

Importance of Cooperative Learning Strategies in Improving Science Learning: A Case Study in a Maldivian School

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ABSTRACT

This study explores the importance of cooperative learning strategies in enhancing science education in the Maldives. It aims to identify the common cooperative approaches used by science teachers, determine key factors necessary to maintain the quality of implementation, and explore the impact of these strategies on students' academic achievement and behavior. Additionally, the study explores the challenges teachers encounter when applying cooperative learning methods in their classrooms. A qualitative research design was employed. Using purposive sampling, 10 science teachers were selected and interviewed through a semi-structured interview guide. Data were analyzed using qualitative content analysis procedures to identify recurring themes and categories. The findings revealed five main categories: commonly used cooperative learning strategies, frequency of implementation, effects on students' academic performance, impact on students' social development, and challenges faced by teachers during implementation. Cooperative learning was perceived to positively influence both academic outcomes and social skills, though practical constraints limited consistent application. The study was confined to one school and a small sample of teachers. Future research should involve a larger participant group, incorporate students' perspectives, and utilize multiple data collection methods to enhance validity and generalizability.

Keywords: Cooperative Learning, Science Education, Student-Centered Pedagogy, Academic Achievement

1. Introduction

Effective teaching requires more than the transmission of information. It involves designing learning experiences that promote deep understanding, long-term retention, and the ability to apply knowledge in real-life contexts. Educational research emphasizes the shift from teacher-centered instruction toward learner-centered pedagogies that actively engage students in constructing knowledge (Hattie & Zierer, 2024). Among such approaches, cooperative learning has received sustained attention as an evidence-based instructional strategy that enhances both cognitive and social outcomes.

Cooperative learning refers to structured instructional methods in which students work together in small groups to achieve shared academic goals while being individually accountable for their contributions (W. Johnson & T. Johnson, 2019). Recent meta-analyses and systematic reviews confirm that cooperative learning has a positive impact on academic achievement across subject areas,

including science, by promoting higher-order thinking, conceptual understanding, and retention (Gillies, 2016; Kaymak et al., 2021). Beyond academic gains, cooperative learning has been shown to improve students' communication skills, self-efficacy, motivation, and social relationships (Mendo-Lázaro et al., 2022; Slavin, 2014). These findings highlight cooperative learning as a pedagogical approach aligned with 21st-century competencies such as collaboration, critical thinking, and problem-solving.

Science education, in particular, benefits from interactive and inquiry-based approaches. The nature of science as a discipline requiring experimentation, reasoning, and collaborative problem-solving, makes it well suited to cooperative learning structures. Empirical studies conducted in secondary science classrooms indicate that strategies such as Jigsaw, think-pair-share, and group investigations significantly improve students' conceptual mastery and engagement compared to traditional lecture-based instruction (Gillies, 2016; Kaymak et al., 2021).

Despite strong international evidence supporting cooperative learning, many education systems continue to rely heavily on teacher-centered practices. In the Maldivian context, earlier research noted the long-standing dominance of traditional "chalk-and-talk" instruction, which limited students' conceptual understanding and critical thinking skills (Nazeer, 2006). In response to global educational reforms, the Maldives introduced the National Curriculum Framework (NCF), which emphasizes learner-centered pedagogy and holistic student development under the vision that "Every child is prepared for life" (National Institute of Education, 2016). The NCF encourages instructional approaches that foster independence, collaboration, and real-world application of knowledge.

While policy documents advocate for student-centered strategies, there remains limited empirical research examining how cooperative learning is implemented in Maldivian classrooms, particularly in science education. Existing international studies provide strong evidence of the effectiveness of cooperative learning; however, contextual factors such as class size, examination pressures (e.g., IGCSE preparation), time constraints, and cultural norms may influence its application in the Maldives. Recent literature underscores the importance of contextualized research to understand how pedagogical innovations function within specific socio-cultural and institutional settings (Gillies, 2016; Mendo-Lázaro et al., 2022).

Therefore, a clear research gap exists regarding the practical implementation, perceived effectiveness, and challenges of cooperative learning strategies in Maldivian secondary science classrooms. Understanding teachers' perspectives is particularly important, as they play a central role in translating curriculum policy into classroom practice. Exploring their experiences can provide valuable insights into which cooperative learning strategies are most frequently used, how these strategies influence students' academic and social development, and what barriers hinder effective implementation.

