



# Integration of West Papuan Culture in Mathematics Learning in Elementary School Classes

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**Abstract.** Mathematics and culture are closely interconnected, so culture has the potential to be integrated into mathematics learning. The teachers play a vital role in integrating culture into their learning practice. This study aims to explore the perceptions and experiences of mathematics teachers in West Papua regarding integrating local culture into their teaching practices. The participants of this study were 76 elementary school teachers in West Papua. The participants completed a questionnaire providing data on their perceptions and experiences of integrating cultural aspects into mathematics learning. More than 50% of participants found integrating Papua's culture into teaching to be either easy or somewhat easy. Additionally, 68.42% expressed that linking mathematics instruction with Papuan culture is essential, while 69.74% highlighted the importance of mathematics textbooks in the context of Papuan culture. However, in terms of practical experience, less than 20% of participants had participated in training focused on integrating local culture into teaching, though 35.53% indicated they had implemented such integration. These findings reflect teachers' awareness of integrating local culture into mathematics learning, particularly Papuan culture. Moreover, professional development is needed to equip teachers for effective cultural integration in their teaching practices.

**Keywords:** Papuan Culture, Teachers' Perceptions, Teachers' Experiences.

## 1 Introduction

The need for the education system to be responsive to the cultural context of learners has become paramount. Education plays a crucial role in cultivating pride and ensuring that cultural heritage is preserved for the young generation [1]. Indonesia is a country immensely rich in culture, characterized by its diverse traditions, languages, and customs that reflect the unique identities of its various regions. However, globalization has led to significant changes in its cultural landscapes. As the impact of globalization, the young generation is exposed to trends, fashions, and lifestyles from abroad. They often show more tremendous enthusiasm and pride for foreign cultures than for their indigenous heritage [2, 3, 4]. This phenomenon needs to be addressed by all stakeholders, particularly in the field of education.

Mathematics and culture are closely interconnected, so culture has the potential to be integrated into mathematics learning. Mathematics itself is a cultural product that is shaped within and by different cultures [5, 6]. Different cultural groups construct unique mathematical realities through ideas, concepts, methods, techniques, and mathematical practices embedded in their daily lives [7, 8]. On the other hand, students' mathematical knowledge and experience in their community can serve as invaluable resources for mathematics learning. Students' cultural activities, daily practices, and personal experiences can be utilized as media for conveying complex and abstract mathematical concepts [9]. There are three forms of culture-based learning: learning about culture, learning with culture, and learning through culture [10, 11]. Integrating culture into mathematics education can be categorized as learning with culture.

Learning mathematics with culture can provide students with meaningful learning experiences. It helps to diminish students' perception that the mathematics they learned in school is unrelated to everyday life. Integrating local culture into mathematics learning fosters an understanding of the relevance and usefulness of mathematics in daily activities. Utilizing the unique sociocultural aspects of students can encourage them to engage more actively in learning [12] and help them construct their own mathematical knowledge [13]. It not only improves students' mathematical ability [14, 15] but also fosters a sense of identity and belonging to their cultural heritage [16, 17, 18, 19].

West Papua, one of the provinces in Indonesia, is rich in cultural heritage. Even noken, a multifunctional woven bag of the Papuan people, has been designated by UNESCO [20] as an intangible cultural heritage that needs to be protected. Previous research has highlighted aspects of West Papuan culture that can be utilized in mathematics learning, such as the sero (a traditional fishing tool) of the Kokas community [21], traditional houses and musical instruments of Biak [22], bark paintings by the Asei community [23], the honai (traditional house) and noken (woven bag) of the Dani tribe [24], traditional women's clothing of the Mee tribe [25], among others. Those aspects can provide meaningful contexts for West Papua students to understand mathematical concepts in a way that resonates with their daily lives and identities. However, despite its importance, integrating culture into mathematics teaching remains inconsistent, particularly in remote and diverse regions such as West Papua.

