

Influence of Learner Interdependence in Cooperative Learning on Achievement in English Language Activities in Pre-Primary Schools in Tharaka-Nithi, Kenya

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Abstract

This study examined how learner interdependence practices in cooperative learning affect preschoolers' English language achievement in Tharaka-Nithi County, Kenya, focusing on shared goals, differentiated tasks, and sharing instructional materials. Persistent challenges in foundational English language skills and predominantly teacher-led instruction highlight the need for learner-centred approaches aligned with the Competency-Based Curriculum. Guided by Social Interdependence Theory and pragmatism, the study adopted a quasi-experimental non-equivalent control-group pre-test-post-test design. The sample comprised 462 PP2 learners, 38 teachers, and 24 headteachers from 24 public pre-primary schools selected through multistage cluster sampling. Data were collected using pre- and post-tests, observation checklists, questionnaires, and document analysis; reliability coefficients exceeded 0.70. The treatment group achieved a higher post-test mean score ($M = 52.58$, $SD = 4.64$) than the control group ($M = 39.92$, $SD = 5.16$), with a statistically significant difference ($t = 8.94$, $p < .001$) and a large effect (Cohen's $d \approx 2.58$). ANCOVA further revealed a significant group effect on English language achievement ($F = 183.951$, $p < .001$). The study concludes that structured learner interdependence through shared goals, task allocation, and resource sharing enhances preschoolers' English language achievement. It recommends integrating structured cooperative learning approaches into teacher training and pre-primary classroom instruction. This study provides empirical evidence to inform teaching practice, teacher preparation, and curriculum development.

Key terms: Achievement, cooperative learning, interdependence, social interdependence theory.

INTRODUCTION

This study examined the effect of learner interdependence practices in cooperative learning on preschoolers' English language achievement in Tharaka Nithi County, Kenya, focusing on shared goals, differentiated tasks, and sharing of instructional materials. Early English language development helps children participate and learn in formal schooling. However, many pre-primary learners struggle to develop key skills in listening, speaking, vocabulary, and emergent literacy, so instruction needs to offer meaningful opportunities for listening and speaking and provide frequent language use. The Competency Based Curriculum (CBC) in Kenya (Kenya Institute of Curriculum Development [KICD], 2024) emphasises active participation, communication, and collaboration in pre-primary education. However, incorporating group activities into the curriculum does not automatically mean it is effective cooperative learning. The problem focuses on whether classroom activities can foster learners' interdependence to work together to accomplish shared learning tasks, and whether this improves English language achievement.

Cooperative learning provides a framework for learners to work together to accomplish common learning tasks. However, it requires not only placing students in groups, but also positive interdependence among group members. Positive interdependence is a situation in which students see their success positively related to the success of others; that is, students' success is related to the success of others (S. Butera & Buchs, 2019). In this respect, learners must interact with each other, coordinate their actions, and contribute to common achievement in cooperative learning. In pre-primary education, this distinction matters because young children need opportunities for oral interaction, peer support, and active participation to acquire basic language skills.

Evidence links cooperative learning to language development, but it is not specific to pre-primary English learning. For instance, Al-Malki et al. (2022) concluded that the male EFL learners in Saudi Arabia had positive attitudes towards CL in terms of social interaction, accountability and academic learning. However, direct generalisation to pre-primary education is limited, as pre-primary learners were not the participants. Likewise, Tamimy et al. (2023) found

that teachers' knowledge, beliefs, and implementation practices were obstacles to implementing cooperative learning in EFL classrooms. Their results show that effective implementation matters more than mere prescription. In this regard, the literature shows that cooperative learning is a potentially useful approach, and its results depend on the quality and organisation of learner interaction.

