
Development of Group-Based Cooperative Learning Model to Improve Literacy and Numeracy Learning Outcomes

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Abstract: This study examines the effectiveness of the STAD (Student Teams Achievement Divisions) cooperative learning model in improving literacy and numeracy outcomes among adult learners in non-formal education settings, specifically in the Paket B program at PKBM Ibnu Ahmad, South Kalimantan. The research aimed to determine whether cooperative learning could enhance students' academic performance, engagement, and motivation in this context. A mixed-methods design was employed, incorporating both quantitative and qualitative data. Pre-test and post-test assessments were conducted to evaluate improvements in literacy and numeracy, while semi-structured interviews and classroom observations provided deeper insights into student and tutor experiences with the cooperative learning model. Paired t-tests were used to analyze the quantitative data, while thematic analysis was applied to the qualitative data. The results revealed significant improvements in both literacy and numeracy skills, with average test scores increasing by 18% in both areas. Qualitative findings highlighted that students felt more engaged and confident, particularly due to the collaborative nature of the learning process. Peer interaction and teacher facilitation were identified as key factors in the success of the intervention. These findings align with previous studies on cooperative learning, which emphasize the positive impact of peer support and collaborative learning on adult education outcomes. The study contributes to the growing body of research on cooperative learning in non-formal education settings by demonstrating the effectiveness of the STAD model in improving adult learners' literacy and numeracy. The findings suggest that cooperative learning can be a valuable tool in non-formal education to enhance engagement, motivation, and academic success. Future research could explore the long-term effects of cooperative learning and its adaptability across different cultural and socio-economic contexts.

Keywords: cooperative learning, STAD model, literacy, numeracy, adult education, non-formal education, student engagement

INTRODUCTION

Improving literacy and numeracy in non-formal education settings in Indonesia presents a range of intertwined challenges. These challenges are compounded by the country's significant educational disparities, particularly between urban and rural areas (Kobasah & Nurhayati, 2024; Nur'aeni et al., 2023; Nurhayati & Musa, 2020). Access to quality education is hindered by multiple factors, including socio-economic issues, inadequate educational resources, and the diverse pedagogical practices used in various educational settings (Susanti & Nurhayati, 2024). For example, many rural areas lack access to qualified educators, and often, non-

formal educational programs rely on outdated teaching materials. This disparity in educational resources is well-documented, with recent studies highlighting the severe gap in the availability of learning resources between urban and rural schools (Nurhayati, Septikasari, et al., 2025; Septiana & Elizar, 2025). Moreover, despite government efforts such as the Kampus Mengajar program, which seeks to address these issues, the implementation and access to quality educational frameworks in non-formal education settings remain insufficient (Musa & Nurhayati, 2025; Nurhayati, Irama, et al., 2025).

Another issue in enhancing literacy and numeracy outcomes is the diversity of educational methods employed in non-formal

education programs. Traditional pedagogical approaches, such as direct instruction, do not always adequately engage students, particularly adult learners who may struggle with motivation or find it difficult to connect with the material presented in a conventional format (Nurhayati et al., 2024; Nurhayati & Lahagu, 2024). While the integration of technology into educational practices—such as multimedia and adaptive learning tools—offers a promising solution, it remains underutilized (Ghofur & Nurhayati, 2023). This underutilization is largely due to the lack of infrastructure and teacher preparedness (Nurhayati & Musa, 2025; Rohaeni & Nurhayati, 2025). The need for adequate teacher training in modern, student-centered methodologies is further highlighted in studies, which emphasize that educators often lack the necessary skills to effectively integrate digital tools into their teaching (Marsegi et al., 2023; Winarti et al., 2022). These systemic issues significantly constrain the potential for improving literacy and numeracy through non-formal education in Indonesia.

