Community Empowerment Through Foundational Mathematics Tutoring and Environmental Cleanliness Education in Panenggo Ede Village, Southwest Sumba

Nopem Kusumaningtyas Sumitro[1]*, Era Dewi Kartika[2], Mika Ambarawati[3], Donna Avianty[4], Nur Elyta Febrianti[5], Miftah Rakhmadian [6], Puspita Pebri Setiani[7], Yulianto Dwi Saputro[8]

[1,2,3,4]Department of Mathematics Education, Universitas Insan Budi Utomo, Malang, Indonesia

[5]Department of Electrical Engineering, Universitas Insan Budi Utomo, Malang, Indonesia

[6]Department of Economics Education, Universitas Insan Budi Utomo, Malang, Indonesia

[7]Department of History and Sociology, Universitas Insan Budi Utomo, Malang, Indonesia.

[8]Department of Physical Education, Universitas Insan Budi Utomo, Malang, Indonesia

***Corresponding Author**

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ABSTRACT

Community service activities represent a collaborative approach to addressing educational and environmental cleanliness needs by utilizing local resources and community potential. This community engagement program aimed to describe the implementation of foundational mathematics tutoring and environmental cleanliness education in Panenggo Ede Village, Kodi Balaghar District, Southwest Sumba Regency, East Nusa Tenggara, Indonesia. The program employed a participatory-descriptive approach involving university students, schools, village authorities, and local residents. Mathematics tutoring was conducted with students from SMPN 1 Kodi Balaghar through step-by-step explanations, addition and subtraction exercises, question-and-answer sessions, and direct learning assistance. Environmental cleanliness education involved coordination with village authorities, dissemination of cleanliness information, and communal cleaning activities around the village office. Program evaluation was conducted descriptively using activity documentation, implementation observations, and partner reports. The findings confirmed the implementation of both programs, providing supplementary learning opportunities and facilitating community participation in environmental cleanliness activities. However, improvements in numeracy skills and sustained behavioral changes could not be established due to the absence of pre- and post-program assessments and longitudinal monitoring. The program highlights the potential of university–community collaboration in supporting local empowerment. Sustainable implementation requires regular mentoring, structured evaluation, clearly defined responsibilities, and stronger stakeholder coordination to maintain and extend program benefits. The activities were undertaken in the context of a university community service initiative, with the school and village authorities serving as institutional partners. The documented outputs concern activities delivered rather than independently measured learning gains or long-term environmental outcomes. Future implementation should establish consistent attendance records, activity schedules, and feasible indicators agreed upon with local stakeholders.

Keywords: Mathematics tutoring; Environmental cleanliness education; Foundational numeracy; Community empowerment; Community engagement.

INTRODUCTION

Basic Education, Numeracy, and the Need for Community Learning Support

Basic education plays an important role in developing community capacity, as the ability to understand numbers, perform simple operations, explain reasoning, and solve everyday problems shapes opportunities for participation in social life. In rural areas, learners do not always have access to the same range of supplementary tutoring, learning materials, and educational facilities available in better-resourced settings. Such contextual differences do not imply that rural students necessarily have low achievement. Rather, they indicate the value of supplementary services designed around actual needs rather than assumptions about geographical location. Roos and colleagues explain that tiered support for basic arithmetic can assist learners who require additional instruction, particularly when initial activities and subsequent support are purposefully planned (Roos & Svensson, 2023).

In mathematics education, addition and subtraction are not merely computational procedures; they enable learners to understand quantitative relationships, numerical meaning, and the flexible selection of strategies. Lopez-Pedersen and colleagues demonstrate how small-group numeracy interventions can be examined using experimental designs and explicit measures, thereby separating observed learning outcomes from impressions formed during implementation (Lopez-Pedersen & Melby-Lervåg, 2022). Tutoring beyond ordinary classroom instruction may also provide opportunities to raise questions without normal classroom time constraints, revisit challenging material, and receive more individualized attention. Nickow and colleagues caution that the effectiveness of tutoring depends not only on whether a program exists but also on its intensity, tutor quality, and implementation context (Nickow & Quan, 2024).

University-led educational engagement should therefore be regarded as a complementary service, not a substitute for the responsibilities of schools, teachers, and families. A cross-level review by Svane and colleagues identifies considerable diversity among mathematics intervention designs, indicating that local activities should not automatically be equated with interventions demonstrated to be effective elsewhere (Svane & Nielsen, 2023). Meanwhile, a synthesis by Charitaki and colleagues highlights the importance of varying instructional support and representations in early numeracy interventions. This principle provides a conceptual basis for organizing simple arithmetic exercises in ways that are responsive to learners' abilities (Charitaki & Soulis, 2021).

For community engagement in Panenggo Ede Village, these considerations support the relevance of foundational arithmetic tutoring while emphasizing the need to assess its contribution using appropriate evidence. University students serving as tutors can create more flexible learning opportunities. They may demonstrate solutions, observe how learners approach exercises, and adapt follow-up questions to students' responses. Such interactions are useful when students recognize mathematical symbols but still need assistance in connecting those symbols to concrete situations.