Learner interdependence is key to cooperative learning, as it makes group membership meaningful. Positive interdependence occurs when students feel they must coordinate with others in the group to complete the activity successfully (Butera & Buchs, 2019). The present study defines learner interdependence in three terms: commitment to shared goals, unique contribution to the group's task, and sharing of instructional resources. These dimensions are similar yet distinct. Sharing goals leads to goal interdependence, sharing unique contributions leads to individual responsibility in a shared task, and sharing resources leads to resource interdependence. They create situations in which learners must coordinate and support each other to engage in learning activities and communicate.

When group members are committed to common goals, they share a purpose. During an English language activity, for instance, students can read together and identify pictures, sequence a story, listen and match words with objects or provide an oral response. Shared goals matter because they encourage learners to see successful task completion as a team effort rather than an individual effort in which the learner carries out a task with other people. This may provide opportunities for listening, speaking, coordinated participation, and peer assistance. Positive interdependence does not occur simply because a teacher assigns a joint task to a class. The activity should be designed to ensure that the learner(s) see the link between their contribution and the group's success. Given that cooperative learning is sometimes presented in ways that are not fully authentic (Tamimy et al., 2023), it is important to consider the intentionality of cooperative learning goal setting in early childhood classrooms.

The second dimension, unique contribution to the group's task, concerns each learner's role in a group

activity. Cooperation is effective only when all group members contribute meaningfully, without some learners being passive. In pre-primary English activities, individual children can take on tasks such as locating a specific picture, naming an object, ordering a story card, making a sound or word, answering a question, or reporting a section of the group's response. Individual accountability can emerge from these differentiated contributions, without losing dependence on the collective task. This aligns with Social Interdependence Theory, which suggests that individual contributions have meaning when they contribute to a group's achievement (Butera & Buchs, 2019). However, findings on older EFL learners do not prove that such task interdependence has the same impact on young learners; therefore, it needs to be studied in the context of young learners.

The third dimension, sharing instructional resources, relates to the degree to which learners rely on other learners to access, share, or combine materials they need to do a learning task. For pre-primary English activities, resources can include picture cards, story cards, objects, books, letter cards or other literacy resources. Resource interdependence may involve communicative and cooperative skills, as multiple students must use and share resources to complete the task successfully. Although not in pre-primary English education, Wong and Adesope (2024) present some evidence of how resource interdependence may impact collaborative learning. Their results thus support the idea that resource interdependence can be an influential mechanism and illustrate the lack of transfer of findings between age groups and learning contexts.

Overall, the empirical literature provides an incomplete picture but a consistent theoretical one. Structured opportunities for interaction, accountability and positive interdependence in cooperative learning typically yield positive social and academic results. The literature, however, also shows that results depend on implementation fidelity and how interdependence is structured (Al-Malki et al., 2022; Tamimy et al., 2023). Research on positive social interdependence has also shown its importance in other educational contexts for collaborative learning (Shimizu et al., 2022), and research on resource interdependence has revealed impacts on specific

learning outcomes (Wong & Adesope, 2024). These findings are informative but mainly relate to older learners and contexts outside early childhood education. So, they cannot describe learner interdependence in the context of pre-primary children learning basic English skills.

There is a further rationale for considering this issue in the context of Kenya. Studies in Kenyan pre-schools have shown that active methods can support the learning process, including language learning. Andima and Kitainge (2016), for example, investigated how child-centred approaches are used in language activities in Kenyan pre-school centres, while Andima (2016) reported the relationships between child-centred approaches and learning outcomes in pre-school science activities. While these studies show that active and learner-centred pedagogy is relevant, they do not explicitly examine positive learner interdependence or differentiate between shared goals, contributions to individual tasks, and resource sharing in pre-primary education in Kenya. The updated PP2 curriculum also highlights active engagement, communication, and collaboration as key competencies (KICD, 2024). However, until this is done, the curriculum expectations do not make it clear whether pre-primary classrooms can consistently be expected to establish the interdependent relationships necessary for effective cooperative learning.