Socio-economic factors also play a crucial role in shaping the effectiveness of non-formal education programs. High levels of poverty limit the ability of many parents to support their children's education outside formal school hours (Ahmad et al., 2024). This is compounded by the fact that many adult learners, particularly those enrolled in non-formal education programs such as Paket B, face multiple socio-economic pressures, including the need to balance work and family responsibilities (Musa & Nurhayati, 2021). As studies suggest, socio-economic challenges significantly affect the participation and completion rates in literacy and numeracy programs (Setiadi et al., 2023). Addressing these challenges requires interventions that go beyond educational practices and include measures to support learners economically, enhancing their ability to participate in learning activities. Evidence also indicates that economic empowerment initiatives, such as financial support for learning materials and transport, can significantly improve participation rates and learning outcomes in non-formal education settings (Supiah et al., 2024; Thinley & Gyeltshen, 2024).

Cultural factors further complicate the landscape of non-formal education. In some regions, education is undervalued, particularly for women or older adults, who may face societal

pressures to prioritize economic activities over education. Cultural attitudes towards education directly influence participation rates, as these individuals often perceive education as unnecessary for their immediate needs (Nurhayati, Vitariyani, et al., 2025; Nurhayati & Judijanto, 2025). Research indicates that increasing community involvement and aligning educational objectives with local cultural contexts can foster higher levels of participation and engagement in literacy and numeracy programs (Nur'aeni et al., 2023). Such initiatives can help to bridge the cultural divide, making education more relevant and acceptable to the community at large.

Institutional and policy support remains another key challenge. Although the Indonesian government has initiated various programs aimed at improving literacy and numeracy through non-formal education, these programs often face challenges in terms of consistent implementation and policy enforcement. For instance, the transition to the Merdeka Curriculum has highlighted the difficulties in implementing educational reforms without adequate resources and effective oversight (Aisah et al., 2024; Kristiyanti et al., 2025). Without robust policy support and proper resource allocation, the potential for widespread educational reform remains limited. Effective educational policies must not only be well-designed but also adaptable to local conditions, ensuring that they address the real needs of adult learners in diverse educational settings (Ratnawulan et al., 2025; Yasri et al., 2025). The landscape of non-formal education in Indonesia is fraught with complex challenges, including disparities in educational resources, outdated pedagogical practices, socio-economic inequalities, cultural barriers, and fragmented policy support (Rahmat et al., 2024). These challenges collectively shape the effectiveness of literacy and numeracy programs, making it necessary to adopt a multifaceted approach that includes educational innovation, community engagement, socio-economic support, and consistent policy enforcement.

Cooperative learning has emerged as a promising solution to the challenges of adult education, especially in the context of improving literacy and numeracy skills. This pedagogical approach facilitates an interactive learning environment, in which learners actively engage with one another, share knowledge, and collectively solve problems. By promoting

collaboration and mutual support, cooperative learning creates an environment conducive to skill development and personal growth. Through cooperative tasks, learners are not only able to enhance their literacy and numeracy skills but also gain essential social and collaborative skills that can improve their ability to function effectively in both academic and real-world settings (Nurhayati & Millenia, 2024; Nurhayati & Rumsari, 2020).

Cooperative learning models, such as STAD (Student Teams Achievement Divisions), are particularly effective in non-formal education settings, where adult learners often come with diverse backgrounds, knowledge, and experiences. Research has shown that cooperative learning promotes communication and peer teaching, which enhances reading, writing, and numeracy skills (Gal et al., 2020). Additionally, cooperative learning creates a sense of shared responsibility, where learners are accountable not only to themselves but also to their peers, motivating them to persist in the face of challenges. Studies have found that when numeracy is taught through real-life applications in cooperative groups, adult learners demonstrate significant improvements in both mathematical understanding and their ability to apply these skills in everyday situations (Goos et al., 2023).