This study aims to address this gap by understanding the importance of cooperative learning strategies in improving science learning in a Maldivian secondary school. Specifically, the research explores commonly used cooperative strategies, their perceived impact on students' academic achievement and social behavior, and the challenges teachers encounter in implementation. By situating the findings within both global empirical evidence and the local educational reform context, this study contributes to the limited body of literature on student-centered pedagogy in the Maldives.

The significance of this study lies in its potential to inform teacher professional development, curriculum implementation, and future educational research. Insights from this study may support policymakers and school leaders in strengthening cooperative learning practices aligned with national curriculum goals, ultimately enhancing science learning outcomes for Maldivian students.

1.1 Research Questions

1. What are the most used cooperative learning strategies in teaching science?
2. How does cooperative learning affect students' academic learning and social behaviour?
3. How important is the use of cooperative learning strategies in improving science learning?
4. What challenges do teachers face in implementing cooperative learning strategies?

2. Literature Review

2.1 Basic elements of cooperative learning

There are 5 cooperative learning skills or principles developed from social interdependence theory (W. Johnson & T. Johnson, 2019). To incorporate cooperative learning successfully in a lesson, there are 5 skills that should be included (Jeppu et al., 2023). The goal of these skills is to make cooperative learning success and make individual students ready to complete the tasks alone. The first skill is positive interdependence. Positive interdependence means "swim together or sink together." Each student in the group has two tasks. Firstly, to understand the learning material and second is to make sure other team members are also aware of it. For positive interdependence to successfully occur students should realize they need each other's help to finish the work and help each other (Gillies, 2016). Therefore, they should develop a sense that if one student fails to understand the learning material, it can affect the whole group's outcome. To ensure that all the students participate in the work teacher can assign roles to different students in the group.

The second component is face to face interaction. When students work together in a group, they interact, discuss, and do verbal interchanges hence face-to-face interaction (Loh & Ang, 2020). This is linked to previous principle (positive interdependence) as both skills requires students to communicate and exchange their ideas. While working students provide constructive feedback to each other which helps them to improve their learning. Hence peer learning takes place.

The third principle is individual accountability as each student in the group has a role and a contribution to make (Quines & Quines, 2023). This is achieved when each student's work is seen and when they are being assessed. To achieve individual accountability, teacher need to make sure that positive interdependence takes place. According to Vygotsky social learning theory, students develop their own Zone of Proximal Development (ZPD) to improve their learning. Hence, once the group work is done, student must remember and repeat the task to achieve individual accountability.

The next component is behavioral or social skill. To achieve this skill, students built interpersonal relationship by communicating and solving problems. This allows students to develop trust for each other (Wattanawongwan et al., 2021). Thus, the productivity and success of this approach depend mainly on social and communication skills. The last principal is group processing. This is where students reflect and analyze how much and to what extent they have learned in the class (Millis & Rhem, 2023). Students discuss and provide feedback for each other so they can improve in the future. Group processing can be between the students in the same group or between whole groups in the classroom.

2.2 Importance of cooperative learning for students

Cooperative learning has been shown to significantly enhance students' academic performance. A meta-analysis revealed that cooperative learning models have a moderate positive effect on learning outcomes across various domains (Öztürk, 2023). Group activities such as presentations and structured feedback sessions improve students' understanding and ability to apply knowledge (Yang & Qian, 2018). Recent research further confirms that cooperative learning has a positive impact on students' engagement and achievement across educational contexts (Arshed et al., 2023).

One of the most significant contributions of cooperative learning lies in the development of students' social skills. Cooperative learning strategies boost students' motivation by creating a more engaging and interactive learning environment. This approach encourages active participation and fosters a sense of responsibility among students (Sulfiani et al., 2024; Thi Thu Ha, 2024). In heterogeneous groups, academically stronger students support lower-achieving peers, fostering peer tutoring and enhancing self-confidence among all members. By working in groups, students develop essential social skills such as communication, cooperation, and conflict resolution. These skills are crucial for personal and professional success (Chen, 2022; Yang & Qian, 2018). In science classrooms, where laboratory work and group investigations are common, strong social cohesion enables students to coordinate effectively, complete experiments efficiently, and assist one another during practical activities.