The gap between the theory and application is therefore not just conceptual; it is also contextual. Conceptually, much of the existing literature treats cooperative learning as a general instructional strategy rather than examining how interdependence among learners affects achievement. Empirical evidence in this context mostly comes from older learners, such as university learners, professional learners, and EFL learners, not PP2 learners in Kenyan pre-primary schools. Studies on child-centred approaches have been conducted in Kenya. Still, evidence on the effects of different types of learner interdependence on success in learning English among pre-primary students is scarce. Specifically, research on the correlation between commitment to shared goals, unique contribution to the group's task, sharing of instructional materials, and improved achievement

in English language activities among PP2 learners in Tharaka-Nithi County is scarce.

This study aims to fill this gap by investigating the role of learner interdependence in cooperative learning on achievement in English language activities among pre-primary learners in Tharaka-Nithi County, Kenya. This study examines three aspects of learner interdependence: commitment to common objectives, individual differences in contribution to the group's task, and sharing of teaching resources. This study aims to determine whether structured interdependent learning among learners is more effective than group learning of English in PP2 in achieving early English language learning, based on these dimensions.

Theoretical Framework

This study was grounded in Social Interdependence Theory, which began most strikingly with the work of John Thibaut and Harold Kelley (1959), and was built up with a great deal of elaboration by David Johnson and Roger Johnson (Johnson, 2003; Johnson & Johnson, 2005, 2009), which provides the framework for the way that individuals interact, and therefore the outcomes of their collective efforts, depend on how the social goals are structured. The theory is founded on key concepts like the structure of the situation, transformation of motivation and the behavioural patterns of interaction and adaptation (Van Lange & Balliet, 2015), all of which are antidotes to actor-centred biases by examining how interpersonal situations structure intrapersonal and interpersonal processes (Rusbult & Van Lange, 2008). Social interdependence (SI) is a key aspect of the theory, where it is defined as a process in which the outcomes of each participant in a group are influenced by the actions of others in the group, specifically positive interdependence (PI) and negative interdependence (NI) (Butera, Buchs, 2019).

In addition to its classical beginnings, it is a successful educational psychology model: Johnson and Johnson (2009) identified more than 1200 research studies that confirm that cooperative learning is a success story in educational psychology; it is consistently and scientifically proven to lead to higher achievement, more positive relationships, and greater psychological health than competitive and/or individualistic approaches.

From the perspective of Social Interdependence Theory, one can infer that the cooperative learning model shapes group structures and learning outcomes, which is directly related to intentional learning architecture. Cooperative learning is an effective strategy that requires teachers to recognise the importance of social interdependence and use five key elements: positive interdependence, individual accountability, promotive interaction, social skills, and group processing (Johnson and Johnson, 2008). Butera and Buchs (2019) support this empirically, showing that group members' behaviours and learning outcomes improve with structured cooperative learning that involves positive goal interdependence, responsibility, and interaction among group members. Educators can use these procedures in formal, informal, or cooperative base groups to create the interactive learning environment essential for academic and social adjustment (Johnson & Johnson, 2002, 2008). Additionally, extensive research indicates that when these elements are operational, educators successfully connect theory, research, and practice to improve students' competencies and achievement (Johnson, 2003; Johnson & Johnson, 2005).

As for criticism, Butera and Buchs (2019) suggest that cooperation is highly susceptible to threatening social comparison; group interactions that shift attention away from the task and toward relative status may diminish cooperation's positive effects. Another issue critics cite is that, if not trained and promoted appropriately, group procedures can be problematic and require careful structuring and teacher facilitation to ensure cooperative procedures enhance learning and maintain positive relationships rather than promoting competitive or individualistic approaches (Butera & Buchs, 2019).

Conceptual Framework

This study assumes that learner interdependence practices in cooperative learning are an independent variable that predicts academic achievement in English language activities among pre-school learners. This study also breaks down the practice of learner interdependence into the components of being committed to shared goals, contributing to a group's task in unique ways, and sharing the learning materials, and discusses how these elements, if planned and executed properly, could help facilitate

the attainment of basic skills in English language experiences (ELS, including vocabulary acquisition, comprehension, and phonological awareness).

