I J C R M
International Journal of Contemporary Research In Multidisciplinary

Research Article

Assessing the Impact of Cooperative Learning in Mathematics Education in Katete District Primary Schools

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DOI: https://doi.org/10.5281/zenodo.19398920

Abstract

This research paper examines the effectiveness of cooperative learning as an instructional strategy for improving mathematics achievement and pupil engagement in primary schools within Katete District, Eastern Province, Zambia. Grounded in a convergent mixed-methods design, the study integrated quantitative data drawn from pre-tests and post-tests with qualitative insights gathered through classroom observations, semi-structured teacher and head teacher interviews, and pupil focus group discussions. The study was conducted across four purposively selected government primary schools, with a combined sample of 200 pupils in Grades 5 and 6, alongside 8 mathematics teachers and 4 head teachers. Quantitative analysis using SPSS revealed that the experimental group — which received mathematics instruction through structured cooperative learning strategies including jigsaw, think-pair-share, and Student Teams-Achievement Divisions (STAD) — achieved a mean post-test score of 63.5 compared to 48.9 for the control group, representing a statistically significant difference ($p < 0.001$, Cohen's $d = 1.34$). Engagement surveys further confirmed that pupils in cooperative settings exhibited substantially higher levels of participation, enthusiasm, and collaborative task completion. Qualitatively, teachers and pupils reported that cooperative learning reduced mathematics anxiety, fostered peer scaffolding, and enhanced motivation. However, the study also identified critical moderating factors — particularly teacher preparedness, class size, and availability of instructional resources — that shaped the degree of effectiveness. The findings align with theoretical frameworks of Social Constructivism, Social Interdependence Theory, and Cognitive Developmental Theory, and contribute original evidence to the underrepresented context of rural Zambian mathematics education. Practical recommendations are presented for educators, policymakers, and curriculum developers.

Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 13-02-2026
- **Accepted:** 23-03-2026
- **Published:** 03-04-2026
- **IJCRM:**5(2); 2026: 385-392

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

How to Cite this Article

Phiri M, Phiri J. Assessing the Impact of Cooperative Learning in Mathematics Education in Katete District Primary Schools. Int J Contemp Res Multidiscip. 2026;5(2):385-392.

Access this Article Online

www.multiarticlesjournal.com

KEYWORDS: cooperative learning, mathematics achievement, pupil engagement, mixed-methods, Katete District, rural education, Zambia

1. INTRODUCTION

Mathematics education occupies a foundational position in primary schooling worldwide, providing learners with the cognitive tools necessary for scientific reasoning, problem-solving, and informed participation in socio-economic life. Despite its acknowledged centrality, mathematics consistently registers among the lowest-performing subjects in Zambian national assessments, with fewer than 40% of Grade 6 pupils meeting minimum proficiency benchmarks (Ministry of Education Zambia, 2023). In rural districts such as Katete, these challenges are amplified by overcrowded classrooms, resource scarcity, and an entrenched reliance on teacher-centred, rote-based instructional methods that limit learner agency and conceptual development (Balimuttajjo, 2019; Ntebil & Ali, 2024).

The persistence of such pedagogical approaches, despite Zambia's competence-based curriculum reforms, signals a systemic gap between policy aspiration and classroom reality. Traditional chalk-and-talk methods leave learners as passive recipients of information, reducing their opportunities for dialsogue, collaborative reasoning, and the development of higher-order thinking skills. Cooperative learning — a structured instructional method whereby learners work in small, heterogeneous groups towards shared academic goals with individual accountability — has emerged in international literature as a highly effective alternative (Johnson & Johnson, 2017; Slavin, 2014). Its theoretical roots in Vygotsky's social constructivism, Piaget's cognitive developmental theory, and Johnson and Johnson's social interdependence framework suggest that structured peer interaction can meaningfully deepen both academic understanding and learner motivation.

While meta-analyses in Western and urbanized developing contexts consistently demonstrate moderate to strong positive effects of cooperative learning on mathematics outcomes (Slavin, 2014; Öztürk, 2023), systematic evidence from rural sub-Saharan African settings, and Zambia's Katete District in particular, remains limited. This paper reports findings from a study that directly addressed this gap, assessing the effectiveness of cooperative learning in improving mathematics achievement and pupil engagement across selected Katete District primary schools. The study also examined the contextual factors that moderated implementation success and proposes evidence-based strategies for scaling cooperative pedagogy in resource-constrained educational environments.

