learners with the foundational knowledge, skills, values and attitudes required for progression into Science, Technology, Engineering and Mathematics (STEM) pathways at the Senior School level (KICD, 2024).

One learner-centered instructional approach that has gained considerable attention is group discussion. Group discussion is grounded in Vygotsky's (1978) Social Constructivist Theory, which posits that knowledge is acquired and constructed through social interaction, collaboration and shared experiences. According to this theory, learning occurs when learners actively interact with one another, exchange ideas and construct meaning through shared experiences. Consequently, group discussion provides learners with opportunities to develop critical thinking, communication, collaboration and problem-solving skills while enhancing their understanding of scientific concepts.

There is substantial global evidence supporting the use of group discussion as an effective learner-centered instructional strategy. For example, in Finland, students actively engage in group discussions and construct knowledge through social interaction, thereby fostering critical thinking, communication and collaboration. Similarly, in the United States of America (USA), group discussion is widely used as a teaching method in which students work together in small groups to achieve common learning goals by discussing and sharing ideas to deepen their understanding (Smith & MacGregor, 2022). Likewise, studies conducted in African countries have shown that peer-group activity-based learning improves students' academic achievement in Integrated Science compared with traditional teaching methods (Tokunbo et al., 2023).

Building on these global and regional experiences, Kenya has embraced learner-centered pedagogies through the Competency-Based Education (CBE) curriculum. The CBE curriculum emphasizes learner-centered approaches that foster critical thinking, creativity, collaboration, communication and problem-solving skills (Ministry of Education, 2020; CEMASTEA, 2021). Consequently, group discussion has become one of the recommended instructional approaches for enhancing learner participation and competency acquisition in classroom instruction.

Integrated Science is introduced at the Junior School (JS) level as one of the learning areas under the Competency-Based Education curriculum in Kenya. Since the CBE curriculum emphasizes the mastery of competencies and the practical application of knowledge, educators and other education stakeholders continue to promote learner-centered instructional approaches that actively engage learners in the learning process. Within this framework, group discussion enables learners to exchange ideas, solve problems collaboratively, apply scientific knowledge and deepen their understanding of scientific concepts.

Previous studies have shown that group discussion enhances academic achievement and promotes critical thinking, creativity, communication, collaboration and problem-solving skills among learners (Nguyen & Oanh, 2025; Agnaou & El Asri, 2025). Similarly, Johnson and Johnson (2018) noted that collaborative learning cultivates deeper understanding, improves knowledge retention, and enhances learners' academic performance. However, the effectiveness of group discussion depends on several factors, including teacher competence, instructional strategies, the availability of teaching and learning resources, and students' attitudes towards collaborative learning (Adl-Amini et al., 2024). These factors may influence the successful implementation of group discussion and its effectiveness in improving learners' problem-solving skills.

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Despite the documented benefits of group discussion, its implementation in schools remains inconsistent because of challenges such as limited teaching and learning resources, large class sizes, unequal learner participation, teacher competence, and instructional practices. These challenges may reduce the effectiveness of group discussion in promoting learners' problem-solving skills and meaningful learning.

Although previous studies have reported the positive influence of group discussion on students' academic achievement, critical thinking, creativity, communication, collaboration and problem-solving skills, few studies have specifically examined its influence on learners' problem-solving skills in Integrated Science within public Junior Schools in Bomet Central Sub-County, Kenya. Furthermore, little is known about the contextual factors that influence the effective implementation of group discussion in Integrated Science classrooms within the study area. This lack of context-specific empirical evidence creates a knowledge gap that warrants further investigation.

Therefore, this study examined the influence of group discussion on students' problem-solving skills in Integrated Science in public Junior Schools in Bomet Central Sub-County, Kenya. The findings of this study are expected to provide empirical evidence that may inform teachers, curriculum developers, policymakers, and other education stakeholders on the effective implementation of group discussion in Integrated Science classrooms under the CBE curriculum.