This conceptual relationship is further supported by cooperative group functioning, positive mutual accountability, and structured interaction as direct consequences of intentional instructional architecture, in light of the Social Interdependence Theory (SIT).

Therefore, when teachers actively establish shared goals with peers, define roles and procedures for role delineation, and ensure an equal distribution of instructional materials, pre-primary classrooms have the conditions required for active, collaborative, high-performance learning.

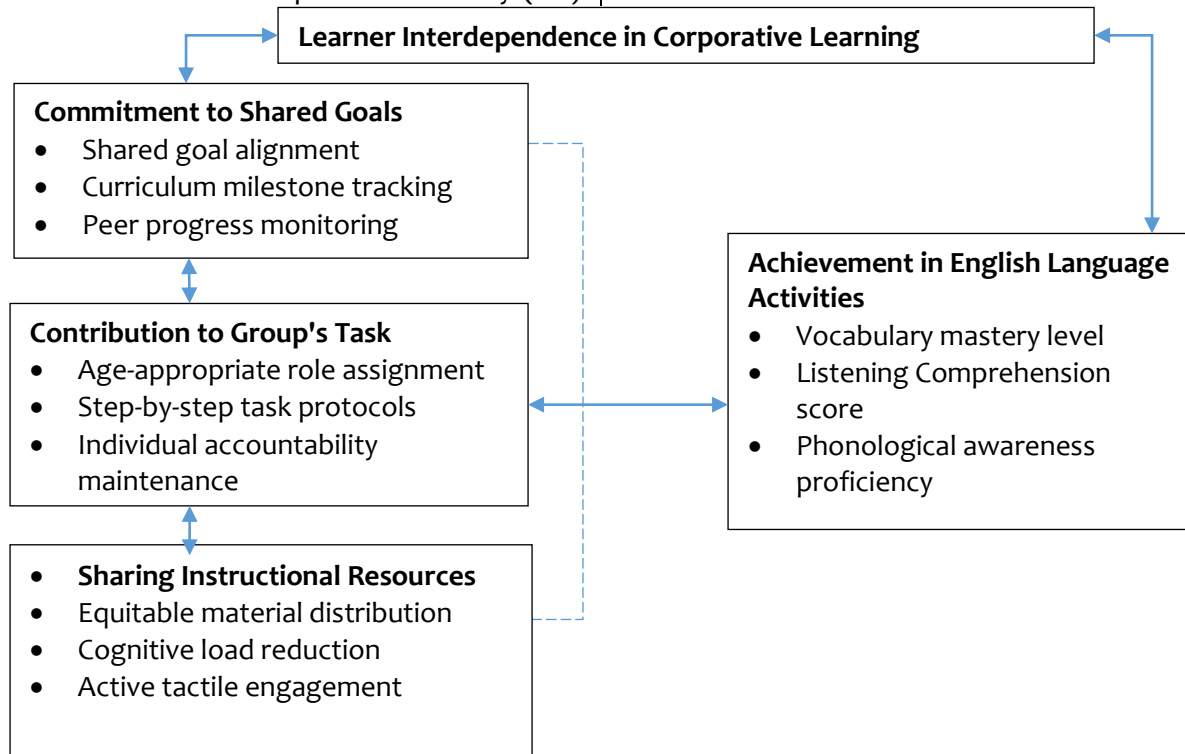


Figure 1: Conceptual Framework

METHODOLOGY

This study used a pragmatic research paradigm, suitable for solving a practical research problem through a method that could answer the research questions. This study was primarily quantitative, as it aimed to determine the effect of cooperative learning, with the concept of learner interdependence, on English language achievement by measuring students' pre-test and post-test results. The quantitative results were complemented and contextualised with qualitative data from teacher interviews and classroom observations. Hence, the researcher used a mixed-methods approach that was quantitatively dominant within the pragmatist paradigm.