Teachers play a vital role in integrating West Papua culture into their learning practice. Successful integration requires teachers to have the knowledge, experience and strong desire to design and deliver lessons that incorporate cultural relevance into mathematical instruction. This study aims to explore the perceptions and experiences of mathematics teachers in West Papua regarding integrating local culture into their teaching practices, highlighting both the opportunities and challenges they encounter in the process.

## 2 Methods

This study employed descriptive research studies [26] to describe elementary school teachers' perceptions and experiences of integrating West Papua's culture into mathematics learning. The participants consisted of 76 elementary school teachers in West Papua. Table 1 presents the participants' demographics.

**Table 1.** Demographic Profile of Respondents

| Category                            | Number of Respondents | Percentage |
|-------------------------------------|-----------------------|------------|
| <b>Gender</b>                       |                       |            |
| Male                                | 31                    | 40,79      |
| Female                              | 45                    | 59,21      |
| <b>Educational background</b>       |                       |            |
| Education-related                   | 73                    | 96,05      |
| Non-education-related               | 3                     | 3,95       |
| <b>Teaching experience</b>          |                       |            |
| Less than 5 years                   | 27                    | 35,53      |
| 5 – 10 years                        | 31                    | 40,79      |
| More than 10 years                  | 18                    | 23,68      |
| <b>Length of residence in Papua</b> |                       |            |
| Less than 5 years                   | 14                    | 18,42      |
| 5 – 10 years                        | 21                    | 27,63      |
| More than 10 years                  | 23                    | 30,27      |
| Since birth                         | 18                    | 23,68      |

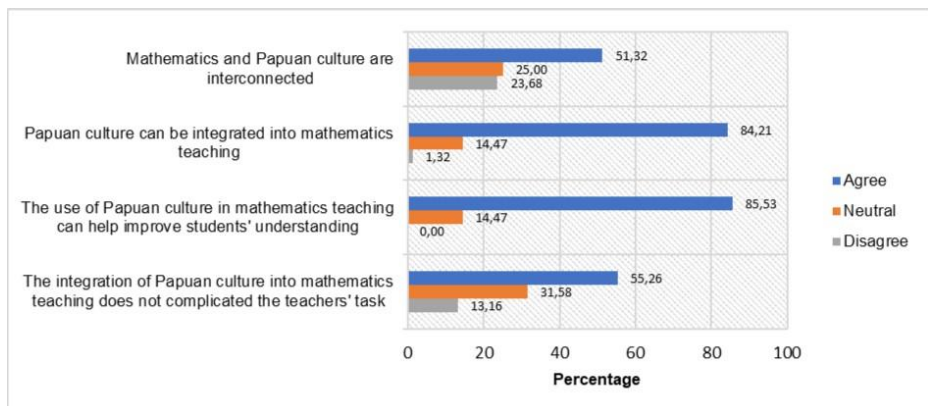
Each teacher completed a questionnaire, providing data on their perceptions, experiences, and opinions on integrating cultural aspects into mathematics learning. The questionnaire included both closed-ended and open-ended items to collect quantitative and qualitative data. The closed-ended questions allowed for a straightforward analysis of trends in teachers' responses, while open-ended questions provided an opportunity for participants to elaborate their experiences and opinions in their own words. The questionnaire was administered to the participants via Google Forms to facilitate data collection. The responses to the closed-ended questions were analyzed using descriptive statistics to summarize the general trends in teachers' perceptions and experiences. The responses to the open-ended questions were analyzed using thematically to identify shared insights.

### 3 Results and Discussion

The data gathered in this study provide insights into teachers' attitudes toward integrating Papuan culture into mathematics education. Through analyzing their responses, prevailing trends can be identified, including the extent to which teachers view cultural integration as valuable and the potential benefits or obstacles they foresee. This section presents the findings in graphical form, illustrating supportive and critical perspectives highlighting teachers' experiences and perceptions. These insights not only reveal the current state of cultural integration in classrooms but also shed light on areas where additional resources or training may be needed to strengthen culturally responsive teaching practices.

#### 3.1 Teachers' Perceptions of Integrating West Papua's Culture into Mathematics Classroom

Respondents' perceptions of integrating Papuan culture into mathematics teaching are presented in Fig. 1.