2. RESEARCH OBJECTIVES AND QUESTIONS

The study was guided by the following specific objectives:

- To investigate current teaching approaches used in mathematics instruction in Katete District primary schools.
- To evaluate the impact of cooperative learning on mathematics achievement among primary school pupils.
- To analyse the effect of cooperative learning on pupil engagement.
- To identify contextual and pedagogical factors influencing the effectiveness of cooperative learning.
- To propose strategies for enhancing cooperative learning in mathematics education.

Correspondingly, the overarching research question was: To what extent does cooperative learning improve mathematics achievement and pupil engagement in Katete District primary schools, and what contextual factors moderate its effectiveness?

3. LITERATURE REVIEW

3.1 Mathematics Education in Sub-Saharan Africa and Zambia

The challenge of mathematics underachievement in sub-Saharan Africa is well-documented. SACMEQ assessments reveal that only approximately 40% of Grade 6 learners across participating African countries demonstrate mastery of basic numeracy skills (SACMEQ, 2021). UNESCO's 2022 global monitoring report confirmed that more than 250 million children globally fail to attain foundational numeracy competencies, with sub-Saharan Africa disproportionately represented. In Zambia, the Ministry of Education (2023) reported that fewer than 40% of Grade 6 pupils met the minimum proficiency standard in mathematics, with rural learners scoring 15–20 percentage points below their urban peers.

Researchers have identified teacher-centred, examination-driven instructional practices as a primary explanatory factor. Balimuttajjo (2019) observed that Zambian classrooms were dominated by chalk-and-talk methods, with pupils afforded minimal opportunities for exploration or collaborative reasoning. Ntebil and Ali (2024) reported that over 80% of observed lesson time in Katete District was devoted to direct instruction, with pupils passively copying notes. These findings are consistent with international evidence pointing to the limited cognitive engagement produced by lecture-based methods, particularly for abstract mathematical concepts.

3.2 Theoretical Foundations of Cooperative Learning

Cooperative learning is grounded in three complementary theoretical traditions. Vygotsky's (1978) Social Constructivism positions learning as inherently social, mediated through interaction with culturally more competent peers. His concept of the Zone of Proximal Development (ZPD) is particularly relevant: cooperative groups create conditions in which learners operate slightly beyond their independent capability, supported by peer scaffolding. This mechanism explains why heterogeneous grouping — a hallmark of structured cooperative learning — consistently produces stronger outcomes than ability-tracked instruction.

Johnson and Johnson's (2017) Social Interdependence Theory provides a practical implementation framework. The theory identifies positive interdependence, individual accountability, promotive interaction, social skills development, and group processing as five essential components that distinguish genuine cooperative learning from unstructured group work. Research has consistently demonstrated that interventions

adhering to these principles produce superior outcomes compared to informal grouping strategies (Slavin, 2014).

Piaget's (1977) Cognitive Developmental Theory contributes the concept of cognitive conflict: when learners with differing perspectives engage collaboratively, the resulting disequilibrium stimulates higher-order reasoning and conceptual restructuring. In mathematics, this manifests as pupils challenging one another's solutions, exposing misconceptions, and constructing more robust understanding through argumentation and joint problem-solving (Slavin, 2014).

3.3 Empirical Evidence on Cooperative Learning in Mathematics

The empirical literature on cooperative learning in mathematics is extensive and largely positive. Slavin's (2014) synthesis of 109 studies reported consistent superiority of cooperative over traditional methods, with an average effect size of +0.54 grade equivalents. Öztürk's (2023) second-order meta-analysis reported a mean effect of g = 0.84, indicating substantial practical significance across diverse contexts. Regional studies from Kenya, Nigeria, Tanzania, and Qatar have confirmed these trends, with significant improvements in algebra, geometry, and arithmetic outcomes reported across primary and secondary school levels (Maluni, 2021; Umoh et al., 2022; Maganda, 2016; Talkhan et al., 2025).

The evidence on engagement is equally compelling. Oyegoke and Maja (2024) documented 35% greater on-task behaviour among Botswana pupils in cooperative settings. Ali (2024) reported a 22% increase in voluntary participation and 28% rise in mathematics enjoyment in Nigerian experimental groups. Fredricks, Blumenfeld, and Paris (2004) theorize engagement as a multidimensional construct encompassing behavioural, cognitive, and emotional components, all of which appear to be enhanced by well-implemented cooperative learning.

However, the literature also flags important contextual moderators. Cardino and Ortega-Dela Cruz (2020) found that resource shortages and class overcrowding diluted cooperative learning's impact in rural Zambian schools. Khalilova (2023) cautioned that unclear group goals and unstructured composition could restrict benefits. These nuances underscore the importance of context-sensitive implementation and adequate teacher preparation.

