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The Nexus of Culture and the Teaching Mathematical Problem: Voices of Elementary Classroom Teachers

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ABSTRACT

This qualitative study employing phenomenology aims to determine the intertwine between culture and the teaching of mathematical problems. The informants of the study were elementary classroom teachers. They were chosen using the purposive sampling. Findings revealed that the integration of culture in the teaching of mathematical problems integrated real-life situations, deepen connections with lessons, and cultural sensitiveness. The process of integration of elementary teachers in teaching mathematical problems were done during the presentation during motivation, integration of community-based examples, and integration of story-telling. Mathematical activities which were developed based on the findings are data analysis, and cultural probability and games.

INTRODUCTION

Teaching within the contexts of students' culture can be of great help in honing their full potentialities. They could easily understand the mathematical problems when these are infused within their cultural perspectives. As learners try to have the deeper understanding of mathematical problems, many of them cannot understand the concepts because there was a lack of application of their own cultural perspectives.

Generally, teachers who handle mathematics faced the same dilemma. Teaching mathematical problems need to have patience. Above all, teachers need to have the skills in the delivery of the lessons to the students. The integration of cultural and folkloric elements and values increased the interest of the students in studying math. In turn, it improved their academic achievements (Fouze & Armit, 2017).

Having students coming from different ethnolinguistic backgrounds posits a big challenge to teachers (Scott, 2001). Cultural differences must be taken into account to ensure that learning occurs. In the study conducted by Massarwe et al. (2012) that construction of geometric ornaments on its relationship with geometry raised awareness among the students. Exposing students to different experiences and cultural resources could enhance appreciation through learning activities that linked between culture and mathematics.

Although there were studies conducted on the relationship between culture and the teaching of mathematics, however, these did not include the views of classroom teachers. For example, the study of Ngan et al. (2010) explored the utilization of culture in Chinese number words. In the same vein, Stathopoulou and Kalabasis (2007) reflected the fusion of language and culture in mathematics education in a Greek school. There were no related studies conducted in the local setting. This gap motivates the researcher in pursuing this study.

Above all, this study will provide activities to students. They will embrace their own culture and tradition in the learning of mathematics. Thus, this will make mathematics class as an avenue for promoting diversity and inclusivity. More importantly, the outcome of this study will be used by teachers not only in Kabacan but to teachers all around the Philippines.

Statement of the Problem

1. What is the perception of elementary classroom teachers in the integration of culture in teaching mathematical problems?
2. How will the elementary mathematics teachers integrate culture in teaching mathematical problems?
3. What mathematical activities which can be developed that integrate the cultural backgrounds of the students?

METHODOLOGY

Research Design

Qualitative research is based on the disciplines of social sciences like psychology, sociology, and anthropology. Therefore, the qualitative research methods allow for in-depth and further probing and questioning of respondents based on their responses, where the interviewer/researcher also tries to understand their motivation and feelings (Aspers & Corte, 2019).

These methods are designed in a manner that help reveal the behavior and perception of a target audience with reference to a particular topic. There are different types of qualitative research methods like an in-depth interview, focus groups, ethnographic research, content analysis, case study research that are usually used. The results of qualitative methods are more descriptive and the inferences can be drawn quite easily from the data that is obtained (Smythe & Giddings, 2007; Gentles et al., 2015).

Likewise, phenomenological research is a qualitative research approach that seeks to understand and describe the universal essence of a phenomenon. The approach investigates the everyday experiences of human beings while suspending the researchers' preconceived assumptions about the phenomenon. In other words, phenomenological research studies lived experiences to gain deeper insights into how people understand those experiences (Neubauer et al., 2019; Gallagher, 2022).

Researchers using phenomenological research design assume that people use a universal structure or essence to make sense of their experience. They interpret the participants' feelings, perceptions, and beliefs to clarify the essence of the phenomenon under investigation. Phenomenological research design requires the researcher to bracket whatever a priori assumption they have about the experience or phenomenon (Van Manen, 2017).

In this study, I will use qualitative-phenomenology. Views of teachers will be identified on the integration of culture in the teaching of mathematical problems among the elementary students in Kabacan South District in the Municipality of Kabacan. They will also be asked to suggest activities where culture can be best applied.

Locale of the Study

This study will be conducted among the elementary schools in Kabacan South District, Municipality of Kabacan, Province of Cotabato. This is the leading district of the town. This covers schools namely: Kabacan Pilot Central Elementary School, Kilagasan Elementary School, Cuyapon Elementary School, Dona Josefa Edralin Marcos Elementary School, Osias Elementary School, Upper Paatan Elementary School, and Lower Paatan Elementary School.

Research Instrument

The following researcher materials will be used in the gathering of the data. A recorder will be used during the interview of the informants and the participants. An interview guide questions will be used in answering the research questions. The MAXQDA software for the analysis of the data (Gizzi & Rädiker, 2021).