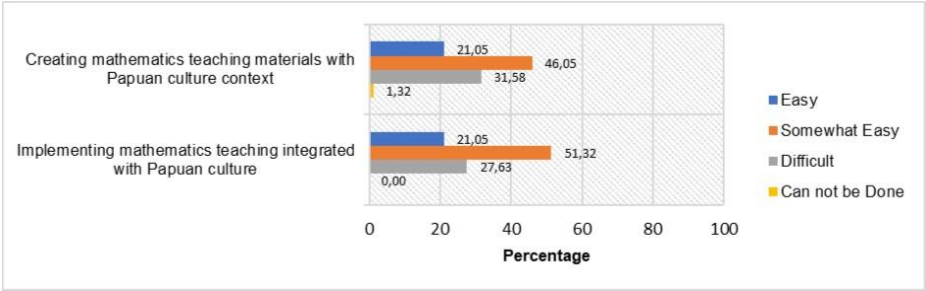
**Fig. 1.** Teachers' Perceptions of the Integration of Papuan Culture in Mathematics Teaching

The majority of respondents, 51.32%, agree that mathematics and Papuan culture are interconnected. However, there are still respondents who are uncertain about this connection, with some even expressing disagreement. An interesting finding was that a higher number of teachers who believe in this connection come from outside Papua. Most respondents also agree that Papuan culture can be integrated into mathematics teaching, with only one respondent disagreeing with this statement. The respondent who expressed the view that Papuan culture can not be integrated into mathematics teaching has less than five years of teaching experience and is not a native of West Papua but only recently settled in West Papua. Additionally, most respondents agree that using Papuan culture can enhance students' understanding of mathematics. Re-

garding integrating Papuan culture into mathematics teaching, although 55.26% of respondents agree that it does not complicate the teacher’s task, a significant number still doubt this statement.

Respondents who believe that integrating Papuan culture into mathematics teaching is not easy have identified several challenges, such as the lack of reference books for developing integrated teaching modules, the absence of suitable textbooks, a lack of appropriate teaching media, limited facilities and infrastructure, and insufficient knowledge of Papuan culture. Some respondents also pointed out that Papuan culture is highly diverse, making it difficult to use the culture of a particular tribe in a class where students come from different ethnic groups. Furthermore, some respondents believe that not all mathematics content can be connected with Papuan culture even when applied. Respondents also mentioned that integrating Papuan culture into mathematics teaching is a new approach, which is not easy to implement. Additionally, some respondents argued that mathematics, as a precise science, is difficult to relate to a culture that focused on customs, traditions, language, and other social aspects.

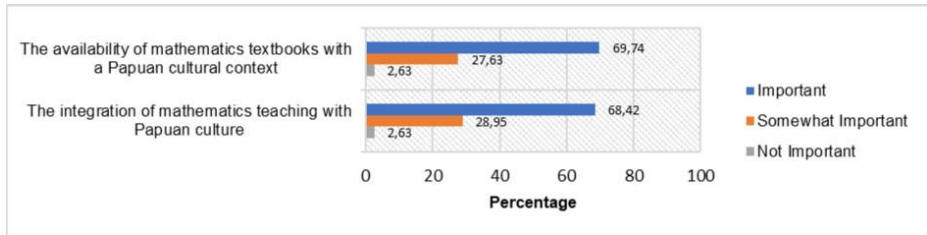
Fig. 2 presents the respondents’ perceptions regarding the ease of integrating Papuan culture into mathematics teaching.



**Fig. 2.** Teachers’ Perceptions on the Ease of Integrating Papuan Culture into Mathematics Teaching

In Fig. 2, more than 50% of respondents believe that implementing mathematics teaching integrated with Papuan culture is easy or somewhat easy. The majority of respondents who stated that this integration is not easy were those who are not native Papuans. They believed that they had to learn about West Papua’s culture before integrating it into mathematics teaching. However, Papua is home to numerous ethnics groups, each with its own diverse cultural practices. No respondents stated that it cannot be done. However, only a few respondents believe that creating mathematics teaching materials in the Papuan cultural context is easy. In fact, one respondent even stated that it cannot be done.