Beyond social benefits, cooperative learning also makes students more responsible allowing their personal growth. Students involved in cooperative learning often report higher self-confidence due to the supportive nature of group work and the opportunity to contribute meaningfully to the group's success (Harianingsih & Jusoh, 2022). The absence of direct interpersonal competition within cooperative structures further enhances learners' sense of belonging and emotional security. Research indicates that cooperative settings can lower anxiety levels while increasing learners' self-confidence and intrinsic motivation (Yassin et al., 2018). As students gain confidence in discussing and defending their ideas, they become more willing to participate actively in classroom discourse. Academically, cooperative learning has demonstrated strong positive effects on student achievement and on-task behavior. By engaging students in structured interaction, educators can simultaneously enhance academic performance and collaborative competencies. Recent findings show that cooperative learning increases students' time on task, thereby improving overall academic outcomes (Salami & Spangenberg, 2024).

3. Methodology

3.1 Research design

This study employed a qualitative research design to explore science teachers' perceptions and experiences of implementing cooperative learning strategies in a Maldivian secondary school. A qualitative approach was appropriate because the research sought to understand subjective meanings, classroom practices, and contextual challenges that cannot be quantified through numerical measures. Recent methodological literature emphasizes that qualitative inquiry is particularly suitable for examining complex educational phenomena within real-life contexts and for capturing participants' lived experiences (Braun & Clarke, 2021; Kyngäs, 2019). Given that the study aimed to explore teachers' perspectives on instructional strategies, student behavior, and academic progress, an interpretive qualitative framework enabled in-depth exploration of these issues within their natural setting.

3.2 Sampling

The study was conducted in one secondary school located in the Greater Malé region of the Maldives. Purposive sampling was used to select participants who met predefined criteria: science teachers with a minimum of three years of teaching experience. Ten teachers participated in the study. Purposive sampling is widely used in qualitative research to ensure that information-rich participants are selected based on their relevance to the research objectives (Campbell et al., 2020). This approach enabled the researcher to gather detailed insights from educators who had sufficient classroom experience with cooperative learning practices. The selected participants were considered well-positioned to provide meaningful reflections aligned with the study's focus.

3.3 Data collection method

Data were collected through semi-structured, in-depth interviews. Semi-structured interviews allow flexibility while ensuring that key research questions are addressed, making them suitable for educational research that explores perceptions and practices (Kallio et al., 2016). An interview guide was developed based on the research objectives and reviewed by subject experts to enhance clarity and relevance. While core questions were asked consistently across participants, probing and follow-up questions were used to elicit deeper explanations and clarify responses. This format facilitated rich, detailed accounts of teachers' experiences with cooperative learning implementation.

3.4 Data analysis

All interviews were audio-recorded with participants' consent and transcribed verbatim. Data were analyzed using inductive qualitative content analysis, a systematic method for identifying patterns, themes, and categories directly from textual data (Kyngäs, 2020). The analysis followed established steps outlined in recent qualitative research guidelines (Kleinheksel et al., 2020).

First, the researcher familiarized with the data by repeatedly reading the transcripts. Significant statements related to the research questions were highlighted and coded. Coding involved assigning descriptive labels to meaningful units of text. Similar codes were then grouped into subcategories, which were further refined into broader thematic categories. Throughout the process, codes were reviewed, revised, and merged where necessary to ensure coherence and alignment with the research focus.

To enhance credibility, member checking was conducted by sharing transcribed data and preliminary themes with participants for verification. This process ensured that interpretations accurately reflected participants' intended meanings.

Ethical considerations were strictly maintained. After obtaining ethics clearance from Ministry of Education, permission from the selected school also was taken before reaching the participants. Participants were provided informed consent prior to the interviews and were assured of confidentiality and anonymity. No identifying information was included in the reporting of findings

Trustworthiness was ensured through strategies aligned with contemporary qualitative research standards (Braun & Clarke, 2021; Nowell et al., 2017). Credibility was enhanced through member checking and peer review of the interview guide. Dependability was supported by maintaining a clear audit trail of coding decisions and analytical steps. Confirmability was addressed through systematic documentation of data analysis procedures, while transferability was strengthened by providing detailed contextual descriptions of the research setting. These measures collectively enhanced the rigor and reliability of the study.

4. Findings

This chapter includes findings of the study. By qualitative content analysis, there were five main categories identified. They are common cooperative learning strategies used by teachers, frequency of implementation of cooperative learning, effects on student academic results, effect on student's social development and challenges teachers face while implementing cooperative learning strategies. Each of these categories are further divided into themes which is explained below with teacher's dialogue. To make the findings more accurate and realistic, narrative form was used to present the dialogues from the interviews.

