Eswatini Educational Research Journal (ESWERJ)
Vol. 1 No. 1, 16-30 (June 2025)
ISSN: 3104-6223 (online)
Website: https://eswera.org/

Exploring the Integration of Ethno-mathematics in Secondary School Mathematics Teaching in Eswatini: An Analysis of Teachers' Practices and Perceptions

Turugari, Munamato
Department of Mathematics and Science Education, Workers College
Email: mturugari@gmail.com
https://orcid.org/0009-0006-8581-5250

Article History
Received:23rdDecember 2023
Accepted: 24th May 2024
Published: 30th June 2025

Keywords
Ethno-mathematics
Indigenous Knowledge
Cultural Relevance
Teaching Practices
Learner Engagement
Mathematics Education

Corresponding Author: *rachmpofu@gmail.com*

Abstract
The significance of incorporating indigenous mathematical knowledge to facilitate the understanding of school mathematics in the mathematics classroom should not be underestimated by the mathematics teachers. Oftentimes, secondary school mathematics teachers teach mathematics as though mathematics has no link to the learners' culture in anyway. This approach to teaching mathematics does not help the learners to understand some certain mathematical concepts. The purpose of the study was to explore the prevalence of the use of ethno-mathematics approach among secondary school mathematics teachers. Its objective was to find the extent to which secondary schoolteachers make connections between school mathematics and the learners' out-of-school mathematics practices. Connecting the teaching of mathematics to the learners' cultural activities helps the learners to see the utility of mathematics. Twenty mathematics teachers participated in this study, which used a survey research design and a mixed approach. It employed questionnaires and interviews to collect data from the participants. The major themes that emerged from the data analysis revealed that secondary school mathematics teachers believe that indigenous mathematical knowledge has no place in the official secondary school mathematics; it is very rudimentary. It also emerged that some mathematics teachers lack the skills required to identify mathematical concepts in the learners' culture in most topics. The significance of these findings is that they assist in explaining why most learners do not perform well in mathematics. It was concluded that the majority of the mathematics teachers do not make a link between the teaching of mathematics and the learners' culture.

Introduction

Mathematics is better understood when it is taught from the known to unknown (Porcu, 2017). The impact of an ethno-mathematics in improving the learners' understanding of mathematical has been proven by many studies (Fouze & Amit; 2023, Machaba & Dlamini, 2021). According to Rosa and Orey (2011), an ethno-mathematics approach is a teaching approach that incorporates how people from a particular culture use mathematics ideas in dealing with quantitative, relational and spatial aspects of their lives. In simple terms an ethno-mathematics approach is a teaching approach, which involves connecting school mathematics and the learners' out-of-school mathematics experience in the teaching of classroom-based mathematics Sunzuma (2020), Although Eswatini is a country which is rich in culture the extent to which the teaching of mathematics incorporates these cultural contexts is noticeably doubtful

(Ngcobo, 2011). From the general principles of teaching, teaching should start from the known to the unknown (Porcu, 2017). However, mathematics teachers regard what is known by the learners to mean what has been taught at school before (Turugari, 2022), thereby neglecting an entire wealth of the learners' out-of-school mathematics experiences that the learner could even bring to bear on the learning of school-based mathematics. When the learners' out of school mathematics experience is not incorporated in the pedagogy the learners are likely not to understand mathematical concepts being taught. Unfortunately, some studies have revealed that mathematics teachers do not form connections between culture and mathematics.