Sampling Procedure

The sampling technique to be employed is the criterion-based sampling (Gentles et al., 2015). Each of them will be selected by following the criteria set in this study as stated below:

- A mathematics teacher in Kabacan South District
- An elementary teacher; and
- A mathematics teacher for at least 3 years.

Data Gathering Procedure

In the conduct of this study, I will adhere to the following procedures. Readings of literatures. These serve as the foundation in order to have the total grasp of the contexts of the study. Following this, I will consult the gathered literatures to my research adviser for further instruction. Next, conceptualization of the paper will follow.

To make the aforesaid strategies into reality, I will write a letter addressed to the Schools Division Superintendent of Cotabato Division. Upon approval, this letter will be presented to the school heads where the participants will be taken. Two groups will be identified. There will be Key Informants and Focus Group Discussion. The first will be interviewed individually, while the second will be in group which aims to confirm or negate the responses of the informants.

Moreover, as a researcher, I will prepare the interview guide questions. Experts will validate its contents. Meanwhile, I have to provide my informants and participants with the consent-to-participate form. They have to affix their signature as part of the ethical standards in research. Similarly, I will interview them after their classes in order not to hamper the delivery of learning to the students. When interview will be done, reciprocity will be given to each of them as a sign of gratitude.

Furthermore, I will transcribe the data. The software MAXQDA will be used in the identification of the themes and their corresponding thematic statements. Each of the themes will be discussed profoundly. However, the analysis will undergo member checks. These will be done by my colleagues especially those who are Master Teachers specializing in mathematics. In congruence, I will ask the help of the debriefers to further check the contents of my paper. Lastly, I will return to my informants and participants to ask them to confirm the interpretation of the gathered data.

Data Analysis

The data will be analyzed using the MAXQDA. This software will identify the themes and the thematic statements. Each of the themes will be discussed and supported or negated with their narratives.

RESULTS AND DISCUSSIONS

This chapter accentuates the results of the analysis of the data which it presented the significant themes, core ideas, and the provisions of implications that dig deeper into the contexts of the study.

Themes and Core ideas on the perception of elementary classroom teachers in the integration of culture in teaching mathematical problems

Table 1 shows the themes and core ideas on the perception of elementary classroom teachers in the integration of culture in teaching mathematical problems. Themes such as integrate real life situations, deepen connections with lesson, and cultural sensitiveness are the major themes which were culled out from the responses of the informants.

Integrate real life situations. In the teaching of mathematical problems, it is important to note the integration of real-life situation. Through this, every learner in the class could grasp the concept of the lesson. Even though math is known to be tough, they could arrive with solutions since teachers developed this skill that can free learners from the bondage of ignorance.

In this connection, an informant stated that:

"Integrating culture in Math problems is a good practice since learners will be able to relate to the situation stated in the problem. Moreover, the problem will be easily understood, analyzed, and solved." **(**Informant 2)

In the same vein, this can be achieved through the localization of medium (Fasinu et al., 2023). This means that in teaching, teachers should have to be aware that learners can easily adjust to the language they know. The bodies of knowledge that would be expanded in their horizon can be taught in their native language. Hence, comprehension is easy to achieve. None of the learners will be left alone since they all have the ability to express themselves (Inganah et al., 2023; Koparan et al., 2023).

Deepen Connections with lessons. The integration of cultural perspectives in teaching mathematical problems can connect learners with their lessons. By doing do, it this resonates with students' cultural experiences and backgrounds. For example, in teaching fractions, teachers should have to use examples related to traditional food, crafts, or music. This helps students related to the content and see its relevance in their daily lives.

Similarly, it was shared during the interview that:

"The integration of culture in teaching of mathematical problems allows the learners to have a deeper connection to the lesson. It makes an avenue of closer link between the body of knowledge and the cultural group where they belong." (Informant 3)

This is in consonance with the statement of the other informant.

"Culture of the student should be considered by math teachers for students to grasp math concepts effectively. For instance, indigenous example and materials should be used in teaching math concepts." (Informant 7)

Finally,

"The integration of culture in teaching Math subject especially in problem solving can give the learners the opportunity to comprehend and express their knowledge well because culture and language play a vital role in their learning process particularly in their early grades where the learner will have the sense of "culture shock" because what he has at home is quite different of what is he being exposed at school. Practices within a culture of each learner affect his understanding." (Informant 8)

In fact, HIdayat and Linda (2023) affirmed that it encourages them to share problem-solving methods they use within their cultural contexts. This promotes cultural diversity in problem-solving and allows them to appreciate different perspectives. More importantly, it entails inclusivity in the delivery of the lessons which would make them more interesting in learning mathematical problems (Oladejo et al., 2023).

