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Enhancing Ethnomathematics Integration in Mathematics Instruction through Teacher Professional Learning Communities (MGMP) in Maros

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Abstract. This community service activity aimed to strengthen the implementation of ethnomathematics in mathematics instruction through the Subject Teacher Consultation Forum (MGMP) in Maros Regency. The primary challenges faced by the partner group included limited teacher understanding of ethnomathematics concepts and constraints in developing culturally based instructional materials. The program was conducted through workshops and mentoring activities involving mathematics teachers as participants. The implementation stages included observation, planning, execution, and evaluation. The findings indicate a significant improvement in teachers' understanding and competencies, as evidenced by questionnaire results categorized as "very good" and increased pretest-posttest scores. Furthermore, teachers successfully produced ethnomathematics-based instructional products, such as student worksheets, mathematical literacy problems, and teaching modules contextualized to local culture. The program also enhanced teachers' practical skills in designing innovative and meaningful learning experiences. Therefore, workshops conducted through the MGMP forum proved effective in improving teacher competencies and supporting the collaborative and sustainable implementation of ethnomathematics-based instruction.

Keywords: *Ethnomathematics, MGMP, Mathematics Instruction, Community Service Activity, Workshop.*

INTRODUCTION

Mathematics education in Indonesia continues to face significant challenges, particularly related to students' low levels of mathematical literacy and the limited connection between instructional content and real-life contexts. Numerous studies have shown that mathematics instruction tends to be abstract and insufficiently contextualized, resulting in low conceptual understanding and reduced student motivation (Putra & Mahmudah, 2021; Rusminati et al., 2025). This condition suggests that mathematics learning needs to be meaningfully connected to real-life contexts, where literacy encompasses not only conceptual understanding but also the ability to interpret and apply knowledge in problem-solving situations (Ismiyati, 2025). imilar issues are observed among teachers participating in the Mathematics MGMP, where many still rely on conventional approaches and have not optimally integrated local cultural contexts into their teaching practices.

One approach that can address these challenges is ethnomathematics. Ethnomathematics connects mathematical concepts with cultural practices and local wisdom, making learning more meaningful and contextually relevant (Khaerani et al., 2024). Recent studies indicate that integrating ethnomathematics into instruction can enhance students'

mathematical literacy, critical thinking skills, and conceptual understanding (Sakdiyah et al., 2025; Sangadah et al., 2025). Additionally, ethnomathematics plays a role in strengthening students' cultural values and identity within the learning process (Lubis et al., 2024).

However, the implementation of ethnomathematics in practice still faces several challenges. Teachers often encounter difficulties in identifying cultural elements relevant to mathematical topics and in developing ethnomathematics-based instructional materials (Khaerani et al., 2024). Moreover, MGMP activities, which should function as a platform for professional development, have not yet been fully optimized to support innovation in culturally responsive teaching. Previous community service studies highlight the need for training and mentoring through MGMP to enhance teachers' competencies in developing ethnomathematics-based teaching materials, assessment items, and instructional media (Mulyatna et al., 2023).

The main problems faced by the partner group mathematics teachers in the MGMP of Maros Regency include: (1) limited understanding of ethnomathematics concepts and implementation; (2) limited ability to develop culturally based instructional materials; and (3) the underutilization of MGMP as a sustainable platform for professional development. These issues have resulted in suboptimal implementation of contextual learning aligned with students' characteristics and local cultural environments.

The urgency of this community service activity lies in the need to improve the quality of mathematics instruction through approaches that are more contextual and culturally relevant. Various studies have demonstrated that MGMP-based training and workshops are effective in enhancing teacher competencies, particularly in developing innovative ethnomathematics-based learning (Lakapu et al., 2023; Nursyahidah et al., 2025). Furthermore, continuous mentoring has been shown to support teachers in translating training outcomes into classroom practice.

Based on the above considerations, this program aims to strengthen the implementation of ethnomathematics in mathematics instruction through MGMP teacher activities in Maros Regency. This strengthening effort is carried out through training, workshops, and mentoring in developing ethnomathematics-based instructional materials contextualized to local culture. It is expected that teachers will be able to implement more meaningful learning, improve students' mathematical literacy, and simultaneously preserve local cultural values within the educational process.