Materials and Methods

This study employed a descriptive mixed-method approach, with concurrent triangulation in order to describe, interpret and explain the current status and influence of group discussion on students' problem-solving skills in Integrated Science. The descriptive component was used to systematically collect quantitative and qualitative data that captured existing practices of group discussion and the extent to which it was being used in the classroom.

The overall research process followed in this study is summarized in Figure 1. The figure illustrates the sequence of the research activities, beginning with the identification of the research problem and selection of the mixed-methods research design, followed by sampling procedures, data collection, pilot testing, data analysis, methodological triangulation, and the generation of the study findings and recommendations.

Quantitative data were collected through structured questionnaires administered to 30 Integrated Science teachers across the 26 sampled schools, focusing on patterns, trends and teachers' perceptions of group discussion. Qualitative data were obtained through classroom observations conducted in selected classes, Focus Group Discussions involving 40 Grade Nine learners and document analysis in order to provide real classroom situations, understand how group discussion was implemented and identify challenges experienced during its implementation. This approach enabled a comprehensive understanding of both statistical trends and rich qualitative evidence regarding the influence of group discussion on students' problem-solving skills.

The sample consisted of 26 public junior schools from Bomet Central Sub-County, representing approximately 30% of all public junior schools in the sub-county. The schools were selected using purposive zonal sampling, after which simple random sampling was used to select schools within each zone to ensure balanced representation. A census approach was then used to include all 30 Integrated Science teachers in the selected schools. The teacher sample represented 32.6% of the total population of Integrated Science teachers in the sub-county and exceeded the minimum sample size recommended by Mugenda and Mugenda's (2003) for descriptive studies. The census approach ensured that all eligible teacher perspectives within the sampled schools were captured, thereby minimizing sampling error and enhancing the adequacy and reliability of the quantitative findings.

For the qualitative data, five schools, one from each educational zone, were purposively selected to provide rich and contextual information about the implementation of group discussion. One Integrated Science teacher participated in classroom observation in each selected school, while one Grade Nine Integrated Science lesson was observed per school. Focus Group Discussions involved eight purposively selected learners from each school, resulting in a total of 40 learners.