The implementation of cooperative learning also fosters a sense of inclusivity and community. Adult learners often face self-doubt and anxiety due to their past educational experiences. The collaborative nature of cooperative learning helps alleviate these concerns by building a supportive environment where learners feel comfortable engaging with others (Sulastri & Nurhayati, 2023). This sense of community is crucial in adult education, where learners may face additional challenges, such as balancing work and family responsibilities, that could hinder their educational progress (Greenberg et al., 2012). Cooperative learning models, particularly STAD, enable learners to draw upon their collective knowledge and experiences, enhancing their understanding of literacy and numeracy concepts in ways that individual learning may not.

The literature also emphasizes the effectiveness of cooperative learning in promoting critical thinking and problem-solving skills. Contextualized learning through cooperative tasks has been shown to improve these skills, which are essential for developing

numerate citizens. By emphasizing real-world applications of literacy and numeracy, cooperative learning provides adult learners with the tools they need to become active participants in their communities and economies (Goos et al., 2023). In this way, cooperative learning not only improves literacy and numeracy outcomes but also equips learners with the skills necessary for long-term success.

This study specifically seeks to address the gaps in the application of cooperative learning in non-formal education settings in Indonesia. While the effectiveness of cooperative learning in formal educational contexts has been widely studied, its potential in non-formal education, particularly for adult learners in rural and underserved areas, remains underexplored. This research aims to fill this gap by exploring the application of a cooperative learning model, specifically the STAD model, to enhance literacy and numeracy among adult learners in Paket B programs at PKBM Ibnu Ahmad in South Kalimantan.

The primary research objectives are to examine the effectiveness of the STAD cooperative learning model in improving literacy and numeracy outcomes for adult learners, identify the challenges and barriers to its implementation, and assess the factors that contribute to its success. The study also aims to explore how cooperative learning can foster a sense of community and motivation among adult learners, thereby improving their engagement and persistence in non-formal education programs.

The central research questions for this study are as follows:

1. How effective is the STAD cooperative learning model in improving literacy and numeracy outcomes for Paket B students at PKBM Ibnu Ahmad?
2. What challenges do adult learners face in engaging with the STAD model, and how can these be addressed?
3. How does cooperative learning influence student motivation and engagement in non-formal education settings?

The hypothesis of this study is that the implementation of the STAD cooperative learning model will result in significant improvements in both literacy and numeracy outcomes for adult learners. This hypothesis is based on the premise that cooperative learning enhances peer interaction, accountability, and

real-life application of skills, all of which contribute to improved learning outcomes. This study aims to explore the application of cooperative learning in non-formal education, with a focus on improving literacy and numeracy for adult learners in South Kalimantan. By investigating the effectiveness of the STAD model, this research will contribute to the growing body of knowledge on the role of collaborative learning in adult education and provide insights into how it can be utilized to address the challenges faced by non-formal education programs in Indonesia.

METHOD

The research adopts a mixed-methods design, which combines quantitative and qualitative approaches. This design is well-suited for the research objectives as it allows the study to gather both numerical data on literacy and numeracy outcomes and rich, contextual insights from participants. (Nurhayati, Judijanto, et al., 2025) By using both methods, the research captures a holistic view of the intervention's impact, thus providing a deeper understanding of the cooperative learning model's effectiveness in non-formal education (Nurhayati, Sari, et al., 2025). The quantitative component of the study employs a quasi-experimental design. Specifically, it uses a pre-test/post-test approach to assess the impact of the cooperative learning intervention on students' literacy and numeracy. The pre-test measures the students' baseline skills before the intervention, while the post-test evaluates any improvements following the intervention. This quasi-experimental design was chosen because, in real-world educational settings, random assignment to control and experimental groups is often not feasible. As a result, the pre-test/post-test design allows the researcher to evaluate changes in learning outcomes without needing to randomly assign students to groups (Iswahyudi et al., 2023). The qualitative component involves semi-structured interviews and observations. The interviews provide insights into the experiences of both students and tutors, capturing their perceptions of the cooperative learning model and its effectiveness. The observations focus on classroom dynamics, particularly how students interact during group work and how they collaborate on tasks. These qualitative methods offer a deeper understanding of the factors that

may influence the effectiveness of cooperative learning, such as student engagement, peer interactions, and the practical challenges faced during the intervention. Together, this mixed-methods approach allows for triangulation of the data, enhancing the validity of the findings by providing a more comprehensive view of the research topic. The quantitative data highlight measurable outcomes, while the qualitative data provide contextual insights into the processes and experiences behind these outcomes.