The accuracy of content and clarity of explanation nevertheless remain essential, especially when students have diverse learning experiences. A tutor's task is not simply to supply an answer as quickly as possible but to help students understand why a particular step is used. A more developed community engagement design should identify learning needs without negatively labeling students. Teachers can recommend topics requiring reinforcement, while university students prepare questions aligned with jointly agreed objectives. This approach can prevent supplementary tutoring from becoming merely repetitive drill. Different mathematically valid strategies should also be recognized, so that tutoring develops reasoning rather than only calculation speed and respects students' existing knowledge.

Partner Needs Assessment and the Relationship Between Two Priority Issues

The situation analysis presented in the PMBP report identifies two priority service areas: arithmetic tutoring for students at SMPN 1 Kodi Balaghar and environmental cleanliness education around the Panenggo Ede Village office. In education, the report records mathematics support focused on addition and subtraction, direct

assistance from university students, practice exercises, and interaction in an open learning space. These observations indicate an effort to provide supplementary learning time, but they do not include diagnostic evidence about the proportion of students experiencing difficulties or the types of misconceptions involved. Ribner and colleagues emphasize the significance of interaction in early mathematics interventions. Their findings support attending to the quality of dialogue during tutoring, rather than drawing conclusions about outcomes for the participants of this particular initiative (Ribner & Libertus, 2023).

Regarding strategy selection, Mustika and colleagues review a range of early numeracy approaches and show that numeracy instruction is more meaningful when learning activities correspond to participants' characteristics (Mustika & Kurniawan, 2025). Hidayah and Retnawati likewise provide scholarly support for deliberate numeracy intervention design, without justifying the transfer of outcomes observed in other populations to learners in this village (Hidayah & Retnawati, 2024). In the environmental component, photographic records indicate a need to remove litter and maintain the area surrounding the village office. The initiative combined coordination, cleanliness messages, and communal cleaning, thus bringing together public education and practical action. Salsabila and colleagues connect waste management practices with public involvement and behavior, reinforcing the view that cleanliness is not solely a matter of employing cleaning personnel (Salsabila & Khairina, 2023). A review by Liu and Green identifies diverse personal and social influences on pro-environmental behavior; accordingly, photographs of a single clean-up cannot establish permanent behavioral change (Liu & Green, 2024).

Although these two challenges differ, both require facilitators, accessible communication, opportunities to put knowledge into practice, and support from local institutions. Their integration within this article is therefore programmatic: they belong to a single community engagement initiative intended to extend educational services and encourage social responsibility in the same village. Integration does not mean testing a statistical relationship between numeracy and cleanliness, since the activities involved different target groups and did not use instruments capable of examining such a relationship. The school provided the institutional setting for learning support, while the village office and local authorities facilitated cooperation on environmental activities.

Realistic objectives are critical. Participating learners received additional learning opportunities, while village partners took part in documented environmental education and cleaning activities. Sustained outcomes would require repeated activities and arrangements that continue after university students complete their placement. The article therefore distinguishes immediate outputs from possible long-term effects throughout its analysis. It is also important to distinguish the groups involved: students who attended tutoring cannot automatically represent all children in the village, and residents who joined a clean-up cannot represent every household. These limits should guide interpretation of the program's contribution.

Rationale, Empowerment Framework, and Program Contributions

Community empowerment regards residents and partner organizations as stakeholders who possess relevant experience, needs, and resources. In education, universities can support supplementary learning through the skills of mathematics education students. In environmental matters, universities can facilitate discussions about local conditions and model cooperative cleaning practices. Both contributions are more likely to match local needs when they build on existing assets rather than impose activities detached from the community.

Practical starting points include the presence of a school, village government support, learners' willingness to participate, and established forms of mutual assistance. Tanjung and colleagues suggest that environmental knowledge should be considered together with facilities and behavioral intentions, since educational information alone does not necessarily produce enduring cleanliness practices (Tanjung & Matsumoto, 2024). Świątkowski and colleagues distinguish observed pro-environmental behavior from reported attitudes or intentions, a crucial methodological consideration when assessing programs primarily through activity documentation (Świątkowski & Butera, 2024). Research by Qomariyah and colleagues on community-based waste management illustrates that strengthening a local management structure is a separate task that follows training or outreach (Qomariyah & Pamungkas, 2022). Rodriguez and colleagues further highlight potential

links among student learning, community participation, and sustainability goals through planned service activities (Rodriguez & Raya, 2024).

The contribution of this article is not an effectiveness test that was never conducted, but an accountable academic description of two complementary services undertaken with school and village partners. Specifically, the article aims to describe foundational mathematics tutoring, document environmental education and communal cleaning around the village office, and identify immediate outputs, evidentiary limitations, and follow-up needs. Conceptually, it illustrates how a participatory-descriptive approach can accommodate two distinct agendas without conflating their success indicators. The tutoring component concerns pedagogical interaction and opportunities to practice; the environmental component concerns collective communication, participation, and the condition of the cleaned area during implementation. Practically, the article proposes a minimal documentation and evaluation framework that future teams can apply. A strong community engagement account should connect identified needs, implemented actions, documented results, and justified recommendations rather than merely present activities or photographs.