The use of an ethno-mathematics approach helps the learner to understand mathematics through seeing the relevance of mathematics by being exposed to how mathematics is used in their daily lives. In other words, the use of an ethno-mathematics approach helps the learner to be mathematically literate. Horsthemke and Schafer (2014), argued that learners taught using an ethno-mathematics approach can contribute and participate confidently in the society in which they live. Seepe (2000) posts that when learners see part of their daily mathematical practices in the curriculum, they are likely to be motivated to perform better in mathematics. Generally, learners may become confused in the mathematics classroom because they are not sure whether their out-of-school understanding of mathematics is recognised in the mathematics classroom. According to Rosa and Orey (2011) the traditional mathematics classroom is confusing because learners are required to do away with what they know and start being taught about formulas and symbols which the learners are not familiar with. Mathematics concepts are taught as though they reside in the mathematics textbook without any connection to what the learners do outside school. Thus, the use of ethno-mathematics approach acts as a bridge between the learners' understanding of mathematics outside school and school mathematics. Also, ethno-mathematics makes the mathematics teachers to engage the learners meaningfully to generate knowledge. Chahine (2013) asserts that ethno-mathematics approach leads to purposeful engagement in existential experiences that unfold culturally embedded mathematical competences can inspire learners to question enforced imminent boundaries and discover the joy and excitement in making transformation real and possible. According to D' Ambrosio (2001), when ethno-mathematics approach is used in the mathematics classroom, learners are helped to construct their own personal mathematics understanding and have alternative ways to explain their work that may be different from that of the teacher.

The way mathematics teachers teach mathematics has been described by many as being at variance with the ethno-mathematics approach. Mathematics teachers resort to the traditional approach where the teachers are the knowers in the mathematics classroom, and the learners' cultural input is disregarded in the creation of mathematical knowledge. The mathematics teachers regard themselves as custodian of mathematics knowledge who have the capacity to distribute it to the learners whose out-of-school mathematics experience is regarded as irrelevant. The teachers regard themselves as transmitters of knowledge while they regard learners as empty vessels waiting to be filled. According to Francois and Kekhove (2010), traditional mathematics lessons are characterised by drills where learners are required to follow given procedures without understanding the concepts being taught. Learning mathematics in this way may result in the learners failing to see the relevance of learning mathematics. For example, if the learners are drilled on lines of symmetry concepts, the learner will not be able to make connections between line of symmetry concepts taught at school and those they experience in their daily life , hence they are likely to quickly forget what they had been taught. Kline (1990) also argues that "mathematics taught in the schools is detached from its rich intellectual setting in the culture of our civilisation and is reduced to a series of techniques and has been grossly distorted." This means that the mathematics taught in the schools lacks

connection with real life mathematics found in the learners' culture, and it is nothing more than sequenced techniques and it is quite distorted type of mathematics that the learners can hardly recognise as mathematics. For example, in Eswatini the concept of symmetry can be taught using several cultural artefacts that are found in every homestead but the mathematics teachers may resort to the use of shapes drawn in mathematics textbooks.

The mathematics teachers do not regard the learners' out-of-school mathematics practices as mathematics. As a result, they do not form any connections between the learners' culture and school mathematics. The failure of mathematics teachers to recognise indigenous mathematical knowledge as mathematics was also evident in a study carried out by Alvarez and Aliveras (2014) who discovered that mathematics teachers in Colombia do not recognise ethno-mathematics as mathematics. Closer to home, Mtetwa and Jaji (2006) similarly report that mathematics teachers in Zimbabwe do not regard mathematics found in the culture of the Shona people of that country as mathematics. They did not recognize mathematics concepts in their culture as serious mathematics which can be incorporated in the secondary school curriculum. Some researchers for example, (Chikodzi & Nyota, 2010; Madusise, 2014) attribute the poor performance in mathematics in secondary schools to lack of connections between the learners' out-of-school mathematics practices and school mathematics. Mathematics teachers teach mathematics as though mathematics resides exclusively in the textbooks and in the classroom without any link to the real-life situation of the learners, and this results in learners failing to understand mathematical concepts.

The mathematics teachers can integrate ethno-mathematics in a mathematics classroom in various ways. In one study in South Africa, Madusise (2014) investigated the mathematical concepts found in a cultural village. According to that study, knowledge of properties of shapes and different transformations can be used to read and understand the decorations on Ndebele paintings and beadings and Venda traditional clothes. This led to a deeper understanding of the beading activities at home in the context of mathematics. Instead of using the abstract approach of calculating enlargement scale, measuring the real artefacts (in some cases counting beads in a line) learners were guided to discover the used enlargement scale factors, the translation vectors and reflection mirror lines (axes of symmetry) (Madusise, 2014). Some learners reiterated that they were going to use their school mathematical knowledge in coming up with their own different beading designs without being coached. This led to deeper understanding of the paintings and beadings. Madusise also developed number sequences from the cultural dances observed in the cultural village and this made the learners to understand number sequences better.