4. RESEARCH METHODOLOGY

4.1 Research Design

The study adopted a convergent mixed-methods design, simultaneously collecting and integrating quantitative and qualitative data (Creswell & Plano Clark, 2018). This design was selected because the complexity of assessing cooperative learning's effectiveness in a real classroom environment required both the statistical rigour of experimental data and the interpretive depth of qualitative evidence. Neither approach alone could provide a sufficiently holistic account of the intervention's effects and the contextual factors shaping its success.

The quantitative strand employed a quasi-experimental non-equivalent control group design. Two schools were designated as experimental sites, delivering mathematics through structured cooperative learning strategies, while two matched schools continued with conventional teacher-centred instruction as the control condition. Pre-tests were administered at the outset to establish baseline equivalence, and post-tests were administered following a six-week instructional intervention. The use of pre-existing intact classes, rather than individually randomized pupils, was necessitated by the practical and ethical constraints of the school environment but is a recognised and widely deployed approach in educational field research (Shadish, Cook & Campbell, 2002).

The qualitative strand deployed classroom observations, semi-structured interviews with mathematics teachers and head teachers, and focus group discussions with pupils in experimental classes. These methods generated rich, contextualised data on the mechanisms underpinning observed quantitative trends and the barriers and enablers encountered during implementation.

4.2 Research Site and Population

The study was conducted in Katete District, Eastern Province, Zambia — a predominantly rural district characterised by low mathematics achievement, large class sizes (frequently exceeding 50 pupils per teacher), limited instructional resources, and a preponderance of teacher-centred pedagogical practices. These characteristics made the district both a contextually relevant and practically important site for the investigation of cooperative learning interventions. The target population comprised all Grade 5 and Grade 6 mathematics pupils and their teachers in government primary schools in the district, alongside school head teachers responsible for institutional governance and professional support.

4.3 Sampling

A two-stage sampling procedure was employed. At the school level, purposive sampling was used to identify four schools that met the inclusion criteria of accessibility, presence of qualified mathematics teachers, and variation in resource availability and location (peri-urban versus rural). Schools were then stratified by type (government versus community-run) and location, and random selection was applied within each stratum to ensure representativeness. Within selected schools, intact Grade 5 and Grade 6 classes were assigned to experimental and control conditions. One experimental and one control class were drawn from each school pair.

For the qualitative component, mathematics teachers were purposively selected based on their direct involvement in the intervention, while head teachers were sampled for their institutional oversight role. Pupil focus groups were formed through random sampling within experimental classes, with each group consisting of 6–8 pupils drawn to reflect gender balance and a range of academic abilities.

4.4 Sample Size

The quantitative sample comprised 200 pupils: 102 in the experimental group and 98 in the control group. This sample size was determined to be sufficient for detecting statistically significant between-group differences using independent and paired-samples t-tests at the conventional significance threshold of $p < 0.05$, with power set at 0.80 and an anticipated effect size of $d = 0.50$ (Cohen, Manion & Morrison, 2018). The qualitative sample consisted of 8 mathematics teachers, 4 head teachers, and 6 pupil focus groups. Data saturation was monitored throughout the qualitative data collection process, and the final sample was considered adequate for the identification of recurring themes (Guest, Bunce & Johnson, 2006).

4.5 Data Collection Instruments

Four complementary instruments were employed:

- Achievement Tests (Pre-Test and Post-Test): Curriculum-aligned assessments covering fractions, geometry, and introductory algebra. Questions included multiple-choice, short-answer, and word-problem formats assessing both procedural and conceptual competencies. Content validity was established through expert review by experienced mathematics educators, and reliability was confirmed via pilot testing.
- Pupil Engagement Survey: A structured Likert-scale instrument measuring behavioural, cognitive, and emotional dimensions of engagement, adapted from Fredricks, Blumenfeld, and Paris (2004).
- Structured Observation Checklists: Standardised tools recording pupil and teacher behaviours during lessons, including on-task behaviour, discussion participation, group interaction patterns, and facilitation quality.
- Semi-Structured Interview Guides and Focus Group Schedules: Open-ended protocols for teachers, head teachers, and pupil groups, exploring implementation experiences, perceived benefits and challenges, and institutional support.