The participants for this study were selected from PKBM Ibnu Ahmad, a non-formal educational institution in South Kalimantan, Indonesia. PKBM Ibnu Ahmad offers the Paket B program, which provides adult learners with an opportunity to complete their education equivalent to junior high school. The sampling method used in this study is purposive sampling, which is appropriate because the study focuses on a specific group of participants who have direct experience with the cooperative learning intervention. This approach allows for the intentional selection of individuals who are most likely to provide relevant insights into the research questions. A total of 41 adult learners participated in the study, divided into two groups: 20 students were involved in a limited trial of the cooperative learning model, while the remaining 21 students participated in a field test. Participants were selected based on their willingness to participate and their varied literacy and numeracy levels. This diversity in ability levels allowed for an evaluation of the model's effectiveness across different learner profiles. In addition to the students, 5 tutors were also included in the study. The tutors were selected based on their experience with teaching adult learners in the Paket B program and their familiarity with the students' learning needs. Including both students and tutors in the study ensures that the research captures multiple perspectives on the cooperative learning model and its implementation.

The data collection methods employed in this study combined quantitative and qualitative techniques to provide a well-rounded analysis of the intervention's impact. The primary tool for collecting quantitative data was the pre-test/post-test. These tests measured the participants' literacy and numeracy skills before and after the intervention. The pre-test established a baseline for each student's abilities, while the post-test measured the change in skills after exposure to

the cooperative learning model. The tests were designed to cover the key literacy and numeracy skills taught in the Paket B curriculum, ensuring their relevance to the students' learning objectives.

Interviews were conducted with both students and tutors to gather qualitative data on their experiences with the cooperative learning model. The students were asked about their perceptions of the model, including its impact on their learning, their engagement with peers, and any challenges they encountered. Tutors were interviewed about the implementation of the model, its effectiveness, and the factors that influenced its success in the classroom. These semi-structured interviews allowed for flexibility in the responses, enabling participants to share their thoughts in detail. Classroom observations were also carried out to complement the interview data. The researcher observed the students during group tasks, focusing on their interactions with one another, the extent of collaboration, and how the tasks were facilitated by the tutors. The observations helped to identify the dynamics of group work and provided insights into how cooperative learning influenced student behavior and engagement.

The data analysis process involved both statistical and thematic methods, allowing for a comprehensive interpretation of the findings. The quantitative data from the pre-test and post-test were analyzed using paired t-tests. This statistical method was chosen to assess whether there were significant differences in literacy and numeracy scores before and after the cooperative learning intervention. The SPSS software was used to perform the analysis, which allowed the researcher to quantify the impact of the intervention on student outcomes. The qualitative data from the interviews and observations were analyzed using thematic analysis. This approach involved identifying and analyzing patterns or themes that emerged from the data. Thematic analysis was chosen because it allows for the exploration of participants' perspectives and experiences in a flexible and inductive manner. The analysis was conducted in several stages: familiarization with the data, generating initial codes, identifying themes, and reviewing the themes to ensure they accurately reflected the participants' experiences.

To ensure the validity and reliability of the study, several steps were taken throughout the research process. Content validity of the pre-test

and post-test instruments was ensured through expert review, with experienced educators confirming that the tests accurately measured the necessary literacy and numeracy skills. Construct validity was maintained by ensuring that the cooperative learning model was implemented in accordance with its core principles, which were confirmed through classroom observations and tutor feedback. To ensure reliability, test-retest reliability was employed, meaning that the pre-test and post-test were administered to the same group of students, and their results were compared to ensure consistency. Additionally, inter-rater reliability was addressed by having a second researcher independently analyze the qualitative data to ensure consistency in the thematic analysis.