4.1 Common cooperative learning strategies used by teachers

From the participants few teachers were able to give specific names for the strategies they use. During the interview process, it was noticed that most of them knows that cooperative learning is nothing but students working or doing assigned tasks in groups. However, they are not familiar with the strategies of cooperative learning.

4.1.1 Jigsaw

Three teachers talked about having home groups and expert groups but only of them said "jigsaw" which is the name given for that strategy. Although they are not very much aware of the names of the strategies, through interview it was found that they know how jigsaw works.

"... most commonly I used jigsaw and most effective one as well. The think-pair-share those things. These are two things, my favorite two things. That is most common ones I use. I know many but practically I don't implement except these two" (Teacher 5)

"Home groups, expert groups are there in cooperative learning." (Teacher 4)

4.1.2 Group works

As mentioned above, many teachers said group works as a strategy. This includes poster making, making power point presentations and group projects. Since cooperative learning is about students working in groups, teachers tend to believe all the activities students do in groups would fit in cooperative learning strategies.

"... group activities like power point presentation for example. So, we will give a topic and I will divide students into groups so they will work together. Give them some poster making, some kind of group activities." (Teacher 2)

"Pair work, the group work and then brain storming." (Teacher 1)

"Giving a task to students and give a role for each student. There is equal contribute to the class work." said by teacher when asked about familiar group activities." (Teacher 3)

4.2 Frequency of implementation of cooperative learning strategies

For different teachers the number of times they use cooperative learning differs. These are the results when asked how often they implement cooperative learning strategies in class.

4.2.1 To introduce a new topic

Teachers usually do something different when they start a new topic. This is mostly to check their prior knowledge which will help teacher to plan the lesson further. In addition, to see if students have any misconception regarding the lesson. As cooperative learning is completely students centered, it is thoughtful to use cooperative learning if students are clear about what they are learning.

"Aah, science lessons whenever I introduce a new concept, the very ones I am sure the misconceptions are clear then I go for it. So, every topic like new topic at least twice I practice it." (Teacher 5)

4.2.2 To provide mass information

Another situation where teachers use cooperative learning is when they want to deliver lot of information to students. In science subjects, there is a lot to learn from the content. Certain topics and their applications can be related to us which makes the topic good for discussion through cooperative learning.

"... cooperative learning as I said before requires aah, it requires lot of information in that. I mean if we want to convey lot of information, only that is my aspect of using cooperative learning in class. Not each and every topic but certain topics like human influences, biotechnology, genetic engineering. Those are the topics that I usually use." (Teacher 7)

4.3 Effect on students' academic results

These are the responses got from teachers when asked whether cooperative learning helps to improve students' academic result.

4.3.1 Mixed ability groups

Findings show cooperative learning includes lot of peer teaching in the classroom. Teachers have highlighted it is an advantage to have mixed ability students in the same groups as they can help other group members. In addition, teachers give importance to include different ability students in one group to promote peer teaching which helps to achieve skills of cooperative learning.

"Yes. Sometimes when we group them, we used to group them in aah mixed ability level. So low learners, slow learners will learn from their peers. So, it helps a lot." (Teacher 1)

"Yes, it does because different students are at different intellectual level so aah the low learners also can learn from the other students." (Teacher 3)

"Yes, because aah the slow learners can get help from gifted students." (Teacher 4)

"... usually when I group them, I group them based on different abilities. So, I have seen that students help the low ability ones, the good ones. Capable students they are always ready to help. So, no one is left out in the class. That's something which I really like about cooperative learning." told teacher 5 when asked how students respond to cooperative learning.

4.3.2 Doing and learning

It is important for teachers to plan students centered lessons where they can get involved and do hands on tasks. It can help students to store information in their long-term memory.

"Definitely, definitely. Because they are doing. If we simply teach then they will forget. If they are doing and learning they will remember the things." (Teacher 2)

4.4 Effect on student's social development

Apart from academic improvement, teachers have talked about influence of cooperative learning on the development of their social behaviors. These are some of the significant statements from interview when asked if using cooperative learning bring noticeable changes to student's social behavior.

"...not only to academic but to their personal development also it is influencing." (Teacher 7)

4.4.1 Sharing of knowledge

When students are grouped, they no longer work alone. As a team students share their knowledge and finish the task. One of the main aspects of cooperative learning is for students to realize they need each other's help to complete the task.