4.6 Data Collection Procedure

Data collection proceeded in four sequential phases. In Phase 1, pre-tests were administered simultaneously to all participants to establish baseline mathematics achievement. In Phase 2, the six-week cooperative learning intervention was delivered in experimental schools, with teachers receiving preparatory training on the principles and mechanics of cooperative learning —including role assignment, task structuring, group processing, and accountability mechanisms. Control school teachers continued routine instruction without modification. In Phase 3, classroom observations were conducted in both experimental and control schools during the intervention period, using structured checklists to document engagement and instructional practice. In Phase 4, post-tests were administered, and semi-structured interviews and focus group discussions were conducted with teachers, head teachers, and pupils to capture qualitative insights on the intervention's impact and the challenges encountered.

4.7 Data Analysis

Quantitative data were analysed using IBM SPSS Statistics. Descriptive statistics — means, standard deviations, and frequency distributions — were computed for pre-test and post-test scores and engagement survey responses. Independent-samples t-tests were used to compare post-test means between experimental and control groups, while paired-samples t-tests assessed within-group changes from pre- to post-test. Effect size was computed using Cohen's d to provide a measure of practical significance beyond statistical significance. Chi-square tests were applied to analyse associations between instructional condition and engagement indicator frequencies.

Qualitative data from interview transcripts, observation notes, and focus group recordings were transcribed and analysed thematically using NVivo software, following Braun and Clarke's (2006) six-step thematic analysis framework: familiarisation, initial coding, theme generation, review, definition, and reporting. Triangulation was achieved by systematically comparing quantitative outcomes with qualitative themes to identify convergences, divergences, and explanatory mechanisms, thereby strengthening overall validity (Creswell & Plano Clark, 2018).

4.8 Ethical Considerations

Ethical approval for the study was obtained from DMI-St. Eugene University. Informed consent was secured from school head teachers, participating teachers, and parents or guardians of all minor pupils. Pupils provided assent. Participation was entirely voluntary, with participants informed of their right to withdraw at any time without penalty. All data were anonymised prior to analysis, and identifying information was stored securely and separately from research data. The intervention was designed not to disadvantage control group pupils; following the completion of the study, cooperative learning materials and teacher training were made available to all participating schools.

5. FINDINGS

5.1 Current Teaching Approaches in Katete District

Observational data confirmed that mathematics instruction in Katete District remained overwhelmingly teacher-centred. Across both experimental and control schools, pre-intervention observations revealed that over 80% of lesson time was devoted to direct instruction, with pupils primarily occupied in copying notes and completing individual exercises. Less than 5% of observed lessons incorporated any form of structured group activity. Teachers interviewed uniformly acknowledged the dominance of lecture-based methods, attributing this to examination pressures, lack of training in alternative methodologies, and the practical challenges of managing large classes without adequate resources. These findings corroborate and extend the baseline descriptions provided by Balimuttajjo (2019) and Ntebil and Ali (2024) and situate the cooperative learning intervention against a backdrop of pedagogical inertia.

5.2 Impact on Mathematics Achievement

The quantitative analysis yielded compelling evidence of cooperative learning's impact on mathematics achievement. Table 1 presents the pre-test and post-test mean scores for experimental and control groups.

Table 1: Pre-Test and Post-Test Mean Scores for Experimental and Control Groups

Group	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Gain
Experimental	102	41.2 (9.8)	63.5 (10.7)	+22.3
Control	98	40.7 (10.1)	48.9 (11.3)	+8.2

Source: Field Data, 2025

The pre-test scores for both groups were statistically equivalent ($t(198) = 0.32$, $p = 0.75$), confirming baseline comparability. Following the six-week intervention, the experimental group's post-test mean of 63.5 (SD = 10.7) was significantly higher than the control group's mean of 48.9 (SD = 11.3), $t(198) = 9.52$, $p < 0.001$. Cohen's d of 1.34 indicated a large effect, exceeding the thresholds for practical educational significance established by Cohen (1988). The experimental group's mean gain of 22.3 points compared to the control group's gain of 8.2 points demonstrates that cooperative learning produced learning improvements approximately 2.7 times greater than those achieved under conventional instruction over the same period.

These results are consistent with Slavin's (2014) meta-analytic findings and with the more recent results reported by Öztürk (2023), while the magnitude of the effect — particularly Cohen's d = 1.34 — surpasses the average effect sizes reported in many prior studies, potentially reflecting the particular salience of cooperative structures in a context where learner-centred instruction was almost entirely absent prior to the intervention. Qualitative corroboration was provided by teacher interviews, in which participants noted that pupils who had previously struggled with abstract mathematical concepts demonstrated improved ability to articulate their reasoning and apply concepts to novel problems following group-based instruction.