Ethical standards were adhered to throughout the study. Participants were fully informed about the purpose of the research and their right to confidentiality. Informed consent was obtained from all participants before data collection began, and they were assured that their participation was voluntary, with the option to withdraw at any time without penalty.

RESULTS AND DISCUSSION

This section presents the results of the study, including the analysis of both quantitative and qualitative data. The objective of the study was to assess the effectiveness of the cooperative learning model in improving literacy and numeracy outcomes among adult learners in non-formal education settings. The results are presented in two main sections: the quantitative results, based on pre-test and post-test data, and the qualitative results, derived from interviews and classroom observations. The findings are analyzed to understand the overall impact of the cooperative learning model on student learning outcomes and engagement.

Quantitative Results

The primary objective of the quantitative analysis was to evaluate whether the cooperative learning model led to significant improvements in students' literacy and numeracy skills. To achieve this, pre-test and post-test data were collected and analyzed using paired t-tests. The pre-tests measured students' baseline literacy and numeracy levels, while the post-tests assessed changes in skills after exposure to the cooperative learning intervention.

Literacy Skills

The pre-test results for literacy skills indicated that the participants had a broad range of literacy abilities, with some students showing minimal proficiency in reading and writing tasks. The average score on the pre-test for literacy was 55.3%, with a standard deviation of 10.2%. Following the cooperative learning intervention, the post-test scores showed a clear improvement, with the average score increasing to 73.4%, a gain of 18.1 percentage points. The standard deviation for post-test scores was 8.6%, indicating a more concentrated improvement across participants. A paired t-test was conducted to assess whether this difference was statistically significant. The results of the t-test revealed a significant difference between the pre-test and post-test scores ($t = -7.92$, $p < 0.001$), indicating that the cooperative learning model had a substantial positive impact on literacy skills. The effect size, calculated using Cohen's d , was 1.4, suggesting a large effect size and indicating that the intervention had a meaningful impact on improving students' literacy skills.

Numeracy Skills

Similar to the literacy results, the pre-test scores for numeracy skills showed considerable variation among participants. The average score on the pre-test for numeracy was 52.6%, with a standard deviation of 11.1%. After the cooperative learning intervention, the post-test scores increased significantly, with the average score rising to 71.2%, a gain of 18.6 percentage points. The standard deviation for post-test scores was 9.4%, indicating that, similar to literacy, there was a consistent improvement across participants. The paired t-test results for numeracy also showed a statistically significant improvement ($t = -8.07$, $p < 0.001$). The effect size for numeracy improvement was 1.5, which is considered a large effect size. This suggests that the cooperative learning model was highly effective in improving numeracy skills, comparable to its impact on literacy. The quantitative data provide strong evidence that the cooperative learning model led to significant improvements in both literacy and numeracy skills. The results of the pre-test and post-test comparison demonstrate substantial gains in student performance across both areas, with large effect sizes indicating the intervention's effectiveness. These findings support the hypothesis that cooperative learning can

effectively enhance literacy and numeracy outcomes in adult education settings.

Qualitative Results

The qualitative data were gathered through semi-structured interviews with students and tutors, as well as classroom observations. These methods were used to gain insights into the students' experiences with the cooperative learning model, the challenges they faced, and the perceived benefits of the intervention. The qualitative data provide a deeper understanding of how the cooperative learning model was implemented and its impact on student engagement and learning.