Cultural sensitiveness. Students are becoming aware of their own cultural identities. Integrating this in the lessons can open doors of opportunities. Furthermore, this implies that having this helps in making mathematical problems more relatable and meaningful to students. When mathematical concepts applied in contexts aligned with their cultural experiences, they are more likely to be engaged and motivated to learn. This only shows a deeper understanding of the subject matter and encourages each one of them to view mathematics as a relevant and valuable tool in their lives.

This theme was integrated in the response of the informants. They shared that:

"Integration of culture is significant in the teaching process. Learning made easy by localizing medium, materials and activities. It is also easy to catch attention of pupils through the use of this in mathematical problem." **(**Informant 4)

And also,

"Integration of culture of students in the teaching of mathematical problems is considered important nowadays because it nurtures the sense of belonging, identify and strengthens community participation. It develops strong bond especially in their group activities." (Informant 5)

Therefore, it indicates the connections between culture and learning in mathematics that leads to cultural awareness.

"Integration of culture of my students in teaching of mathematical problems makes them think deeper to have connections of ideas between mathematics and cultural practices." (Informant 6)

Moreover, this only supports that cultural sensitivity in mathematics education contributes to the preservation and promotion of students' cultural identities. In addition, by incorporating cultural examples and problem-solving approaches, students can see the value of their cultural heritage in academic settings. This enhances their sense of pride, self-esteem, and cultural belonging which fosters positive learning experiences (Khilji & Xenofontos, 2023).

Table 1. Themes and Core ideas on the perception of elementary classroom

teachers in the integration of culture in teaching mathematical problems

Themes	Core Ideas
Integrate real-life situations	Connections between the experiences of the learners with the problem-solving activities
	Localization of medium, materials, and activities
Deepen connections with lessons	Connections with the lessons through culturally sensitive lessons
	Comprehension towards the lessons
Cultural sensitiveness	Connections between the learners and the cultural perspectives.
	Foundation of learning identities of the learners

Themes and Core ideas on the process of integration of elementary teachers in teaching mathematical problems

Table 2 presents the themes and core ideas on the process of integration of elementary teachers in teaching mathematical problems. They revealed that this can be done through the presentation during motivation, integration in world problem, and connection to the experiences of learners.

Presentation during motivation. Usually, lessons begin with a motivation. It is the process by which learners' interests which drives them to initiate their actions especially their interests towards the lessons. However, it should be noted that this can make more interesting when the integration of cultural perspectives should not be forgotten. Instead of doing activities that they cannot relate, teachers should have to do this in order to capture the real picture of learning and appreciation.

She underscores that:

"Integration of cultural perspectives can be done during motivation time. It acts as a springboard of the lesson Integration can also be done in the rest of the lesson." (Informant 2)

The beginning of the class is always crucial for learners. To how the teachers integrate the essence of motivation matters. When class is too boring to them, they tend to resort to other things. Therefore, when creating activities to learners one should bring them to their culture (Lim et al., 2023; Trouche et al., 2023).

Integration of community-based examples. Integrating community-based examples in teaching mathematical problems can help in making the content more relatable and meaningful for learners. It allows them to see the practical applications of math in their lives and connotes deeper appreciation of the subject matter. In the same vein, the teachers can assure that learning can easily be integrated by the learning. More importantly, they can create meanings that would provide better learning opportunities.

This was revealed during the interview. The statement says that:

"I can integrate the cultural perspectives of my pupils in teaching mathematical problems through community-based examples or problems with a distinct cultural emersion in terms of pupils' tradition or beliefs, practices, and lifestyle." (Informant 3)

For informant 5,

"Real-world connection is one way. I can integrate the cultural perspective of my students in the teaching of mathematical problems. It can help student connect diverse culturally experience." (Informant 5)

Similarly,

"I can integrate the cultural perspective by the experience of students in their community, traditions, native language." (Informant 6)

Finally, the utilization of indigenous material matters in this context.

"I will use indigenous materials so that students can conceptualize math concepts." (Informant 7)

This acknowledges the value the language diversity present in the classroom. Teachers have to recognize that students may have different levels of proficiency in the language of instruction and provide support accordingly. Encourage students to explain and discuss mathematical concepts in their own words and languages, promoting both language development and mathematical understanding (Ramadhan, 2023).

Integration of story-telling. Story-telling provides a context for mathematical problems, making them more meaningful for students. In doing so, math problems within a narrative or real-life scenario, they can better understand the purpose and relevance of the mathematical concepts they are learning. This helps them connect abstract ideas to practical situations, facilitating deeper comprehension.

This was provided by the response of informant 4.

"Cultural perspective is integrated-through storytelling of word problem, construction exam through the use of names, place, object or events that is relatable to the culture of my pupils." (Informant 4)

To support this, stories involve visual descriptions and mental imagery, which can enhance students' visualization skills and support the development of conceptual understanding in math (Koparan et al., 2023). As they follow the story, they can visualize the problem, relate it to concrete situation, and mental representations of the mathematical concepts involved. Additionally, this aids in grasping abstract ideas and promotes deeper understanding of mathematical relationships and processes (Ramadhan, 2023).