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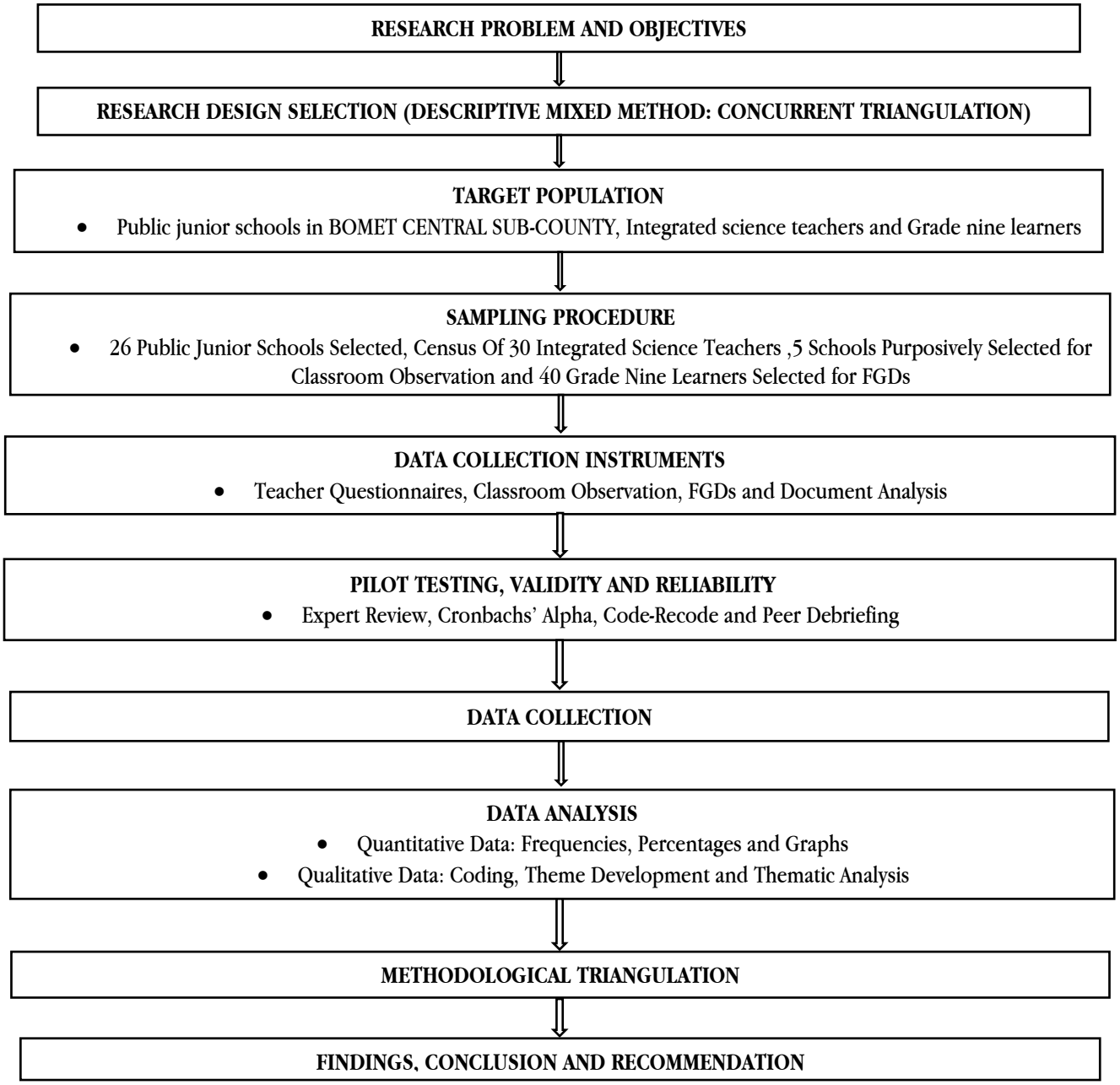
Figure 1

Research process flow diagram



Data collection employed four instruments: teacher questionnaires, structured classroom observations, Focus Group Discussions and document analysis. Teacher questionnaires were used to obtain standardized quantitative data on teachers' experiences and perceptions regarding group discussion. Structured classroom observations were used to collect real-time information on classroom interactions and learners' problem-solving behaviors during Integrated Science lessons. Focus Group Discussions provided learners' experiences and perceptions regarding the use of group discussion in solving scientific problems, while document analysis examined lesson plans, schemes of work, group activities and assessment records to establish how group discussion was planned, implemented and reflected in learners' outcomes.

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All the instruments were piloted to test their clarity, reliability and effectiveness. Content validity was established through expert review to assess the relevance and clarity of the instruments. Reliability of the quantitative questionnaire was determined using Cronbach's alpha, which yielded a coefficient of 0.80, indicating acceptable internal consistency. Since the qualitative data were coded by a single researcher, formal inter-coder reliability was not applicable. Instead, trustworthiness was enhanced through a code-recode procedure and peer debriefing. During the code-recode procedure, the researcher coded the qualitative data and later re-coded the same data to determine coding consistency. Peer debriefing with the research supervisor and a colleague was used to review the coding process and interpretation of emerging themes, thereby strengthening the trustworthiness and credibility of the qualitative findings.

Quantitative data were analyzed using descriptive statistics, including frequencies, percentages and graphs to summarize teachers' experiences, perceptions and challenges related to group discussion and to examine patterns in the use of group discussion and students' problem-solving skills across selected variables. Qualitative data obtained through classroom observations, Focus Group Discussions and document analysis were analyzed thematically following Braun and Clarke's (2006) framework. The analysis involved familiarization with the data through repeated reading of field notes and discussion records, generation of initial codes, organization of related codes into themes, review and refinement of the themes, and reporting of the findings. Methodological triangulation was then employed to compare findings from the questionnaires, classroom observations, Focus Group Discussions and document analysis, thereby enhancing the credibility and validity of the study.