Student Experiences with Cooperative Learning

The interviews with students revealed that the majority of participants had a positive experience with the cooperative learning model. Students reported that working in small groups helped them to better understand the material and facilitated peer support. Many students noted that they felt more confident in their abilities, particularly when they were able to explain concepts to their peers. One student, for example, stated, "I used to feel embarrassed about my reading and math skills, but when we worked together in a group, I felt like I could help others, and that made me feel more confident." Another student explained, "The group activities helped me understand the problems better. When I didn't understand something, my friends explained it to me in a way that made sense." In addition to increased confidence, students also reported that the cooperative learning model made the learning process more engaging. They felt more motivated to participate in lessons because they could interact with their peers and learn collaboratively. A common theme that emerged from the interviews was the idea of "shared responsibility," where students felt accountable not only for their own learning but also for helping their peers succeed. As one student put it, "We all worked together to solve the problems. If someone didn't get it, we would help each other, and that made learning more fun." The interviews with tutors provided valuable insights into the implementation of the cooperative learning model and its effectiveness in the classroom. Tutors generally supported the cooperative learning approach, noting that it fostered a more interactive and collaborative classroom

environment. One tutor remarked, “I saw a lot more interaction between students, and they were more engaged in the lessons. The cooperative model allowed students to help each other, and that’s something we hadn’t seen much before.” Tutors also highlighted some challenges in implementing the model. One tutor mentioned that managing the dynamics of group work was sometimes difficult, especially when students had varying levels of ability. “Sometimes, the more advanced students would dominate the group work, and it was challenging to ensure that everyone was participating equally,” the tutor said. However, this challenge was mitigated by the tutor's role in facilitating the groups and ensuring that each student had the opportunity to contribute.

Classroom Observations

The classroom observations revealed that the cooperative learning model encouraged active participation and collaboration among students. During group tasks, students were observed engaging in discussions, explaining concepts to each other, and working together to solve problems. The groups exhibited a high level of cooperation, with students demonstrating respect for each other’s ideas and offering assistance when needed. One of the key findings from the observations was the high level of peer teaching that occurred during group work. Many students were observed explaining concepts to their peers in a way that was easier to understand, which reinforced their own learning and helped to improve the overall group’s performance. This aligns with the findings from the interviews, where students reported that peer explanations were particularly helpful in improving their understanding of the material. However, the observations also noted some challenges related to group dynamics. In some groups, there was a noticeable imbalance in participation, with a few students taking on a more dominant role while others were less involved. This issue was most apparent in groups with a significant range of abilities. Nevertheless, the tutor’s facilitation helped to balance participation and encourage quieter students to contribute. The qualitative data provide rich insights into the experiences of both students and tutors with the cooperative learning model. Overall, the students reported positive experiences, with many indicating that the model improved their understanding of the material and boosted their confidence. The sense

of shared responsibility and peer support were key factors contributing to these positive outcomes. Tutors also recognized the benefits of the cooperative learning approach but noted challenges related to group dynamics and ensuring equal participation. The classroom observations reinforced the idea that the model encouraged active collaboration and peer teaching, although some challenges related to participation and group balance were observed.

The integration of the quantitative and qualitative results provides a comprehensive understanding of the impact of the cooperative learning model. The quantitative data clearly demonstrate significant improvements in both literacy and numeracy skills, while the qualitative data reveal the underlying mechanisms contributing to these improvements, such as increased student engagement, confidence, and peer collaboration. The positive changes observed in student performance can be attributed to the collaborative nature of the cooperative learning model. The quantitative results show substantial gains in literacy and numeracy, and the qualitative data indicate that these improvements were driven by enhanced interaction and peer support. This integration of data supports the hypothesis that cooperative learning is an effective method for improving both literacy and numeracy outcomes in adult education settings.

The results of this study provide strong evidence for the effectiveness of the cooperative learning model in improving literacy and numeracy skills among adult learners. The quantitative analysis showed significant improvements in both literacy and numeracy, with large effect sizes indicating that the cooperative learning model had a meaningful impact on student performance. The qualitative data further supported these findings, revealing that students’ increased confidence, engagement, and peer support played a critical role in their improved learning outcomes. The study also identified some challenges, particularly related to group dynamics and ensuring equal participation among students. However, these challenges were managed effectively by tutors and did not undermine the overall success of the cooperative learning model. The results suggest that cooperative learning is a highly effective approach for improving literacy and numeracy skills in non-formal education settings, and the findings have important implications for the

design and implementation of adult education programs.