Table 2. Themes and Core ideas on the process of integration of elementary

teachers in teaching mathematical problems

Themes	Core Ideas
Presentation during motivation	The teacher integrates the cultural awareness in the teaching of mathematics from the beginning of the lesson
Integration of community-based examples	The teacher utilizes the problems that learners should have to deal with every day of their lives
	The teacher underscores the role of learners' language, community, and traditions in learning mathematical problems
Integration of story-telling	The teachers used stories which incorporates the cultural identities of the students.

Mathematical Activities that Integrate Cultural Backgrounds of Students

The last research question is on the identification of mathematical activities that integrate cultural backgrounds of students. Below are the activities and their corresponding descriptions.

1. Data Analysis

This can be done by having the students collect and analyze data related to their cultural backgrounds. For example, they can survey their classmates or family members to gather information about traditional foods, festivals, or language spoken in their community. These data will be presented through graphs, charts, and visualizations.

2. Cultural Probability and Games

This activity investigates cultural games and their connection to probability. They can analyze traditional games of their own culture and explore the underlying mathematical concepts, such as dice probabilities, card games, or board games. By doing this, they can simulate and calculate the probabilities for different game scenarios, enhancing their understanding of probability theory while appreciating cultural gaming traditions.

IMPLICATIONS

This chapter provides the implications for practice, implications for future research, and concluding remarks.

Implications for Practice

The integration of culture in teaching mathematical problems creates inclusivity of the learning environment that is celebrating the diversity of learners' backgrounds. Indeed, it acknowledges and values the unique perspectives and knowledge that students bring to the classroom. Teachers validate their identities and create opportunities for them to contribute and share their cultural insights. This approach not only enhances their engagement but also promotes a sense of belongingness and respect.

In fact, this stimulates critical thinking and problem-solving skills. Cultural perspectives often require them to analyze, interpret, and apply mathematical concepts to real-world situations. In the same manner, this encourages them to think critically, consider multiple perspectives, and develop creative solutions. When they encounter mathematical problems embedded within different cultural contexts, they can develop a broader problem-solving repertoire and gain a deeper understanding of how math can be applied in diverse settings.

In today's interconnected world, the integrating culture in teaching mathematical problems helps learners develop global competence. Looking into this aspect, different cultural perspectives, traditions, and problem-solving approaches, they can gain a broader understanding of how this can be utilized across various cultures and societies. This strengthens cultural awareness, empathy, and the ability to collaborate with individuals from diverse backgrounds. Therefore, they become better equipped to navigate and contribute to a globalized world where cultural sensitivity and intercultural communication skills are essential.

Implications for Future Research

This study has important implications for future research. These are bounded on four important points. First, they can delve into the development and adaptation of culturally relevant mathematical tasks and problems. This involves the identification and incorporation of mathematical concepts and skills that align with diverse cultural contexts. Exploring different cultural perspectives on mathematical and problem-solving activities can help in creating learning materials that resonate with their cultural experiences and backgrounds.

Second, it is essential to conduct a study on the effectiveness of culturally responsive pedagogical approaches in teaching mathematics. Researchers can examine how instructional strategies that acknowledge and validate students' cultural identities and experiences impact their motivation, engagement, and learning outcomes. Studies can focus on the implementation of culturally responsive pedagogy, or ethnomathematics, to determine their influence on the mathematical achievement of learners and their attitudes towards the subject.

Third, it is crucial to determine the role of teacher professional development in integrating culture into mathematics instruction. This can deal with the knowledge, skills, and beliefs that teachers need to effectively incorporate cultural elements in their teaching practices. In line with this, effective professional models and strategies can be effectively identified so that educators can be better equipped with the essentialities of integrating culture into their instructional design and delivery that would be more culturally responsive in mathematics classrooms.

Concluding Remarks

This study is important in strengthening the teaching of mathematical concepts to learners especially to those who have struggles in this subject. It is within this premise that the integration of culture in teaching mathematics holds immense potential for creating a more inclusive and meaningful learning experience for both teachers and learners. To teachers, embracing cultural diversity in the mathematics classroom can open up new avenues for engagement. Culturally relevant tasks and pedagogical strategies can empower learners to see the brighter side of learning mathematics as a subject that is connected to their own lives and experiences.

As a teacher, I saw the value of my paper in the contexts of teaching not only in mathematics but in all subject areas. Aside from that, there is a need for us to develop instructional materials that will enhance the cooperation of the learners in the class making them more responsive to the needs of time. Furthermore, it is also noted that this cannot be achieved without the help and constant support of school leaders and the community.

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