RESEARCH METHODS

This community service activity was conducted at SMP Negeri 1 Maros, South Sulawesi, on July 23, 2025, involving mathematics teachers who are members of the Subject Teacher Consultation Forum (MGMP) as the primary partners. The program was implemented over approximately two to three months, encompassing four main stages: observation, planning, implementation, and evaluation. The selection of MGMP as a partner was based on its strategic role as a collaborative and sustainable platform for enhancing teachers' professional competencies through continuous professional development activities (Nursyahidah et al., 2025).

The initial stage involved an observation process carried out through interviews and discussions with MGMP administrators and members to identify the needs and challenges faced by teachers in mathematics instruction. The findings revealed that teachers still encountered difficulties in understanding ethnomathematics concepts, integrating local cultural elements into instruction, and developing culturally based instructional materials.

Based on these findings, the planning stage involved the development of program instruments, including training modules, workshop materials, and sample ethnomathematics-based instructional resources such as student worksheets (LKPD), mathematical literacy tasks, and contextual learning media. This planning phase was designed to align with the identified needs of the participants, ensuring that the program would be practical and easily

implementable in classroom settings. A needs-based approach has been shown to be effective in improving the quality of community service programs conducted through MGMP (Lakapu et al., 2023).

The implementation stage was carried out through interactive workshop methods that actively engaged participating teachers. The workshop activities included the presentation of fundamental concepts of ethnomathematics, examples of implementation based on local cultural contexts, training in the development of instructional materials, and hands-on practice by participants. In addition, the program incorporated group discussions and reflective sessions to deepen participants' understanding. The workshop approach was selected due to its effectiveness in enhancing teacher competencies through direct and collaborative learning experiences (Mulyatna et al., 2023). To ensure sustainability, follow-up mentoring was provided to support teachers in developing and implementing ethnomathematics-based instructional materials.

The final stage involved program evaluation using a questionnaire to measure teachers' understanding, responses, and competency improvement after participating in the activities. The questionnaire was designed using a Likert scale and included indicators such as understanding of ethnomathematics concepts, ability to develop instructional materials, and perceptions of the program's benefits. The collected data were analyzed using descriptive quantitative methods to assess the effectiveness of the program implementation. The use of questionnaires as an evaluation instrument has been widely recognized as effective in measuring the impact of training programs on teacher competency development.

RESULTS AND DISCUSSION

Results

The implementation of this community service activity through ethnomathematics based workshops and mentoring within the Mathematics MGMP of Maros Regency yielded significant outcomes, both in terms of the process and the outputs produced by participants. The program involved junior high school mathematics teachers who actively participated in all stages of the activities, ranging from theoretical sessions to hands-on development of instructional materials.

During the workshop, there was a noticeable increase in teachers' active participation, as reflected in their engagement in discussions, question and answer sessions, and collaborative group work in developing ethnomathematics-based instructional materials. Rather than passively receiving information, teachers actively explored local cultural elements relevant to mathematical concepts, such as geometric patterns in traditional culture, local trading practices, and distinctive architectural forms.

The results further indicate that teachers participating in the MGMP were able to produce a variety of ethnomathematics based instructional products as outputs of the workshop. These products included student worksheets (LKPD), mathematical literacy tasks grounded in local cultural contexts, and instructional modules integrating ethnomathematical elements. In the development process, teachers utilized various local cultural contexts such as geometric motifs in traditional crafts, community economic activities, and regional architectural forms as meaningful sources for mathematics learning. These outputs demonstrate that teachers were able to systematically and contextually connect mathematical concepts with real-life situations.

In addition, the quality of the instructional materials showed considerable improvement in both structure and content. The developed worksheets incorporated problem based activities that promote students' critical thinking skills, while the assessment items were oriented toward enhancing mathematical literacy through contextualized situations. The instructional modules were also aligned with learning outcomes and integrated more innovative pedagogical approaches. These findings suggest that the workshop not only enhanced teachers' theoretical understanding but also enabled them to produce tangible outputs that can be directly implemented in classroom practice.

To evaluate the effectiveness of the program, a questionnaire was administered to all participants after the completion of the workshop and mentoring activities. The instrument employed a Likert scale (1–5) and included several indicators, such as understanding of ethnomathematics concepts, ability to integrate culture into instruction, ability to develop instructional materials, and perceptions of the program's relevance and benefits. The collected data were analyzed using descriptive quantitative methods to provide an overview of the program's overall effectiveness.