The paper's originality lies in the combination of programs and reflective analysis of their implementation, rather than in the invention of a new teaching method. It illustrates how two forms of community service can be coordinated within one village while retaining distinct indicators for each. Other practitioners may draw practical lessons about the use of documentation, the need to avoid overstating impacts, and the value of follow-up decisions made jointly with partners. Current limitations in evaluation provide a starting point for improving subsequent initiatives.

IMPLEMENTATION METHODS

Participatory Approach and Program Framework

The activities employed a participatory-descriptive approach to document actual practices, partner involvement, forms of interaction, and immediate outcomes supported by narrative accounts and photographs. In environmental management, Hermahayu and colleagues provide an example of how education and community support should be linked to a management work plan so that residents' contributions have clear direction (Hermahayu & Qomariyah, 2024). Anam and Siwiendrayanti show the value of examining community-based waste management in relation to local mechanisms and organizational capacity (Anam & Siwiendrayanti, 2023). Sasmita and colleagues discuss the role of community groups in cleanliness education through participation in social activities, supporting the involvement of village representatives and university students as facilitators (Sasmita & Kuswantono, 2022). He and colleagues emphasize the diversity of participatory approaches and indicators in waste management, indicating that participation should be explained in terms of who was involved and what they actually did (He & Bin-qiang, 2024). Maharani and colleagues also frame everyday waste management activities as environmental learning through community experience, a perspective relevant to the communal clean-up described here (Maharani & Dharma, 2025).

On this basis, the methodological framework comprises five stages: identifying needs using partner information and documented local conditions; coordinating preparations with the school and village government; implementing mathematics tutoring; implementing cleanliness education and collective cleaning; and undertaking descriptive evaluation and reporting. These stages should not be understood as having equally complete administrative records. The source report describes preparation and coordination narratively but does not provide minutes for every meeting or a pre-program needs assessment questionnaire.

The sequence presented here therefore reconstructs implementation from existing records, rather than implying that detailed evidence exists for every meeting. Partnership is a central principle: university students contribute academic knowledge, labor, and communication; the school connects the initiative with learners; and village authorities assist with access and local coordination. This approach seeks to avoid treating the community as a passive recipient of services.

In this article, success refers to the documented implementation and immediately observable outputs.

Improvements in arithmetic proficiency or lasting changes in cleanliness practices are treated as questions for future evaluation. A subsequent report could describe partner involvement more precisely by recording which decisions were made jointly, who proposed priorities, and what resources each stakeholder contributed. This would distinguish participation as mere attendance from participation in shaping program decisions. Although shared decision-making may strengthen continuity beyond the student placement, the level of such involvement was not measured in this project.

Location, Target Groups, and Educational Tutoring Procedures

The program took place in Panenggo Ede Village, Kodi Balaghar District, Southwest Sumba Regency, East Nusa Tenggara Province, Indonesia. The educational target group comprised students from SMPN 1 Kodi Balaghar, while the environmental activities involved village representatives and residents participating in cleaning work. According to the partner confirmation letter included in the supporting records, the stated implementation period was March 15 to May 31, 2026.

Bhattarai and colleagues stress that sustainable behavior has multiple determinants; consequently, community characteristics and institutional support should be considered in program planning (Bhattarai & Knez, 2024). Álvarez-Vanegas and colleagues view service-learning as an educational experience connecting university students' activities with community issues, consistent with the broader social learning aims of PMBP (Álvarez-Vanegas & Volante, 2024). Mardia and colleagues identify both opportunities and challenges of outdoor mathematics learning, providing a useful perspective on tutoring in an open space without assuming that specialized facilities were available (Mardia & Kamid, 2025).

Tutoring sessions comprised introductions, explanations of simple mathematical material, worked examples, arithmetic exercises, opportunities for questions, and direct assistance when students needed additional clarification. The documented topics were addition and subtraction. There is no evidence that sessions formally included algebra, fractions, geometry, educational applications, or a specific named instructional model, and none is added to this account. University students functioned as learning assistants rather than competency examiners. The documentation shows groups of learners working on exercises while facilitators interacted with them. Verified attendance totals, group allocations, session durations, and the complete chronology of meetings were not available, so the description is deliberately limited to recorded details.

For future replication, these details should be entered into an activity log alongside learning materials and a short assessment approved by the school. Language and examples are particularly important when tutors come from a university setting. Before a session, facilitators should ensure that their mathematical terminology is consistent with classroom practice and students' level of understanding. Such alignment does not necessarily require expensive equipment, but it does require attention to whether learners comprehend the steps used in a solution. Support should be adjusted for students who continue to struggle without embarrassing them in front of their peers. These are pedagogical recommendations for future implementation, not claims about procedures documented in the current project.

Cleanliness Education, Documentation, and Descriptive Evaluation

The environmental component combined communication about the importance of a clean environment, coordination with village representatives, and collective cleaning around the village office. It linked two aspects of community education: accessible explanation and visible demonstration. According to the documentation, cleaning activities involved collecting scattered litter and tidying the surrounding area. No waste sorting equipment or waste processing system is assumed where it was not reported.