The study used a quasi-experimental, non-equivalent control group pre-test/post-test design. The study was

conducted in existing pre-primary schools, and it was difficult to assign individual children to specific groups. Therefore, this design was suitable. Twenty-four public pre-primary schools were selected from Maara, Meru South, Tharaka South, and Tharaka North sub-counties, with half as experimental schools and half as control schools. The experimental group received structured cooperative learning activities using a learner interdependence approach (commitment to shared tasks, unique contributions to cooperative group tasks, and sharing of instructional resources). In contrast, the control group received conventional instruction. Pre- and post-tests were administered to both groups to measure differences in English language achievement.

The target population included 24,000 PP2 learners, 508 Pre-primary teachers and 411 headteachers. Multistage sampling was used to select a sample of 462 learners, 38 teachers and 24 headteachers. Schools were selected using stratified and random sampling; learners and teachers were selected through simple random sampling, and headteachers were selected through purposive sampling. The following instruments were used for data collection: learner English language pre-test, classroom observation checklist, teacher questionnaire, interview schedule, document analysis, and modified peer-assessment forms. The instruments were pre-tested in five pre-primary schools not included in the main study. Experts validated the instruments, and reliability was measured using an appropriate reliability coefficient with a minimum acceptable value of 0.70.

Descriptive statistics, independent-samples t-tests, effect size, and Analysis of Covariance (ANCOVA) were used to analyse quantitative data. ANCOVA was used to analyse differences in post-test achievement in English between the experimental and control groups,

controlling for pre-test scores. The model was specified as:

$$\text{Posttest} = \beta_0 + \beta_1(\text{Group}) + \beta_2(\text{Pretest}) + \epsilon$$

Before conducting the ANCOVA, we tested the assumptions of normality, linearity, homogeneity of regression slopes, and homogeneity of variance. The statements obtained from the teacher interviews and classroom observations were transcribed and analysed thematically. The qualitative results supported and clarified the quantitative results when discussing the implementation of learner interdependence practices.

FINDINGS AND DISCUSSION

Effect of Learner Interdependence on English Language Achievement

This study examined the effect of learner interdependence in cooperative learning on English language achievement among pre-school learners. Table 2 presents the descriptive statistics for the treatment and control groups.

Table 1: Grouped Descriptive Statistics for English Language Achievement

Assessment Stage	Group	N	Mean	Std. Deviation	Std. Error
Pre-test	Treatment	24	43.00	4.61	0.94
Pre-test	Control	24	31.08	3.08	0.63
Post-test	Treatment	24	52.58	4.64	0.95
Post-test	Control	24	39.92	5.16	1.05

The treatment group recorded higher mean scores at both assessment stages. Its mean increased from 43.00 at pre-test to 52.58 at post-test, while the control group increased from 31.08 to 39.92. An

independent-samples t-test was conducted to determine whether the differences between the groups were statistically significant. Table 3 presents the results.

Table 2: Independent-Samples t-Test for English Language Achievement

Assessment	t	df	p	Mean Difference	95% CI
Pre-test	10.54	46	< .001	11.92	[9.64, 14.19]
Post-test	8.94	46	< .001	12.67	[9.82, 15.52]

The pre-test difference between the groups was statistically significant, $t(46) = 10.54, p < .001$, indicating baseline differences. At post-test, the treatment group

also scored significantly higher than the control group, $t(46) = 8.94, p < .001$. Table 4 presents effect sizes.

Table 3: Effect Sizes for Group Differences in English Language Achievement

Assessment	Cohen's <i>d</i>	Hedges' <i>g</i>	Glass's Δ
Pre-test	3.04	2.99	3.87
Post-test	2.58	2.54	2.46

The effect sizes indicate large differences between the groups at both assessment stages. However, because the groups differed significantly at pre-test, interpret the post-test difference alongside the adjusted analysis rather than as evidence of the intervention effect on its own.