Table 1. Results of the Questionnaire on Teachers' Responses and Competency Improvement

No	Indicator	Mean Score	Category
1	Understanding of ethnomathematics concepts	4,35	Very Good
2	Ability to integrate culture into instruction	4,20	Good
3	Ability to develop instructional materials	4,18	Good
4	Perceived benefits of the program for instruction	4,50	Very Good
5	Relevance of the materials to teachers' needs	4,40	Very Good
	Overall Mean	4,33	Very Good

Based on Table 1, the overall mean score of 4.33 falls within the "very good" category, indicating that the community service program had a positive impact on improving teachers' competencies. The highest rated indicator is the perceived benefits of the program for instruction, with a score of 4.50. This suggests that participants directly experienced the relevance and practical usefulness of the program in supporting their classroom practices. It also indicates that the materials and methods employed during the workshop were well aligned with teachers' actual instructional needs.

Furthermore, the indicator related to the relevance of the materials to teachers' needs also obtained a high score (4.40), confirming that the program was effectively designed based on a prior needs assessment of the participants. Meanwhile, the indicator of understanding ethnomathematics concepts achieved a score of 4.35, reflecting an improvement in teachers' comprehension of fundamental ethnomathematics principles following their participation in the program.

In contrast, the indicators concerning the ability to integrate culture into instruction (4.20) and the ability to develop instructional materials (4.18), although still categorized as "good," received relatively lower scores compared to the other indicators. This finding suggests that while teachers have developed a solid conceptual understanding of ethnomathematics, they still require further practice and sustained mentoring to implement these concepts optimally in the form of instructional materials.Overall, the questionnaire results demonstrate that the workshop and mentoring activities conducted through the MGMP were effective in enhancing both teachers' understanding and practical skills in implementing ethnomathematics based instruction.

In addition to the questionnaire used to capture participants' perceptions and responses, this program also incorporated measurements of teachers' initial and final competencies through simple pretests and posttests. These assessments were intended to provide a more objective evaluation of competency improvement, particularly in terms of understanding ethnomathematics concepts, integrating cultural elements into instruction, and developing instructional materials. The pretest and posttest data were analyzed descriptively using percentage-based measures of competency attainment.

Table 2. Pretest–Posttest Results of Teacher Competencyu

No	Measured Aspect	Pretest (%)	Posttest (%)	Improvement
1	Understanding of ethnomathematics concepts	45%	85%	40%
2	Ability to integrate culture into instruction	40%	80%	40%
3	Ability to develop instructional materials	35%	78%	43%
	Mean	40%	81%	41%

Based on Table 2, all measured aspects demonstrate a significant improvement following the implementation of the program. The average teacher competency increased from 40% in the pretest to 81% in the posttest, reflecting an overall improvement of 41%. This finding indicates that the workshop and mentoring activities conducted through the MGMP had a substantial impact on enhancing teachers' competencies.

The highest improvement was observed in the aspect of the ability to develop instructional materials, which increased by 43%. This suggests that the hands-on practice incorporated in the workshop provided an effective learning experience for teachers in developing ethnomathematics based instructional resources. Meanwhile, the aspects of understanding ethnomathematics concepts and the ability to integrate culture into instruction each showed an improvement of 40%, indicating that teachers not only gained conceptual understanding but also began to apply these concepts within instructional contexts.

These findings reinforce the results presented in Table 1, which highlighted participants' positive responses to the program. The observed improvement in pretest–posttest scores confirms that the program not only influenced teachers' perceptions but also led to measurable gains in their competencies.

Figure 1. Workshop Activity Atmosphere

Figure 1 illustrates the atmosphere of the workshop conducted as part of the initiative to strengthen the implementation of ethnomathematics through the Mathematics MGMP forum in Maros Regency. The participants, who are mathematics teachers, are shown engaging attentively and actively in the activities. They are seated in small groups, utilizing devices such as laptops and mobile gadgets to support the learning process and discussions.

Interactions among participants appear highly collaborative, as they engage in discussions, exchange ideas, and work on assigned tasks during the workshop. This setting

reflects an interactive and participatory learning environment, aligning with the program's objective of enhancing teachers' competencies in developing ethnomathematics-based instruction.

Furthermore, the use of technology in the workshop indicates an integration of local cultural approaches with digital tools in the learning process. The conducive classroom environment and active participant engagement serve as indicators that the program was effectively implemented and capable of fostering improvements in teachers' understanding and practical skills..