In mathematics education, Söderström and colleagues examine how learners perceive the usefulness of feedback. Methodologically, their findings illustrate why responses observed during a session should not be treated as equivalent to formal assessment results (Söderström & Granberg, 2024). Stovner and colleagues explore instructional situations in which substantial mathematical feedback arises, suggesting that records of interactions between university tutors and learners could be strengthened by structured observations (Stovner & Nortvedt, 2021). For environmental cleanliness, Zhang documents the complexity of influences on waste

sorting, demonstrating why one clean-up event cannot automatically establish changes in disposal behavior (Zhang, 2023). Konstantinidou and colleagues similarly emphasize the need to examine specific attitudes and practices related to reducing and separating waste rather than inferring them from attendance alone (Konstantinidou & Tsantopoulos, 2024).

The evaluation therefore focused on implementation, visible responses, field photographs, and consistency between activities and program objectives. The evidence base consisted primarily of the final report, activity photographs, the approval page, and a confirmation letter from the village partner. Photographs support the conclusion that learning and cleaning activities occurred; they do not provide accurate counts of participants, quantities of collected litter, or levels of mathematical proficiency.

Comparable before-and-after photographs taken from identical positions were not systematically documented, so changes in environmental condition could not be quantified. Complete attendance records, pre- and post-assessment scores, standardized observation sheets, waste-volume measurements, and follow-up assessments were likewise unavailable. Evaluation was therefore descriptive and distinguished directly documented activities from observers' impressions and proposals for future programming.

This distinction is a matter of accountability, not a negative judgment about the efforts of students and partners. Future educational programs should define observable learning indicators before implementation, such as accurate arithmetic operations and the ability to explain a solution. Environmental indicators might include cleaned locations, partner involvement, or an agreed maintenance schedule. The two sets of indicators should not be combined into one composite score because their aims, target groups, and observation methods differ. A simple evaluation framework is valuable when procedures are clear and can be implemented consistently by the school and village government.

Implementation Results

Implementation of Foundational Mathematics Tutoring

The available narratives and photographs document mathematics tutoring involving students of SMPN 1 Kodi Balaghar and university students serving as learning assistants. Activities focused on addition and subtraction exercises, worked examples, repeated explanations, and direct assistance to learners who needed support. Photographs show students learning together in an open space with university students nearby. This evidence establishes that supplementary tutoring was provided and direct interaction was possible, but it does not provide individual numeracy scores. Hidayat and colleagues review benefits and implementation considerations of peer tutoring in mathematics; their work helps contextualize group interaction, although the present initiative is better described as university student-led tutoring rather than a peer-tutoring experiment (Hidayat & Shukeri, 2023). Widad and colleagues describe community tutoring as a setting where children can interact and develop interest in learning, although their findings relate to a different location (Widad et al., 2022).

Amanda and colleagues describe a community initiative in which tutoring provided educational activities in a relatively flexible atmosphere, but its outcomes cannot be generalized to this village (Amanda & Lasari, 2024). Fauzi and colleagues similarly document free tutoring as an educational service coordinated with local stakeholders (Fauzi & Islamiyah, 2024). Arrahim and Ratnasari note that active interaction in mathematics peer tutoring requires deliberate strategies and group organization rather than simply placing a facilitator among participants (Arrahim & Ratnasari, 2023).

The most defensible immediate benefit of this program is that participating students received additional practice and attention. Findings are presented descriptively for two reasons. First, official attendance records do not establish the number of unique participants at each session. Second, no pretest, posttest, or collection of graded student work is available from which to calculate average learning gains. Although the photographs document students' participation, appearing in an image is not an indicator of mastery. Statements about increased motivation must also be treated cautiously: visible engagement and willingness to participate may be described, but a change in motivation requires measurement at different time points.

Consequently, this paper reports no success percentages, effect sizes, or statistical tests. A practical strength was the opportunity for close interaction between tutors and learners. An important limitation is the absence of structured records identifying particular learning difficulties and the type of support each student received. This distinction avoids assigning more evidentiary weight to the documentation than it can support. The term "implemented" is justified by photographs and activity narratives, whereas "improved" would require comparable baseline and follow-up observations. A future results table could separately describe indicators, sources of evidence, implementation status, and unmeasured outcomes. Such a format would enable readers to recognize that an activity can be successfully delivered even when its effectiveness has not yet been demonstrated.

Learning Interactions, Instructional Setting, and Immediate Outputs

The tutoring photographs depict a learning atmosphere different from a conventional classroom. University students worked with groups of learners, provided time for exercises, and remained close enough to respond to questions. The open-air setting reflects the use of available facilities rather than a purpose-built classroom or sophisticated equipment. This use of simple local resources facilitated organization of the activity within the conditions available on site.

Outdoor arrangements also deserve consideration in future programs, including noise, weather, seating comfort, and tutors' ability to observe all students' work. Lindström-Sandahl and colleagues show that numeracy interventions targeting learners at risk require systematic planning to determine the level of support and assess progress (Lindström-Sandahl & Danielsson, 2024). Gortazar and Hupkau demonstrate that mathematics tutoring programs for vulnerable students can be evaluated with rigorous designs; however, evidence from such studies cannot be transferred directly into a claim of effectiveness for this local initiative (Gortazar & Hupkau, 2024). Kusuma and colleagues examine tutoring and learning motivation, reminding activity observers not to equate temporary participation with measured improvement in motivation (Kusuma & Alwi, 2024). Asare discusses links between peer support, teacher-student relationships, and mathematics self-efficacy, offering a possible direction for attitude measures in subsequent programs (Asare, 2025).