Discussion

The findings of this study contribute to the growing body of research on the effectiveness of cooperative learning in improving literacy and numeracy outcomes for adult learners, particularly in non-formal education (NFE) settings. The results indicate that the cooperative learning model, specifically the STAD (Student Teams Achievement Divisions) model, significantly enhanced the literacy and numeracy skills of the participants. This section discusses the key findings, compares them with relevant literature, and highlights the implications for future educational practice.

The quantitative results of this study demonstrate that the STAD cooperative learning model led to significant improvements in both literacy and numeracy. These results align with previous research that emphasizes the benefits of cooperative learning in adult education. For instance, studies by Thinley & Gyeltshen (2024) and Hapon (2023) suggest that cooperative learning methods in NFE foster enhanced engagement, collaboration, and peer-based support, which in turn increase both the motivation and effectiveness of learning. The improvements in literacy and numeracy observed in this study reflect these mechanisms, as students reported increased confidence, motivation, and engagement through peer interactions.

Moreover, the cooperative learning environment provided a space for students to take collective responsibility for their learning, which has been shown to be a significant factor in improving learning outcomes (Hohn & Rivera, 2019). The pre-test and post-test scores demonstrated substantial gains in both literacy (18.1%) and numeracy (18.6%), with large effect sizes for both subjects, indicating that the intervention had a substantial impact on student performance. This finding is consistent with previous studies on the STAD model, such as those by Cholifah & Cahyaningsih (2023) and Insani (2023), who observed similar improvements in student achievement following the implementation of cooperative learning strategies. The large effect sizes in this study further reinforce the notion that cooperative learning models can lead to substantial academic gains in adult learners.

The qualitative data, gathered through interviews and observations, also support the quantitative findings. Students expressed positive experiences with the cooperative learning model, noting that working in small groups helped them better understand the material and boosted their confidence. This finding is consistent with Goos et al. (2023), who argue that cooperative learning fosters a sense of community and provides peer-based support that enhances both cognitive and social skills. Students in this study reported that peer interactions not only helped them grasp literacy and numeracy concepts but also motivated them to engage more actively in their learning. As noted by Hapon (2023), community-based learning environments, such as those created by cooperative learning, play a critical role in adult education by providing a supportive space for learners to collaborate and improve their skills.

The role of the tutor in facilitating cooperative learning was also highlighted in the qualitative data. Tutors in this study observed that the STAD model promoted greater student engagement and helped create a more collaborative classroom environment. This aligns with Harianja et al. (2020), who emphasized that the success of cooperative learning is often contingent on the active involvement of the teacher. Tutors in this study reported that their facilitation of group dynamics and their encouragement of equal participation were key factors in the success of the intervention. This reflects the broader literature on cooperative learning, which highlights the importance of teacher involvement in ensuring that all students actively contribute to the learning process.

Despite the positive outcomes, some challenges were identified during the implementation of the cooperative learning model. One of the key challenges was managing group dynamics, particularly when students had varying levels of ability. Some students in the study found it difficult to fully engage in the collaborative tasks, as their peers often took a more dominant role in the group discussions. This issue has been noted in previous research, such as by Novita & Sukenti (2023), who highlighted that students in cooperative learning environments may experience unequal participation, especially in mixed-ability groups. However, the tutors in this study were able to mitigate this challenge by providing guidance and ensuring that all students had an opportunity

to contribute. This underscores the importance of active teacher facilitation in maintaining balanced participation within cooperative learning groups.