"Yes, yes. They will learn sharing things and sharing ideas...then how to behave in a group that's very important. So, those kinds of things will improve." (Teacher 2)

4.4.2 Build confidence

These are the most common responses received from the participants. Teachers have observed their students become more confident and socialized when they practice cooperative learning style in classroom.

"Yes, students will get confidence" (Teacher 4)

"Sometimes quite students also aah they use to talk in small groups. But when you ask questions directly to the particular student, they feel shy. So, I think it is better to conduct cooperative learning in classroom." (Teacher 1)

Teacher 7 has given a similar response as teacher 1:

"Yes, because there are students who feel shy who does not have confident talking in front of people. If we give small community discussions like for example in cooperative learning first, they will be discussing among their groups so in the mall groups they will be discussing skills and they will learn the content so they will get developed confident on talk in front of class as well." (Teacher 7)

Teacher 7 further added:

"Step by step they will be developing their interpersonal skills, communication skills at the same time socialization also."

Teacher 6 has also talked about socializing:

"...this can help with lot of socializing." (Teacher 6)

Cooperative learning is said to be catering different types of learners in the class. Hence, students feel more accepted and get involved actively in the lesson. One of the teachers shared her experience where she managed to successfully handle a very hyper active class.

"One class I handled few years ago, like many of them are boys so many teachers have difficulties in maintaining the class, teaching them. But then for me it is very easy because everyone know they are involved; they are accepted in class and they learn everyday something new..." (Teacher 5)

4.5 Challenges in implementing cooperative learning

Clearly there were challenges for all the teacher during the implementation of cooperative learning strategies. According to this study, time management was most concerned challenge for teachers followed by syllabus.

4.5.1 Lack of time

Cooperative learning requires lot of time starting from preparation to execution. Within 35 minutes of single period, teachers face difficulty in managing time with these strategies. Even if they start an activity, they might not be able to finish it within single period.

"Sometimes when we give group activity aah it takes some time to arrange and form the groups..." (Teacher 1)

"...then time management. Because it is a time-consuming process..." (Teacher 2)

"... it takes time also. In biology I get single period and it takes time actually. We need time for preparation, we need time for discussion and presentation also..." (Teacher 7)

"...so, with these 35 minutes we can't do anything. The thing is can be done in extra, like some extra classes where those classes can be adjusted by this cooperative learning strategies." (Teacher 6)

In relation with lack of time, teacher 2 has mentioned about syllabus. According to the response, because they have to stick with the syllabus, they are unable to embed cooperative learning activities in the lesson.

"Especially in grade 10 we have to finish the syllabus and we mainly prepare students for the exam." (Teacher 2)

4.5.2 Difficulty in accepting each other

Not all the students are very welcoming and some students prefer to do individual learning even in classroom. For these students, cooperative learning can be a bit difficult to adapt.

"... there are certain kids who do not mingle with others. May be because of their background that can be language problem even." (Teacher 6). These students feel difficulty in being in the groups, hence a challenge for the teacher to implement.

“Every class at the beginning it is challenging because students they may not like the other one coming to their group. That is the biggest challenge actually. Students accepting the other one...” (Teacher 5)

Table 1 Summarization of findings of this study

Categories	Themes
Common CL strategies used by teachers	<ul style="list-style-type: none"> ✓ Jigsaw ✓ Group works
Frequency of implementation of CL strategies	<ul style="list-style-type: none"> ✓ To introduce a new topic ✓ To provide mass information
Effect on student’s academic result	<ul style="list-style-type: none"> ✓ Mixed ability groups ✓ Doing and learning
Effect on student’s social development	<ul style="list-style-type: none"> ✓ Sharing of knowledge ✓ Build confidence
Challenges in implementing CL	<ul style="list-style-type: none"> ✓ Lack of time ✓ Difficulty in accepting each other

5. Discussion

5.1 Jigsaw and structured cooperative learning in Maldivian science classrooms

This study found that the Jigsaw technique is commonly used by science teachers and when well-facilitated it promotes student responsibility, peer teaching, and improved communication. Recent empirical evaluations similarly report Jigsaw’s effectiveness for conceptual learning and learner accountability across contexts, supporting our participants’ perceptions that carefully structured Jigsaw activities increase engagement and content retention (Al-Kreimeen, 2024).

However, several participants equated any group activity with cooperative learning. Recent CL studies emphasizes that mere grouping is insufficient, effective cooperative lessons must be intentionally designed to include positive interdependence, individual accountability, promotive face-to-face interaction, explicit interpersonal skills instruction, and group processing. When tasks (e.g., poster tasks on plant vs. animal cells) allocate complementary roles and include post-task reflection, they are more likely to generate the positive interdependence and individual accountability described by teachers in this study and in the CL literature.