Existing records support the conclusion that supplementary learning sessions took place and students practiced mathematics; they do not establish improvement in arithmetic proficiency for every participant. The interactions observed also illustrate the tutor's role in mediating between prepared material and students' experiences. Future facilitators could record exercise types, learners' initial approaches, the questions they ask, and subsequent explanations. A brief record of this kind may be more informative than photographs alone because it reveals the sequence of instructional support. Dated attendance records could likewise help the school review participation frequency. These are proposed methodological improvements and should not be confused with procedures documented for the current initiative.

The results are consequently framed as a documented tutoring practice rather than as evidence of statistically significant improvement, high effectiveness, or achieved numeracy gains. One practical avenue for development is to record questions students ask most frequently, with brief notes about errors, possible causes, and support provided. With school approval, these records could help subsequent tutors build on previous sessions. Educational continuity would be stronger if future activities were connected to teachers' observations of classroom learning needs rather than depending entirely on the visiting university team.

Environmental Cleanliness Education and Collective Cleaning Around the Village Office

The second program consisted of communication about the importance of maintaining cleanliness and collective cleaning around the Panenggo Ede Village office. Meeting photographs show university students coordinating with village representatives. Subsequent photographs show students in program attire participating in outdoor cleaning. Together these records document two immediate outputs: communication concerning cleanliness and physical action to clean the area. Both activities can be described as implemented, but the available photographs cannot establish whether cleanliness behavior changed after the engagement period. Poague and colleagues show that water, sanitation, and hygiene are associated with the quality of

educational environments, placing cleanliness messages in a broader context than the appearance of a location (Poague & Anthonj, 2022). Sangalang and colleagues provide an example of sanitation and hygiene interventions assessed through changes in knowledge and practices, which offers a methodological comparison not applied in PMBP (Sangalang et al., 2022). Ismail and colleagues emphasize that school-based hygiene programs should be examined through both knowledge and behavioral indicators while considering the quality of supporting evidence (Ismail & Abdul Rahim, 2024). Erkoca and colleagues also illustrate how educational hygiene practices can be investigated using measurements planned before and after an intervention (Erkoca & Çal, 2025).

The implementation records contain no figures for the number of bags of litter, the weight of collected waste, categories of waste, or the surface area cleaned. Nevertheless, communal cleaning includes an observable element of modeling: university students did not merely communicate recommendations but actively took part in collective work. This aligned educational messages with practical action. At the same time, attributing cleanliness problems entirely to individual behavior would overlook infrastructure, collection arrangements, and waste governance. The report does not explain how the collected material was sorted or transported to a disposal or processing site.

Accordingly, the article describes litter collection and cleaning, without claiming that a sustainable village waste management system was established. The immediate contribution is best understood as cleaning the area at the time of the activity and creating an opportunity for communication with partners. Comparable before-and-after photographs, notes on area covered and waste types, and an identified post-project maintenance coordinator would provide stronger evidence in subsequent initiatives. These recommendations are distinct from activities already completed. Area maintenance could also function as social learning when residents discuss the reasons for cleaning and the distribution of responsibilities. Although follow-up data were not collected, the documentation establishes that explanation and practice were incorporated into the same program. Future work could introduce feasible indicators, such as lists of priority areas and inspection schedules, recorded consistently by mutually agreed coordinators.

Documentation, Coordination, and Evidentiary Boundaries

Relevant PMBP documentation consists of photographs of mathematics tutoring, group photographs with learners, meetings between students and village representatives, communal cleaning around the village office, the report approval page, and a village partner confirmation letter. Together, these materials demonstrate cooperation among university students, the school, and local officials.

These records do not all serve the same evidentiary purpose. Photographs show activities, whereas the partner letter supports information about formal implementation and the reported period. Narrative accounts help establish the general sequence and intended purpose, but discrepancies in dates, personnel numbers, or location labels must still be checked. Ismail and Sutarni link cooperative learning approaches to mathematics outcomes and motivation, indicating that educational evaluation should consider participants' learning rather than only the completeness of activity documentation (Ismail & Sutarni, 2025). Bick and colleagues demonstrate how school environmental interventions can examine health-related outcomes and attendance, thereby underscoring the value of explicit indicators for more intensive cleanliness programming (Bick et al., 2024). Salsabila, Purnomo, and Jovita emphasize public participation in waste management, supporting the need for documented partner agreements if environmental work is to extend beyond isolated events (Salsabila & Jovita, 2021). Maulana and colleagues discuss community waste management education, illustrating how educational outcomes can be specified when suitable instruments and records are available (Maulana & Septiana, 2024). Mulyani and Andriani address a participatory learning model for rural waste management literacy, pointing to opportunities to develop a one-off initiative into continued mentoring (Mulyani & Andriani, 2026).

The reportable findings are the two activities and their immediate outputs, not quantitative differences in achievement. A further finding concerns inconsistent administrative information within the source records. The approval page provides a duration different from that described elsewhere, and the preliminary timetable includes activities before the formal program period. The number of university students mentioned in the

discussion of supporting factors also differs from the number listed on the approval page. These discrepancies should not be silently erased. The article follows location identifiers that are consistent across the approval page and partner letter while identifying administrative details requiring confirmation.