Additionally, while students generally reported positive experiences with the model, some expressed initial reluctance to engage in group work due to concerns about their own abilities. This reflects a common barrier to cooperative learning in adult education, as many adult learners, particularly those returning to education after a long hiatus, may experience anxiety and lack of confidence (Poka et al., 2022). However, the peer support provided within the groups helped alleviate these concerns, allowing students to gradually build confidence in their abilities. This finding is consistent with Utami et al. (2023), who found that cooperative learning models help students overcome personal barriers to learning by fostering a supportive and non-threatening environment.

The positive effects of peer interaction observed in this study are consistent with the findings of Gagné & Parks (2013) and Imsiyah et al. (2024), who emphasized the importance of peer tutoring and collaborative activities in enhancing both academic performance and interpersonal skills. In this study, students who engaged in peer-based learning reported improved communication skills, problem-solving abilities, and greater confidence in their literacy and numeracy skills. These findings underscore the social dimension of cooperative learning, which not only enhances academic outcomes but also promotes essential social and collaborative skills.

In addition to the academic and social benefits, the study found that cooperative learning had a positive impact on student motivation. As noted by Insani (2023), cooperative learning can enhance student motivation by creating an interactive and engaging learning environment. Students in this study reported feeling more motivated to participate in lessons because they felt a sense of accountability to their peers. This aligns with the findings of Syahbuddin et al. (2022), who noted that cooperative learning fosters a sense of shared responsibility, which leads to increased motivation and engagement among students.

One limitation of this study is that it was conducted in a single non-formal education institution, which may limit the generalizability of the findings. Future research could expand the

study to include multiple sites and a larger, more diverse sample to further assess the effectiveness of cooperative learning in different contexts. Additionally, future studies could explore the long-term effects of cooperative learning on literacy and numeracy skills, as well as its impact on other aspects of adult education, such as critical thinking and problem-solving skills. This study provides strong evidence that the STAD cooperative learning model is an effective intervention for improving literacy and numeracy outcomes in adult education settings. The results demonstrate that cooperative learning promotes engagement, collaboration, and peer-based support, all of which contribute to improved academic performance. The findings of this study are consistent with the broader literature on cooperative learning, which highlights the positive impact of collaborative learning environments on adult learners' motivation, confidence, and academic achievement. By fostering a supportive and collaborative learning environment, cooperative learning models like STAD can play a key role in improving literacy and numeracy skills among adult learners, particularly in non-formal education settings.

CONCLUSION

This study aimed to assess the effectiveness of the STAD (Student Teams Achievement Divisions) cooperative learning model in improving literacy and numeracy outcomes among adult learners in non-formal education settings. Specifically, it examined whether cooperative learning could enhance students' academic performance and engagement in a non-formal education context, focusing on adult learners enrolled in the **Paket B** program at PKBM Ibnu Ahmad, South Kalimantan. The findings of this study reveal that the STAD cooperative learning model significantly improved both literacy and numeracy outcomes, with pre-test and post-test data showing substantial gains in student performance. The qualitative data further support these findings, with students and tutors reporting positive experiences regarding increased engagement, confidence, and peer support. The collaborative nature of the model fostered a sense of shared responsibility among students, which contributed to a more motivating and supportive learning environment. These results align with existing literature on cooperative learning, which

underscores the positive impact of peer interaction, group work, and teacher facilitation on adult learning outcomes. The significance of this study lies in its contribution to the growing body of research on cooperative learning in non-formal education settings. By demonstrating the effectiveness of the STAD model in improving both literacy and numeracy among adult learners, this research provides valuable insights for educators and policymakers seeking to enhance educational outcomes in non-formal contexts. The findings suggest that cooperative learning can be a powerful tool for fostering engagement, motivation, and academic success in adult education. However, this study is not without limitations, such as its focus on a single educational institution. Future research could explore the effectiveness of cooperative learning in diverse non-formal education settings and examine its long-term impact on students' skills development. Additionally, further studies could investigate how cooperative learning models can be adapted to different cultural and socio-economic contexts, potentially broadening their applicability in adult education worldwide.

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