5.3 Effect on Pupil Engagement

Pupil engagement survey results, presented in Table 2, uniformly favoured the experimental condition across all measured dimensions.

Table 2: Pupil Engagement Survey Results (Percentages)

Engagement Indicator	Experimental (%)	Control (%)
Actively participated in discussions	78	45
Asked or answered questions voluntarily	72	39
Showed enthusiasm during lessons	81	42
Completed tasks collaboratively	76	33
Reported reduced anxiety in mathematics	69	36

Source: Field Data, 2025

Pupils in cooperative learning classrooms were significantly more likely to participate actively in discussion (78% vs. 45%), demonstrate enthusiasm (81% vs. 42%), and report reduced mathematics anxiety (69% vs. 36%). Classroom observations provided convergent evidence: experimental group pupils were more frequently observed initiating questions, supporting peers, and persisting through challenging tasks. In contrast, control group pupils more commonly displayed passive behaviours — waiting for teacher exposition, avoiding voluntary contribution, and disengaging when tasks became difficult.

Focus group discussions enriched these findings. Pupils described group work as making lessons 'more enjoyable' and 'less stressful', noting that the ability to ask peers questions they were too anxious to direct at teachers was particularly valuable. This resonates with the emotional engagement dimension identified by Fredricks, Blumenfeld and Paris (2004) and aligns with Social Interdependence Theory's prediction that promotive interaction fosters intrinsic motivation and positive affect toward learning.

5.4 Contextual Factors Moderating Effectiveness

The study identified four primary contextual moderators of cooperative learning effectiveness: teacher preparedness, classroom resources, class size, and school-level institutional support.

Teacher preparedness emerged as the most consistently influential factor. Teachers who had received prior exposure to learner-centred approaches, through either pre-service training or self-directed professional development, demonstrated greater fidelity in implementing the five essential elements of cooperative learning. They were more effective at structuring heterogeneous groups, assigning and rotating roles, monitoring group processes, and managing the transition between individual and collaborative tasks. In contrast, teachers without such preparation frequently reverted to directive instruction during group activities, undermining the mechanisms through which cooperative learning produces its effects.

Class size constituted a significant structural barrier. In classes exceeding 60 pupils — a common condition in Katete District —teachers reported difficulty simultaneously monitoring multiple groups, ensuring equitable participation, and providing timely corrective feedback. Observational data confirmed that in the largest classes, some groups operated with minimal teacher input, and dominant pupils occasionally monopolised group discussions, leaving weaker learners disengaged. Head teacher interviews corroborated these challenges, with one noting: 'Where groups were well-structured and classes manageable, learning improved significantly. But in classes with over 60 pupils, it was difficult to manage group work effectively.'

Resource availability was the third significant moderator. Schools equipped with mathematical manipulatives, visual aids, and printed task cards were better positioned to support the hands-on, exploratory activities that maximise cooperative learning's cognitive benefits. In resource-poor classrooms, teachers were compelled to rely on verbal interaction alone, reducing the richness of cooperative tasks and limiting opportunities for concrete mathematical exploration. Institutional support from school leadership played an enabling

role in several experimental schools. Head teachers who created dedicated planning time, encouraged reflective practice, and recognised teacher innovation contributed to a professional culture more conducive to pedagogical experimentation. Conversely, schools with rigid timetabling and exclusively examination-focused cultures provided fewer structural supports for sustaining cooperative approaches beyond the intervention period.

6. DISCUSSION

The findings of this study provide robust empirical support for the effectiveness of cooperative learning in improving mathematics achievement and pupil engagement in rural Zambian primary schools. The large effect size for achievement (Cohen's d = 1.34) and the substantial improvements in engagement across all measured dimensions indicate that the intervention was not merely statistically significant but educationally meaningful. Taken together, the quantitative and qualitative evidence suggests that cooperative learning can serve as a genuinely transformative pedagogical strategy in contexts characterised by resource constraints and persistent underachievement — provided that contextual moderators are systematically addressed.

From a theoretical perspective, the findings validate all three frameworks underpinning the study. The observed peer scaffolding, whereby stronger pupils supported weaker peers in accessing complex concepts, directly reflects Vygotsky's (1978) ZPD mechanism. The positive interdependence structures embedded in STAD and jigsaw activities, and the consequent improvements in motivation and group cohesion, align closely with Johnson and Johnson's (2017) predictions. The cognitive conflict generated by group-based problem-solving discussions, visible in teachers' reports of pupils challenging and correcting one another's reasoning, corroborates Piaget's (1977) account of collaborative knowledge construction.