Data confidentiality was ensured through anonymity. Teachers were identified using codes such as Teacher 1, schools were identified as School 1, and learners were identified as Learner 1. Participation was voluntary, all data were stored securely, and the information was used solely for academic research purposes. The study complied with the Kenya Data Protection Act and adhered to the ethical guidelines of Rongo University.

Results and Discussion

Quantitative Results

The study sought to determine the influence of group discussion on students' problem-solving skills in Integrated Science in public junior schools in Bomet Central Sub-County. Quantitative data were obtained from 30 Integrated Science teachers using a structured questionnaire and analyzed using descriptive statistics. The findings are presented in Table 1.

Table 1

Teachers' perceptions of the influence of group discussion on students' problem-solving skills in Integrated Science (n = 30)

	Very often /strongly agree		Often/agree		Sometimes/ disagree		Never/strongly disagree	
	f	%	f	%	f	%	f	%
How often do you notice improvements in your students' problem-solving skills after group activities	14	46.67	15	50.00	1	3.33	0	0.00
Group discussion improves my students problem solving skills in integrated Science class	12	40.00	18	60.00	0	0.00	0	0.00
Enhances my students creativity	7	23.33	23	76.67	0	0.00	0	0.00
Enables my students to effectively find solutions to integrated science problems	11	36.67	16	53.33	3	10.00	0	0.00
Does not improve my students critical thinking	0	0.00	0	0.00	4	13.33	26	86.67

f=frequency %=percentage

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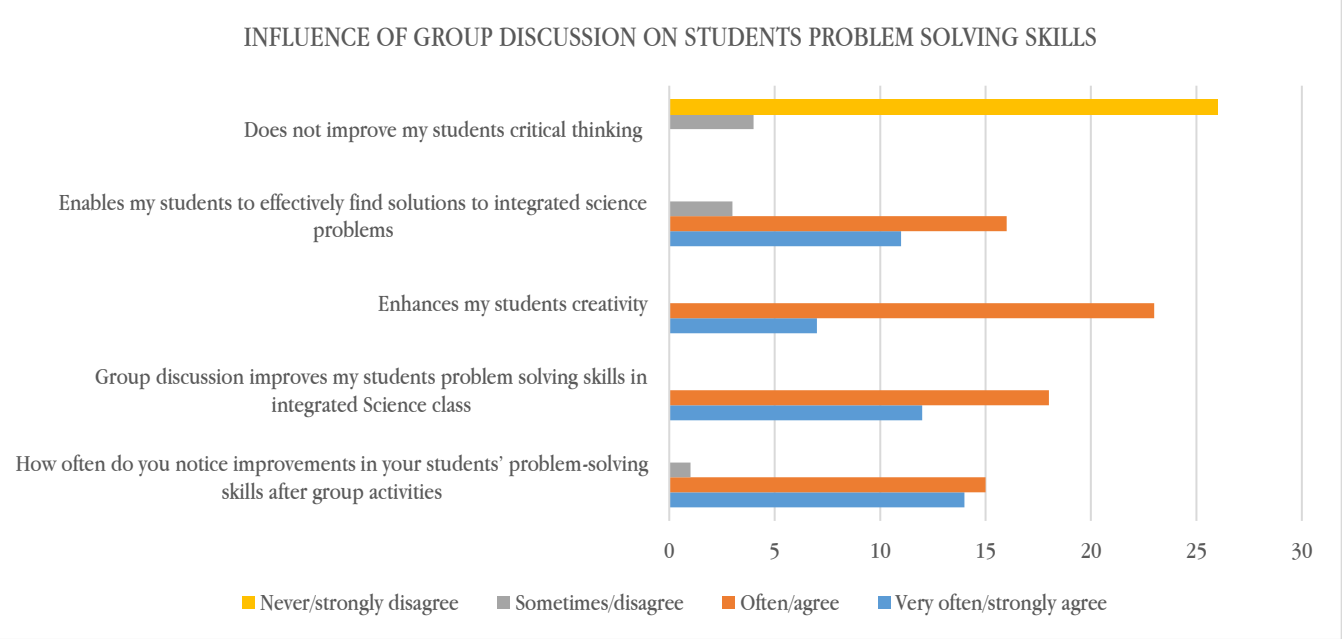