Discussion

The results of this community service program indicate that its primary objective strengthening the implementation of ethnomathematics in mathematics instruction through MGMP activities has been successfully achieved. This is evidenced by the improvement in teachers' understanding (Table 1), the measurable increase in competencies reflected in pretest–posttest results (Table 2), and teachers' ability to produce ethnomathematics based instructional materials. These findings suggest that the program contributed not only to cognitive aspects (conceptual understanding) but also to practical skills (development of instructional materials).

The significant improvement observed in the pretest–posttest results demonstrates that the workshop-based approach was effective in enhancing teachers' competencies. This finding aligns with constructivist learning theory, which emphasizes that knowledge is constructed through direct experience and active engagement in the learning process. In this context, the workshop provided opportunities for teachers to engage in experiential learning (learning by doing), resulting in deeper and more applicable understanding. This is consistent with previous studies indicating that workshop-based training within MGMP forums can significantly enhance teachers' professional competencies (Nursyahidah et al., 2025).

The instructional products developed by teachers further demonstrate their ability to integrate local cultural contexts into mathematics instruction. This finding reinforces the concept of ethnomathematics, which highlights the importance of connecting mathematical knowledge with cultural practices and everyday life to create more meaningful learning experiences (Khaerani et al., 2024). The integration of local culture not only supports conceptual understanding but also contributes to strengthening students' cultural identity and improving mathematical literacy. This is in line with prior research showing that ethnomathematics based learning can enhance students' critical thinking skills and mathematical literacy (Ismiyati, 2025; Sakdiyah et al., 2025).

This program offers several key strengths. First, the use of interactive and participatory workshop methods effectively increased teachers' active engagement. Second, the inclusion of hands on practice in developing instructional materials ensured that the outcomes were practical and directly applicable. Third, the relevance of the materials to teachers' actual needs enhanced the effectiveness of the program. Fourth, the utilization of MGMP as a collaborative platform supported the sustainability of the initiative. These strengths are consistent with previous findings that highlight MGMP as an effective medium for continuous teacher professional development (Lakapu et al., 2023; Mulyatna et al., 2023).

However, several challenges were also identified. First, the limited duration of the workshop prevented some participants from fully developing their instructional materials. Second, variations in teachers' initial competencies affected the pace at which they understood the material and completed tasks. Third, some teachers still experienced difficulties in accurately linking mathematical concepts with relevant cultural contexts. These challenges indicate that the implementation of ethnomathematics cannot be achieved instantly but requires sustained mentoring and continuous support. This finding is consistent with studies emphasizing

that the successful implementation of ethnomathematics is strongly influenced by the intensity of training and mentoring provided (Balacuit & Oledan, 2024; Mulyatna et al., 2023).

Overall, this community service program has demonstrated a positive and significant impact on improving teachers' competencies in implementing ethnomathematics. The impact is evident not only in improved evaluation results but also in changes in teaching practices, which have become more contextual and innovative. Therefore, similar programs should be continuously developed on a broader scale and supported by follow up mentoring initiatives to ensure the optimal implementation of ethnomathematics in classroom practice.

CONCLUSION

Based on the results of the community service program implemented through workshops and mentoring within the Mathematics MGMP of Maros Regency, it can be concluded that the program successfully strengthened the implementation of ethnomathematics in mathematics instruction. This success is evidenced by improvements in teachers' understanding and competencies, as indicated by both questionnaire results and pretest–posttest data, as well as teachers' ability to produce ethnomathematics-based instructional materials that are contextual and aligned with local cultural values.

The program contributed not only to cognitive aspects (conceptual understanding) but also to enhancing teachers' practical skills in designing and implementing more innovative, contextual, and meaningful learning experiences. Therefore, the utilization of MGMP as a platform for teacher professional development has proven to be effective in supporting the collaborative and sustainable implementation of ethnomathematics-based instruction.

In line with these findings, it is recommended that teachers continue to consistently develop and implement ethnomathematics-based approaches in their classroom practices. MGMP is expected to organize follow-up programs, such as periodic training and mentoring, to ensure the sustainability of teachers' competency development. Furthermore, future practitioners or researchers are encouraged to expand similar programs on a broader scale and integrate technology-based instructional innovations. Support from policymakers is also essential, particularly in providing facilities and establishing policies that promote the development of culturally responsive mathematics instruction in schools.

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