This approach presents outputs that readers can scrutinize and identifies ways to strengthen reporting accountability. Better administrative documentation is not only a publication requirement; it also helps schools and local government share accurate information about activities, target groups, dates, and follow-up responsibilities. Records should be standardized from the planning stage rather than only when preparing the final paper. Activity names, village spelling, team membership, official dates, and partner approvals should be consistent across documents. This reduces the need for later clarification and distinguishes planned events from those actually conducted, an important distinction in community engagement reporting.

DISCUSSION

The Contribution of Tutoring to Opportunities for Understanding Mathematics

Mathematics tutoring in Panenggo Ede provided opportunities for additional practice through direct interaction between university students and school learners. Such practical value should not be immediately translated into higher test scores because the documentation contains no learning outcome measures. In mathematics, attempting a solution, making errors, asking questions, and receiving a different explanation are all part of developing conceptual understanding. Tutor responses should be sensitive to learners' mathematical thinking rather than limited to supplying correct answers.

Ramaila reviews cognitively guided instruction and emphasizes the importance of aligning pedagogical decisions with students' actual responses (Ramaila, 2025). Asare discusses teacher-learner relationships, collaborative learning, and self-efficacy, suggesting that supportive tutoring environments may matter for students' mathematics experiences (Asare, 2025). Ernst and colleagues highlight how feedback is interpreted in relation to recipients' perceptions of their own ability, giving a reason to avoid remarks that diminish students when they make mistakes (Ernst & Voss, 2025). Cameron finds that accessible feedback and opportunities to try again relate to students' learning experiences and self-efficacy in a different educational setting (Cameron, 2025). Weyers and colleagues highlight the significance of teachers noticing learners' mathematical thinking, pointing to a potential area of professional development for university student tutors (Weyers & Santagata, 2024). Seen in this light, the program's clearest contribution was an opportunity for closer pedagogical interaction, which could become more meaningful if learning progress were assessed systematically.

A distinction must be drawn between an evaluated learning intervention and an additional learning activity. A claim of demonstrated effectiveness requires specific objectives, clear instructional design, and evidence of change attributable to the intervention. Supplementary activities may provide valuable services even without such evidence, but indicators of implementation cannot substitute for effectiveness measures. Future teams, together with teachers, could select five to ten pairs of arithmetic problems of comparable difficulty, record students' initial strategies, and compare their approaches after tutoring. If formal testing is inappropriate, brief oral assessments or students' explanations of solutions may still support reflection provided they are consistently documented. This would give learners a voice and reduce reliance on facilitators' impressions.

Tutoring should also align with curriculum expectations to prevent confusion. If the school has already introduced a particular method for explaining subtraction, visiting tutors should become familiar with that method before presenting alternatives. Different valid strategies can stimulate productive discussion, but without adequate explanation they may undermine confidence. Consultation with teachers before sessions would help determine priorities, select examples, and establish modest objectives achievable within the program period.

Scaffolding, Feedback, and Responsible Learning Engagement

Effective mathematics tutoring requires balanced assistance: students should not face difficulties without support, but neither should they receive complete solutions before having an opportunity to try. Tutors can

locate the step causing difficulty, pose guiding questions, demonstrate an example where necessary, and gradually withdraw assistance as students become more independent. Although the PMBP report describes step-by-step explanations, the available documentation cannot establish that a validated model of adaptive scaffolding was implemented. Dignath and colleagues highlight the role of monitoring learning processes in supporting self-regulated learning, informing the development of comprehension-checking questions (Dignath & Fabriz, 2023). Engelbrecht and Borba examine changing spaces and technologies in mathematics education, but the immediate priority in this village setting is the quality of face-to-face interaction and access to simple learning resources (Engelbrecht & Borba, 2024). Geisler and Rolka discuss affective dimensions of mathematics learning, suggesting that pressure and self-confidence may interact with academic tasks even though they were not assessed in PMBP (Geisler & Rolka, 2023). Evans and Jeong show how representations of conceptual relationships can contribute to assessment for learning, informing the idea that tutors should check understanding of operations rather than procedural recall alone (Evans & Jeong, 2023). Öztürk and colleagues compare forms of feedback in self-regulated learning, indicating that explanation is more valuable when learners can use it to improve subsequent steps (Öztürk & Türker, 2025).

Accordingly, graduated assistance, dialogue, and reflection can be discussed as plausible pedagogical mechanisms rather than outcomes measured by this particular program. Mathematics education students could prepare questions at different levels of support. For addition, an initial question might ask learners to identify two quantities being combined before choosing a calculation strategy. For subtraction, the tutor might ask what is known and what is being removed or compared. These are proposals for future practice, not verbatim transcripts of the reported sessions. Concrete objects, simple drawings, and everyday contexts could also be introduced with attention to local culture and available resources. Teacher involvement in planning would help align supplementary tasks with the formal curriculum. Brief records of students' steps before assistance, assistance provided, and steps after assistance would offer process-level evidence currently missing from the documentation.