Table 1 and bar graph shows that teachers generally perceived group discussion as having a positive influence on students' problem-solving skills in Integrated Science. Most teachers (96.67%) reported that they often or very often observed improvements in students' problem-solving skills following group activities, while only one teacher (3.33%) reported observing such improvements only sometimes.

All teachers (100%) agreed that group discussion improves students' problem-solving skills in Integrated Science. Similarly, all teachers agreed that group discussion enhances students' creativity, with 76.67% agreeing and 23.33% strongly agreeing. Regarding students' ability to find solutions to Integrated Science problems, 90.00% of the teachers agreed or strongly agreed that group discussion enhances this ability, while 10.00% indicated disagreement.

Teachers also expressed positive perceptions regarding the contribution of group discussion to higher-order thinking. A majority (86.67%) strongly disagreed with the statement that group discussion does not improve students' critical thinking, while the remaining 13.33% disagreed. None of the respondents agreed with the negative statement, indicating a consistent perception that group discussion supports students' critical thinking.

Overall, the quantitative findings indicate that teachers perceived group discussion as an effective instructional strategy for promoting students' problem-solving skills through enhanced creativity, critical thinking and the ability to generate appropriate solutions to scientific problems.

Qualitative Results

Qualitative data were collected through classroom observations, Focus Group Discussions (FGDs) and document analysis to provide a deeper understanding of how group discussion influenced students' problem-solving skills in Integrated Science. The analysis generated four themes: task identification, idea generation and analytical skills, application of scientific knowledge, and teacher facilitation.

Task Identification

The findings showed that group discussion enhanced learners' ability to identify and understand scientific tasks before attempting to solve them. Classroom observations indicated that learners in all five schools worked collaboratively to read, interpret and clarify tasks before discussing possible solutions. Schools 1 and 3 demonstrated high levels of task identification, with learners actively engaging in discussions and seeking clarification from peers. School 4 showed moderate performance, as learners occasionally required

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additional guidance from the teacher before beginning the task.

Document analysis supported these findings. Lesson plans and schemes of work in Schools 1 and 3 contained well-structured group discussion activities with guiding questions, while Schools 2, 4 and 5 included group discussion activities but with less detailed guidance. Assessment records also indicated gradual improvements in learners' participation and understanding following collaborative learning activities.

The Focus Group Discussions further confirmed these findings. Learners reported that group discussions enabled them to understand scientific tasks more clearly before attempting solutions. One learner explained, "We can ask questions from peers," While another stated, "Those who understand explain in simple terms." These responses indicate that peer interaction supported learners in clarifying scientific tasks and promoted a shared understanding of learning activities.

Idea Generation and Analytical Skills

The findings revealed that group discussion encouraged learners to generate different ideas when solving scientific problems. Classroom observations showed that learners actively shared opinions, suggested alternative solutions and built on one another's ideas during discussions. Schools 2, 3 and 5 demonstrated high learner participation during brainstorming activities, whereas School 4 showed comparatively lower participation due to unequal learner involvement.

Although learners generated a variety of ideas, observations also revealed that analyzing and evaluating those ideas often required teacher guidance. Some learners were able to propose different solutions but experienced difficulty selecting the most appropriate scientific explanation without support from the teacher.

The FGDs supported these observations. Learners explained that discussing ideas with peers helped them think more broadly about scientific problems. One learner stated, "We think together," while another explained that group discussions helped learners "expand ideas." However, several learners also reported that some members dominated discussions or remained silent, limiting equal participation within groups.