Inferential Analysis

Because the treatment and control groups differed at baseline, an adjusted analysis was used to determine whether group membership was associated with post-test achievement after accounting for pre-test performance.

English Language Achievement

Table 5 presents the inferential results for English language achievement.

Table 4: Tests of Between-Subjects Effects for English Language Achievement

Source	Type III SS	df	Mean Square	F	p
Corrected Model	5664.458	3	1888.153	95.787	< .001
Group	3626.042	1	3626.042	183.951	< .001
Time	2035.042	1	2035.042	103.239	< .001
Group $\times$ Time	3.375	1	3.375	0.171	.680
Error	1813.500	92	19.712		

$R^2 = .757$; Adjusted $R^2 = .750$.

The overall model was statistically significant, $F(3, 92) = 95.79$, $p < .001$, explaining 75.7 per cent of the variance in achievement. The main effects of group and time were significant, $F(1, 92) = 183.95$, $p < .001$, and $F(1, 92) = 103.24$, $p < .001$, respectively. However,

the Group $\times$ Time interaction was not significant, $F(1, 92) = 0.17$, $p = .680$.

Participants' Activity Levels

Table 6 presents the results for participants' activity levels.

Table 5: Tests of Between-Subjects Effects for Participants' Activity Levels

Source	Type III SS	df	Mean Square	F	p
Corrected Model	3045.115	3	1015.038	28.498	< .001
Group	2156.510	1	2156.510	60.545	< .001
Time	882.094	1	882.094	24.765	< .001
Group $\times$ Time	6.510	1	6.510	0.183	.670
Error	3276.875	92	35.618		

$R^2 = .482$; Adjusted $R^2 = .465$.

The model for activity levels was statistically significant, $F(3, 92) = 28.50$, $p < .001$, explaining 48.2 per cent of the variance. The main effects of group and time were significant, while the Group $\times$ Time interaction was not significant, $F(1, 92) = 0.18$, $p = .670$.

Discussion

The results suggest that the structured learner-interdependence instruction had a significantly more positive effect on English language achievement for pre-primary students. The treatment group recorded a higher post-test mean ($M = 52.58$, $SD = 4.64$) than the

control group ($M = 39.92$, $SD = 5.16$), while the inferential analysis showed a significant group effect, $F(1, 92) = 183.95$, $p < .001$. The model explained 75.7 per cent of the variance in the outcome ($R^2 = .757$). However, the between-group difference was significant at pre-test, and the test difference should be interpreted in light of the baseline difference. The results, however, indicate that structured cooperative learning with positive interdependence can facilitate English language development more effectively than conventional instruction.

The results support Social Interdependence Theory, which posits that positive interdependence exists when students believe their success is tied to their peers' success. Cooperative learning is also effective when learning is goal-oriented and relies on students supporting each other to complete a shared task, as Butera and Buchs (2019) note. This research builds on this theoretical stance by providing evidence for pre-primary learners, who have received little empirical attention on learner interdependence. The results indicate that the form of cooperation matters more than group work per se. Shared objectives, shared resources, and interdependent tasks provided opportunities for communication and participation. Still, the present analysis cannot distinguish the contribution of any one element of these dimensions from the others.

The results also support those of Tamimy et al. (2023), who indicated that implementation fidelity plays a significant role in the effectiveness of cooperative learning. Their study, based on ELT teachers, revealed that the cooperative learning method could be limited due to problems applying cooperative learning principles. In contrast, the present study used a structured interdependence approach in pre-primary classrooms and found significant differences between the intervention and control groups. This distinction may be partly the result of the availability of explicit structures for cooperation, as opposed to relying on general instructions for working in groups. However, the results cannot be taken as a direct replication of Tamimy et al. because of differences in learners' ages and educational backgrounds. The contribution of the present study is therefore contextual since it shows the possibility and value of purposefully designed

interdependence in English learning in a pre-primary context in Kenya.