Fig. 3 illustrates respondents’ opinions on the importance of integrating Papuan culture into mathematics teaching and the availability of supporting textbooks.



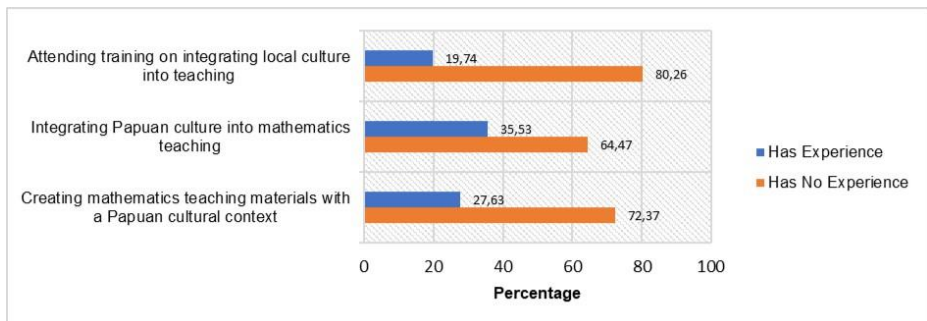
**Fig. 3.** Teachers' Perceptions of the Importance of Integrating Papuan Culture into Mathematics Teaching

Nearly 70% of respondents expressed the importance of integrating mathematics teaching with Papuan culture, along with the availability of supporting textbooks. 68.42% expressed that linking mathematics instruction with Papuan culture is essential, while 69.74% highlighted the importance of mathematics textbooks in the context of Papuan culture.

The findings regarding teachers' perceptions align with the research conducted by Azis et al. [1], which shows that, although some teachers remain uncertain about integrating local culture into elementary school teaching, the majority consider this integration important. That research focused on integrating the local wisdom of the Bugis-Makassar tribe, known as *siri' na pacce*, while this study focused on Papuan culture.

### 3.2 Teachers' Experiences in Integrating West Papua's Culture into Mathematics Classroom

Respondents' experiences integrating Papuan culture into mathematics teaching are presented in Fig. 4.



**Fig. 4.** Teachers' Experiences of Integrating Papuan Culture into Mathematics Teaching

Based on Fig. 4, less than 20% of respondents have attended training on integrating local culture into teaching. Although only a few have attended such training, 35.53% of respondents have stated that they have integrated Papuan culture into mathematics teaching. Additionally, 27.63% of respondents reported that they had created mathematics teaching materials with a Papuan cultural context. Teachers with experience

shared examples of Papuan culture that have been integrated into teaching, such as geometric shapes on the Asmat carving motifs, Honai houses, tifa (wooden drum), angles formed by traditional bows and arrows, prices and measurements of traditional food ingredients like *sagu* and *papeda*, the betel nut trade, the thread needed to make noken (woven bag), the custom of shifting cultivation for clearing land for agriculture.

Dwiputra and Sundawa [27] highlight the benefits of culture-based learning, not only for students' knowledge, attitudes, and academic abilities but also in strengthening the local culture and instilling its inherent values to shape students' noble character. Integrating culture into mathematics learning enables students to comprehend mathematical concepts more meaningfully by connecting them to their daily lives, as well as broadening their perspective on mathematics and fostering an appreciation for cultural diversity within their classroom [28]. On the other hand, Papua's natural environment and culture have the potential to be utilized as local content in mathematics learning in Papua [29]. Therefore, the integration of Papuan culture into mathematics learning is essential. However, this requires teachers' knowledge and skills to implement it effectively, highlighting the need for more extensive training on integrating culture into mathematics education.

## 4 Conclusion

The findings of this study reflect teachers' awareness of integrating local culture into mathematics learning, particularly West Papuan culture. Despite the challenges, the integration of Papuan culture into mathematics teaching is considered important by the majority of teachers. However, this requires teachers' knowledge and skills to implement it effectively. Therefore, more training and the provision of relevant resources are needed to equip teachers for effective cultural integration in their teaching practices.

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