Monitoring the learning process could also promote university students' professional reflection. When a learner answers incorrectly, tutors need to distinguish a computational slip from a conceptual misunderstanding. The two difficulties do not necessarily call for the same response. A procedural error may require practice with a specific step, whereas a conceptual difficulty may require a different representation. Such observations can constitute research findings only when collected systematically; at present, they are recommendations for improving the quality of future tutoring.

Environmental Cleanliness Education as Collective Action and Behavioral Learning

Environmental cleanliness education around the village office has two potential levels of contribution that need to be distinguished. The first is immediate: coordination meetings, communication of cleanliness messages, and the cleaning completed during communal work. The second concerns the possible development of sustained cleanliness habits, which would require maintenance, appropriate facilities, shared social norms, and monitoring over time. The records support the first level but do not measure the second. Galeotti and colleagues review environmental education through observed behavior and social norms, illustrating why behavioral measures should be distinguished from participants' self-reported responses (Galeotti & Mantilla, 2024). Lisboa and Gómez-Román discuss the complex psychological factors related to adolescents' pro-environmental behavior, making it inappropriate to treat a single educational session as sufficient to explain lasting behavior change (Lisboa & Gómez-Román, 2024). Budiyarto and colleagues discuss both the opportunities and management challenges of waste banks in Indonesia, indicating the need to link cleaning activities to locally feasible waste handling (Budiyarto & Ross, 2025). Bang and colleagues study waste sorting among university students in relation to social factors and facilities, suggesting that behavioral education should be matched by conditions that enable action (Bang & Ngan, 2025). Alam and colleagues highlight the influence of environmental awareness, social norms, and sorting facilities on community behavior in their study, showing why cleanliness cannot be treated solely as an individual responsibility (Alam & Ahsan, 2025).

The PMBP activities therefore represent an entry point for connecting education with collective action, not

proof that the village waste management system has been transformed. Mutual assistance should also be discussed proportionately. University students' participation in cleaning gave an example of the behavior being encouraged and created opportunities for informal communication with village representatives and residents. However, efforts dependent entirely on visiting students may not continue after the placement. Future planning could therefore include agreements about responsibility for particular areas, maintenance days, collection facilities, and safe and lawful disposal arrangements. Such decisions should be negotiated with partners rather than imposed by the university team.

In academic reporting, photographs can establish that collective action took place, whereas habits require follow-up observations, activity logs, or periodic reports from responsible individuals. These procedures would allow evaluation to distinguish short-term physical improvements from more enduring changes in management. Future educational materials could distinguish recyclable waste, residual waste, and safe handling practices in accordance with facilities genuinely available. The program should not promise that all waste will be recycled when collection and processing arrangements are absent. Realistic information improves credibility. Communal cleaning should also be conducted safely, including appropriate protective equipment and avoidance of potentially hazardous materials.

Village-School-University Collaboration as a Basis for Continuity

The strength of the two activities lies in the involvement of institutions with different roles. The school has direct knowledge of students' learning needs and participation; village authorities understand environmental conditions and local coordination; and the university contributes students' skills and its responsibility for community engagement. This arrangement demonstrates the potential for local partnerships, although continued collaboration cannot be inferred solely from a letter confirming that activities were completed.

Suryawan and Lee show that residents' attitudes toward waste management policies differ, indicating that follow-up activities should be adapted to local preferences and circumstances (Suryawan & Lee, 2024). Seroney reviews school-based water, sanitation, and hygiene initiatives with attention to preparedness and sustainability, demonstrating the need for procedures that local institutions can maintain (Seroney, 2025). Niba and colleagues describe community education and waste management organizations as part of empowerment work, highlighting the importance of local management capacity after outreach activities (Niba & Alisalman, 2026). Adarlo and Delos Reyes discuss links between service-learning and the Sustainable Development Goals, supporting the principle that student service should produce reciprocal benefits for communities (Adarlo & Delos Reyes, 2024).

In this framework, the continuity of PMBP depends on agreements, assigned responsibilities, and shared monitoring rather than arising automatically from a completed service activity. One feasible next step would be to identify a liaison at the school and another at the village office for coordination after the university students depart. Teachers could determine arithmetic topics needing further practice, while village officials could identify places requiring maintenance. The university could then plan follow-up visits or communication according to its resources.

Such arrangements would allow new facilitators to use information from earlier periods rather than repeating the entire needs assessment. They are presented here as recommendations, not accomplished results. Keeping a clear distinction between what occurred and what is proposed respects local partners and reinforces the authors' accountability.

Partnership planning could include a brief post-program evaluation meeting to discuss immediate benefits, implementation challenges, and next steps. Partners' responses could help establish priorities without complicated questionnaires. Written minutes would give the university and village a common point of reference and reduce dependence on the recollections of individual students, who may change in subsequent program cycles. A formal jointly documented evaluation process of this type was not identified in the present report.

Evaluation Limitations and Priorities for Program Improvement

Accountable community engagement reporting must distinguish implemented activities, verifiable immediate outputs, and impacts that remain unmeasured. For tutoring, the evidence consists of photographs of interactions and descriptions of exercises; baseline proficiency, individual work samples, and follow-up assessments are unavailable. For cleanliness education, meetings and cleaning work are documented, but quantities of waste, repeated site inspections, and later behavior among residents are not. A descriptive presentation is therefore not merely a stylistic preference; it follows from the nature of the evidence.