The findings on participants' participation levels also support the idea that the intervention may have a positive effect on class participation. The analysis revealed a significant group effect, $F(1, 92) = 60.55$, $p < .001$; the model accounted for 48.2 per cent of the variance ($R^2 = .482$). This is significant because cooperative learning is supposed to be active learning, not just grouping students. Sequenced goal sharing, materials, and task responsibilities may have facilitated children's interactions, sharing, and participation in group tasks. These mechanisms are not tested here, however, but are interpretive explanations.

The results are similar to those of Al-Malki et al. (2022), who found positive relationships between cooperative learning, group accountability, and academic achievement among university EFL learners. However, their participants were adult learners in higher education, while the present study involved pre-primary learners. This matters because young children's needs differ developmentally, and they may not manage group dynamics as well as older students. The present results thus indicate that the concept of interdependence may be transferable across educational levels, but application should account for learners' developmental characteristics.

The results also apply to Wong and Adesope (2024), who studied resource interdependence and found that allocating learning resources to collaborators may affect learning outcomes. Their research provides evidence that resource interdependence can foster engagement. However, their findings were in a different educational and task context and did not specifically consider English learning among pre-primary children. The present study thus provides evidence from an under-researched age group and educational context; however, the specific impacts of resource sharing cannot be separated from other facets of the intervention.

Overall, the results support the view that effective cooperative learning is not simply about grouping students. The large inequities in English language achievement and activity levels indicate that deliberately using structured learner interdependence

may offer a useful framework for participation and learning in pre-primary classrooms. This study's contribution is especially in the context of Kenyan public pre-primary education, where evidence on structured learner interdependence and early English language achievement is limited. However, caution is needed when interpreting the results of the present study because of baseline differences between the groups and the lack of separate statistical testing for each interdependence dimension. Therefore, the results do not establish the effectiveness of shared goals, resource sharing, or task interdependence separately, but confirm the overall effectiveness of the structured intervention.

CONCLUSION AND RECOMMENDATIONS

Conclusion: The study concludes that structured learner interdependence within cooperative learning significantly enhances preschoolers' English language achievement and activity levels in public pre-primary schools in Tharaka Nithi County. In particular, commitment to shared goals, differentiated task contributions, and sharing of instructional resources provided structured opportunities for learners to interact, participate, and contribute to collective learning. The significant group differences and large effect sizes indicate that cooperative learning is more effective when interdependence is deliberately structured rather than when learners are merely placed in groups. However, the findings should be interpreted within the context of the selected schools and study design and should not be generalised to all pre-primary settings without further evidence. This study therefore provides empirical support for strengthening structured cooperative learning in early childhood English language instruction while highlighting the need for further research across diverse contexts and over longer periods.

Recommendations: Based on the findings, the study recommends that the Ministry of Education and the Kenya Institute of Curriculum Development (KICD) consider incorporating structured learner interdependence principles into pre-primary cooperative learning guidance and materials, particularly through shared goals, differentiated learner roles, and equitable sharing of instructional resources. Such integration should be accompanied by appropriate teacher professional development rather than immediate nationwide implementation.

At the school level, headteachers and pre-primary teachers should structure cooperative English language activities so that learners have shared goals, clearly differentiated responsibilities, and opportunities to access and share learning resources. Teachers should monitor individual participation and ensure that every learner makes a meaningful contribution to group tasks.

Teacher-training institutions and ECD professional development programmes should strengthen training on Social Interdependence Theory and practical strategies for implementing developmentally appropriate cooperative learning among young children. Demonstration lessons, collaborative planning, and peer learning could help teachers translate these principles into classroom practice.

Finally, further research should evaluate the intervention longitudinally and across different counties, school types, linguistic environments, and socio-economic contexts. Future studies should also examine the individual and combined contributions of goal, task, and resource interdependence to determine which components produce the greatest learning benefits.

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