In the Maldives, national curriculum priorities stress competency-based and learner-centered approaches, embedding structured cooperative elements therefore aligns with policy goals to develop communication and collaboration skills across grades. Practical implementation will require teachers to translate curriculum intent into classroom task design that deliberately integrates the five CL elements rather than relying on unstructured group work (Neena Ali et al., 2022).

5.2 Academic outcomes, hands-on tasks, and mixed-ability grouping

Teachers reported improved academic understanding when students worked collaboratively, particularly in hands-on and discussion-rich activities. Recent systematic reviews and experimental studies of science education show consistent benefits of hands-on and cooperative approaches on conceptual understanding, retention, and performance, effects that are relevant for Maldivian secondary science where experimental and procedural understanding is essential (Tindan & Anaba, 2024).

Mixed-ability grouping was a common practice, teachers perceived higher-performing students as supporting peers' learning. Studies suggest heterogeneous groups often generate higher socio-cognitive interaction and question-asking, which can accelerate learning for lower-attaining pupils while deepening understanding for higher-attaining ones, provided tasks are scaffolded to ensure meaningful contribution by all group members. Thus, pairing hands-on tasks with role assignment and individual accountability (e.g., expert reporting in Jigsaw) helps mitigate "free-riding" and strengthens learning gains (An & Zhang, 2024).

5.3 Social development, confidence, and inclusion

Teachers reported gains in social skills and self-confidence, especially among quieter students who gradually contributed more within structured groups. Recent empirical studies affirm that CL can raise student engagement, self-esteem, and willingness to speak in class, important outcomes for small-island classrooms like those in the Maldives, which often include linguistic and socio-cultural diversity. Cooperative tasks that include explicit teaching of communication and leadership skills and regular group processing foster inclusivity and reduce social barriers (Yilmaz et al., 2024).

5.4 Barriers: time, curriculum pressures, student preferences

Teachers consistently identified time constraints and heavy syllabus demands, notably at Key Stage 3 and 4, in IGCSE preparation as major obstacles to implementing extended cooperative lessons within 35-minute periods. These pressures push teachers toward teacher-led, exam-focused methods, reducing space for collaborative inquiry unless scheduling or curricular priorities are adjusted. In addition, some students resist group work due to language barriers, social preferences, or established friendship cliques, such resistance highlights the need for explicit social-skills instruction and careful grouping strategies. National analyses and sector reviews document how pandemic measures and the shift to remote learning disrupted hands-on activities and reduced opportunities for social learning, while technological inequalities and variable parental support limited the effectiveness of online cooperative tasks. These systemic constraints help explain the uneven use of CL reported by teachers (Sattar et al., 2022).

6. Implications and Conclusion

This study explored the importance of cooperative learning strategies in improving science learning within a Maldivian secondary school. The findings demonstrate that structured approaches such as the Jigsaw technique and mixed-ability grouping positively influence both academic achievement and students' social development. Cooperative learning promoted deeper conceptual understanding, active engagement, improved communication skills, and enhanced self-confidence among learners. These outcomes highlight the value of cooperative learning as an effective pedagogical approach for science education in the Maldives, particularly when aligned with the core principles of positive interdependence, individual accountability, face-to-face interaction, interpersonal skills, and group processing.

However, consistent implementation remains constrained by limited instructional time, heavy syllabus requirements, examination pressures, and post-pandemic classroom adjustments. Addressing these challenges requires targeted professional development that moves beyond general group work and explicitly models the essential elements of cooperative learning. In-service training should be contextualized to local curriculum demands, particularly science practical work and IGCSE preparation, to ensure classroom applicability. Curriculum developers and school leaders may also consider more flexible timetable structures, identifying opportunities such as starter activities, laboratory sessions, and revision lessons where cooperative strategies can be effectively integrated without compromising syllabus coverage.

To support mixed-ability and reluctant learners, teachers should incorporate structured scaffolds such as role cards, accountability rubrics, and explicit instruction in interpersonal skills. Overall, strengthening institutional support and teacher capacity will be critical to maximizing the impact of cooperative learning in Maldivian science classrooms. Future research should expand to multiple schools and include students' perspectives to further examine the academic and social outcomes of cooperative learning across diverse contexts in the Maldives.

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