Application of Scientific Knowledge

The findings indicated that group discussion enhanced learners' ability to apply scientific knowledge when solving Integrated Science problems, although the level of application varied across schools. Classroom observations showed stronger application of scientific concepts in Schools 2, 3 and 5, where learners confidently related classroom concepts to the assigned tasks. Schools 1 and 4 demonstrated moderate application, with some learners requiring additional teacher support to apply scientific principles correctly.

Document analysis provided similar evidence. Assessment reports from School 3 showed noticeable improvements in learners' performance on problem-solving tasks, while Schools 1, 2 and 5 reported gradual improvements in learners' reasoning and participation. School 4 recorded only slight improvements, reflecting the less structured implementation of group discussion activities.

Learners also attributed improved understanding to peer interaction. One learner explained, "Yes, I understand better through discussion," while another reported, "Those who understand explain in simple terms." These responses suggest that collaborative discussion enabled learners to connect scientific concepts with classroom tasks and strengthened their application of knowledge.

Teacher Facilitation

Teacher facilitation emerged as an important aspect influencing the effectiveness of group discussion. Classroom observations showed that teachers who assigned learner roles, monitored group activities and guided classroom discussions promoted greater learner participation and engagement. Schools 1 and 3 demonstrated stronger teacher facilitation, where teachers actively moved between groups, asked probing questions and encouraged learner participation. In contrast, School 4 demonstrated comparatively limited teacher guidance, resulting in lower learner participation and reduced analytical discussion.

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Document analysis further showed that schools with well-developed lesson plans and clearly structured collaborative activities demonstrated more consistent implementation of group discussion than schools where lesson plans contained only brief references to group work.

The FGDs also highlighted the importance of teacher support. Learners suggested that group discussions would be more effective if teachers allocated more time for discussion, provided sufficient learning materials and assigned clear responsibilities to each group member. Across all five schools, learners consistently indicated that teacher guidance improved their confidence, participation and understanding during group discussions.

Discussion

The findings of this study demonstrate that group discussion positively influences students' problem-solving skills in Integrated Science. Both the quantitative and qualitative findings consistently showed that group discussion enhances learners' ability to identify scientific tasks, generate ideas, apply scientific knowledge and develop higher-order thinking skills. These findings support the emphasis of the Competency-Based Education (CBE) curriculum on learner-centred instructional approaches that promote active participation and collaborative learning.

The quantitative findings showed that almost all teachers perceived group discussion as an effective strategy for improving students' problem-solving skills. Teachers reported that learners demonstrated improved creativity, critical thinking and the ability to generate appropriate solutions to scientific problems after participating in group discussions. These findings suggest that collaborative learning provides learners with opportunities to exchange ideas, justify their reasoning and collectively solve scientific problems. Similar findings were reported by Siregar and Tambusai (2025), who found that group discussion enhances learners' ability to identify problems, generate alternative solutions and evaluate possible solutions. Likewise, Xu, Wang and Wang (2023) reported that collaborative problem-solving promotes critical thinking by encouraging learners to evaluate different perspectives before reaching a conclusion.

The qualitative findings further explained how group discussion contributes to problem-solving. Learners first worked together to identify and understand the assigned scientific tasks before attempting to solve them. Classroom observations and document analysis showed that schools with well-planned collaborative activities provided learners with greater opportunities to clarify scientific problems through discussion. This suggests that group discussion creates an environment where learners actively construct knowledge through interaction with their peers, thereby strengthening their understanding of scientific concepts before attempting solutions. These findings are consistent with the social constructivist perspective, which emphasizes that learning occurs through interaction and shared experiences.