Rahmawati and Pratiwi discuss community participation in waste management, providing a reason to assess not only attendance but also the depth of partner involvement (Rahmawati & Pratiwi, 2025). Marta and Usrotin describe community empowerment through a waste bank, illustrating how assigned organizational responsibilities become important when environmental work expands beyond communal cleaning (Marta & Usrotin, 2022). Suryawan and Lee show the value of identifying residents' preferences regarding waste management alternatives, implying that subsequent decisions should be informed by genuine village consultation (Suryawan & Lee, 2025). Fauzan and colleagues emphasize the development of tutoring based on learning needs and motivation, reinforcing the view that simple evaluation should guide appropriate support rather than merely produce reporting figures (Fauzan & Nadhirah, 2025). Nofita, Sujarwanto, and Masitoh present an example of tutoring-related mathematics materials and their feasibility assessment, which could inform the future development of numeracy resources for tutors and families (Nofita et al., 2021).

Overall, the article treats limitations as matters for transparent evaluation rather than obscuring them behind generic claims of success. Practical improvement can begin with simple tools that do not overburden local partners. Before tutoring, the team could record the agreed target group, learning objectives, and several grade-appropriate arithmetic tasks. During delivery, tutors could document attendance, dates, forms of assistance, and difficulties encountered. Afterwards, teachers and students could revisit comparable exercises without pressuring learners to obtain predetermined results.

For environmental work, the team and village representatives could photograph the same locations before and after cleaning, record visible waste types, and agree on a follow-up inspection date. Simple indicators are useful only when consistently applied, mutually agreed, and proportionate to service objectives. The program's duration and team membership should also be verified before journal submission because the underlying records contain discrepancies. Such steps would allow reporting quality to develop alongside the quality of community engagement. Evaluation requirements should remain proportionate to program scope.

Small-scale engagement programs should not automatically employ complex statistical methods when their design, duration, or participant numbers do not justify them. Structured observation, records of completed exercises, and brief partner reflections may be sufficient to describe implementation and immediate improvements. However, causal claims about changes in competence or behavior require stronger evidence. Determining the intended type of claim in advance will help teams select appropriate instruments.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Community Service Based on Local Potential (PMBP) initiative in Panenggo Ede Village, Kodi Balaghar District, Southwest Sumba Regency, illustrates how collaboration among universities, schools, and village authorities can facilitate community-oriented activities responding to educational and environmental cleanliness needs. Using a participatory-descriptive approach, the program delivered two activities: foundational mathematics tutoring for students at SMPN 1 Kodi Balaghar and environmental cleanliness education through coordination and communal cleaning around the village office. Both activities demonstrate how university students' skills and locally available resources can support supplementary educational services and practical action to maintain the shared environment.

In the educational component, students received opportunities to work on basic arithmetic, particularly addition and subtraction, through step-by-step explanations, practice exercises, questions and answers, and direct interactions with university student tutors. These activities underscore the value of an additional learning space in which assistance can be provided as needs arise. In the environmental component, educational messages were paired with communal cleaning, involving university students and village partners in maintaining a shared public facility. Although both programs were implemented and documented, improved numeracy and lasting changes in cleanliness practices cannot be confirmed because baseline and follow-up measures, as well as longer-term monitoring, were not available. The initiative's demonstrated contribution is therefore the delivery of collaborative educational support and collective environmental action, which provides a foundation for more structured, measurable, and sustainable future programs.

Recommendations

Future programming should strengthen cooperation among Universitas Insan Budi Utomo, the school, village authorities, and residents through more systematic planning and clearly assigned responsibilities. For tutoring, subsequent programs should identify students' initial competence, prepare numeracy materials based on actual learning needs, organize periodic learning support, and conduct appropriate assessments before and after activities to evaluate progress objectively. Teachers should be involved in determining priority material and designing instructional assistance so that supplementary sessions remain consistent with classroom learning. In this way, the program could produce useful information about learning development, rather than providing additional study time alone.

For environmental cleanliness education, future activities should go beyond one-time cleaning and develop practical arrangements for sustained area maintenance. Village authorities and residents could agree on communal cleaning schedules, priority areas, suitable waste collection facilities, and responsibility for routine upkeep. Documentation should include comparable before-and-after photographs, verified attendance counts, and periodic monitoring of outcomes. The university team should also improve administrative consistency by recording dates, team membership, participants, and activities accurately. Better coordination and evaluation may allow both initiatives to evolve from student placement activities into continuing partnerships between the university and the local community.

Ethical Considerations

The source manuscript reports community engagement activities involving school students and village partners. It does not provide an ethics committee approval number or documentary details of participant consent. The authors must confirm the applicable ethics review, permissions, consent or assent arrangements, and any approval/exemption status before submission.

Conflict of Interest

Declaration pending author confirmation. The authors should disclose any actual or potential conflicts of interest or explicitly confirm that none exist.

Data Availability

The manuscript draws on an activity report, field photographs, administrative documentation, and a village partner confirmation letter. A public data repository or access link is not identified in the source document. The authors must confirm whether supporting materials may be shared, subject to the privacy and permissions of students and community partners.

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