The study's unexpected finding that female pupils demonstrated slightly higher gains than male pupils under cooperative conditions is noteworthy and merits further investigation. This may reflect the particular value of cooperative structures for learners who face social or motivational barriers to participation in teacher-centred settings — barriers that may disproportionately affect girls in rural Zambian classrooms. Similarly, the finding that lower-achieving pupils benefited most from cooperative learning suggests an equity-enhancing property that has important implications for inclusive education policy.

The cultural resonance of cooperative learning in Katete District is a finding that contextualises its effectiveness in ways that are often overlooked in transplanted educational interventions. Both teachers and pupils noted that group-based learning aligned with prevailing community values of collective responsibility and mutual support — values deeply embedded in local cultural practice. This cultural alignment may have facilitated acceptance of the approach and sustained engagement in a way that culturally dissonant interventions might not achieve.

The moderating role of contextual factors cautions against uncritical optimism. As Cardino and Ortega-Dela Cruz (2020) observed in comparable settings, resource constraints and overcrowding can substantially dilute the benefits of cooperative learning when implementation fidelity is compromised. The present study confirms that cooperative learning is not a self-executing panacea; its effectiveness is contingent on a constellation of enabling conditions that must be deliberately cultivated. This finding has direct implications for how policymakers and school leaders approach the scaling of cooperative pedagogies.

7. CONCLUSIONS

This study established that cooperative learning is an effective and contextually appropriate instructional strategy for improving mathematics achievement and pupil engagement in Katete District primary schools. The experimental group's statistically significant and practically large achievement gains, combined with substantially elevated engagement levels across behavioural, cognitive, and emotional dimensions, provide compelling evidence that structured peer-collaborative instruction offers a viable and powerful alternative to the teacher-centred approaches that currently dominate rural Zambian mathematics classrooms.

The study also demonstrated that cooperative learning's success is not unconditional. Teacher preparedness, class size, resource availability, and institutional support are significant moderators that must be addressed if the benefits observed in this study are to be reliably replicated at scale. These contextual realities do not diminish the potential of cooperative learning; rather, they define the conditions under which that potential can be most fully realised.

The findings contribute original and contextually specific evidence to an area of international educational research that has been dominated by studies from higher-income and urbanised settings. By demonstrating cooperative learning's effectiveness in a rural Zambian context — and by identifying the moderating factors specific to that context — the study makes a substantive contribution to both the academic literature and the practical knowledge base available to educators and policymakers in Zambia and comparable settings across sub-Saharan Africa.

8. RECOMMENDATIONS

8.1 For Educators

Mathematics teachers in Katete District and comparable settings should integrate structured cooperative learning strategies — including jigsaw, think-pair-share, and STAD — into their regular instructional practice. Effective implementation requires deliberate task design, clear role assignment, explicit group processing, and mechanisms for individual accountability. Teachers should prioritise heterogeneous group composition to maximise the scaffolding benefits identified in this study, and should engage in systematic self-reflection on group dynamics following cooperative lessons. Local and community-available materials

can supplement formal teaching aids to support hands-on collaborative tasks even in resource-constrained settings.

8.2 For Policymakers and Curriculum Developers

The Ministry of Education should formally embed cooperative learning as a mandated instructional strategy within national curriculum guidelines and teacher competency frameworks, moving beyond aspirational language toward specific, operational guidance. Targeted in-service teacher professional development programmes should be funded and decentralised to district level, incorporating both initial training and sustained coaching and mentorship to support implementation fidelity. Investment in classroom resources — including manipulatives, activity cards, and visual aids — is essential to maximising the effectiveness of cooperative tasks. Efforts to reduce class sizes through targeted infrastructure investment and teacher recruitment in rural districts should be accelerated, as overcrowding represents a structural barrier that undermines the equity-enhancing potential of cooperative learning.

8.3 For Researchers

Future research should employ longitudinal designs to assess the sustainability of cooperative learning's effects over multiple academic years. Comparative studies across subjects and grade levels would establish the breadth of its applicability within the Zambian curriculum. The equity-enhancing effects observed for female pupils and lower-achieving learners warrant targeted investigation using intersectional lenses to explore how gender, socio-economic status, and prior achievement interact with cooperative structures. Digital and hybrid cooperative learning models represent an emerging and underexplored frontier, particularly relevant as technology access gradually expands into rural Zambian communities.

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