The study also found that group discussion promoted idea generation by encouraging learners to share opinions, suggest alternative solutions and build on one another's ideas. However, the findings also showed that although learners generated multiple ideas, effective analysis and evaluation often required teacher guidance. This implies that group discussion alone may not be sufficient for developing higher-order problem-solving skills unless teachers actively facilitate the learning process. Similar findings were reported by Mugabekazi et al. (2025), who observed that learners develop higher-order thinking skills more effectively when teachers provide appropriate guidance during collaborative learning activities.

Another important finding was that group discussion enhanced learners' application of scientific knowledge. Learners reported that explaining concepts to one another improved their understanding and enabled them to apply scientific concepts more effectively when solving classroom problems. Document analysis also demonstrated gradual improvements in learners' performance and participation following collaborative learning activities. These findings agree with Andama and Muwanga (2024), who concluded that collaborative discussion strengthens learners' ability to apply knowledge through collective reasoning and shared problem-solving experiences.

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Teacher facilitation emerged as a critical factor influencing the effectiveness of group discussion. Schools where teachers assigned learner roles, monitored discussions and provided guidance demonstrated stronger learner participation and better problem-solving outcomes than schools with limited teacher support. These findings suggest that the effectiveness of group discussion depends not only on learners working together but also on the teacher's ability to organize, facilitate and guide collaborative learning. This finding reinforces the Competency-Based Education approach, where teachers act as facilitators who support learners in constructing knowledge rather than simply transmitting information.

Overall, the findings demonstrate that group discussion is an effective learner-centered instructional strategy for improving students' problem-solving skills in Integrated Science. These findings reinforce the importance of collaborative learning within the Competency-Based Education framework, particularly when supported by effective teacher facilitation and adequate instructional resources.

Conclusion and Recommendation

This study investigated the influence of group discussion on students' problem-solving skills in Integrated Science in public Junior Schools in Bomet Central Sub-County. The findings demonstrated that group discussion positively influenced students' problem-solving skills by enhancing task identification, idea generation, critical thinking, creativity and the application of scientific knowledge. The integration of quantitative and qualitative findings further established that learners benefit from collaborative interaction, where they share ideas, justify their reasoning and work collectively to solve scientific problems. However, the study also found that the effectiveness of group discussion largely depends on effective teacher facilitation through clear instructions, role assignment and continuous guidance during discussions. In addition, inadequate teaching and learning resources, large class sizes and unequal learner participation limit the effective implementation of group discussion. Overall, the findings support the use of group discussion as an effective learner-centered instructional strategy for promoting problem-solving skills within the Competency-Based Education (CBE) framework

Based on the findings of this study, the following recommendations are proposed to strengthen the implementation of group discussion in Integrated Science:

Teacher Professional Development: The Ministry of Education, teacher training institutions and school administrators should organize regular subject-specific professional development programs to equip Integrated Science teachers with practical skills for planning, facilitating and assessing group discussions. This recommendation is based on the finding that effective teacher facilitation was central to the successful development of learners' problem-solving skills.

Classroom Practice: Integrated Science teachers should incorporate group discussion more consistently into classroom instruction by providing clear task instructions, assigning learner roles such as leader, recorder and presenter, and designing collaborative activities that require learners to analyse, reason and solve scientific problems. This recommendation addresses the finding that structured teacher guidance enhances learners' participation and problem-solving abilities.

Provision of Teaching and Learning Resources: Schools and education stakeholders should ensure the availability of adequate instructional resources, including science textbooks, charts, laboratory equipment and other learning materials, to support meaningful group discussions. This recommendation responds to the finding that inadequate teaching and learning resources limit the effective implementation of collaborative learning.

Future Research: Future studies should investigate the long-term influence of group discussion on other Competency-Based Education learning outcomes, such as creativity, communication, collaboration and scientific inquiry skills, across different learning areas and educational contexts.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain information that could compromise the privacy and confidentiality of the research participants.

Credit authorship contribution statement

Chepngetich: Conceptualization, data collection, data analysis, original draft preparation and manuscript revision. **Omoso:** Supervision, manuscript review and editing. **Namunga:** critiquing and proofreading

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