In another study Rosa and Orey (2009) studied the symmetrical designs found in freedom quilts, making associations that involved geometry and the craft and art of quilting. During their analyses of different symmetrical freedom quilts, Rosa and Orey (2009) developed a teaching unit for geometrical transformations from the different analysis of symmetrical freedom quilts. A number of mathematical concepts which include symmetry, reflections, rotations, and translations were incorporated in the topic that was developed. The captured mathematics concepts from the freedom quilts were incorporated in lesson plans that enable mathematics teachers to design geometry activities that would help learners to understand geometry, especially transformation and symmetry concepts. Transformation concepts were viewed as abstract by most learners; however, after the use of the freedom quilts real symmetrical freedom quilts the learners changed their views about geometry and see the relevance of learning transformation (Rosa & Orey, 2009). In another study in Zimbabwe Sunzuma (2020) investigated the in-service secondary school mathematics teachers' integration of ethno-

mathematics in the teaching of geometry and found that sixty percent of the mathematics teachers use various cultural activities in the teaching of geometry.

Theoretical Framework

Social Constructivism

In addition, Kim (2001) points out that social constructivism emphasises the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding. According to Social Constructivism, individual knowledge originates from social interaction of individuals with other people and their environment and then the individuals internalise that knowledge. In support of this view, Gergen (2004) also affirms that in the social construction perspective, explanations of reality are not based on what exists but they have their origins in people interactions. This means that people only come to know about the world around them through interacting with other people in different social relationships.

Moreover, Amineh and Asl (2015, p.13) said, "…knowledge is a human construction that is socially and culturally constructed." This means that people living in a society have their own unique interpretation of the world and give rise to reality, which is contextual, subjective, localised and suit their own context. Therefore, in this study, the way in which the mathematics concepts and activities are presented in the Swati learners' out-of- school activities represented their mathematics reality. The mathematics teachers have to respect that reality and take it as the starting point when teaching secondary school mathematics. This view is supported by Amineh and Asl (2015) who point out that in a socio-constructivism perspective, reality is not something that individuals can discover because it does not pre-exist prior to its social invention. This implies that learners take part in creation of the social reality through participating in the communities in which they live. The learners are not observers in the society they live, but they are active participants, and it is through social participation that shapes the way they understand mathematics reality. Although learning may involve the learner's mind, Socio-constructivism argues that learning is highly dependent on the learner's interaction with other members in the community. According to Gergen (2004), constructivism takes into consideration social and cultural aspects of acquiring knowledge. This implies that under Socio-constructivism, knowledge construction by the learner is not independent of the social and cultural context. Basing on this perspective, the role of the teacher is to elicit and understand the prior instruction knowledge of the learners to help learners to construct new knowledge and connect it with what they already know. For example, in this study, the mathematics teachers were asked how they elicit from the learners how the mathematics concepts were used in the learners' out-of-school mathematical experience in order to help them to understand mathematics knowledge.

Problem Statement

Eswatini is one of the countries in the Southern Africa Development Community [SADC] region where learners do not perform well in mathematics in secondary schools (Ngcobo, 2011). One of the reasons why students perform badly in mathematics is because mathematics teachers use what Turugari (2008) called 'go to page x and do exercise y syndrome'. In this case mathematics teachers do not check the relevancy of the question to be answered by the learners; they are just concerned about the learners answering the questions about a particular mathematical concept right. The learners are taught how to solve mathematics problems without explaining to the learners the reasons why such problems are to be solved. The learners are

starved from understanding the utility of mathematics. When the mathematics concepts are linked to the real-life situations, the situations are far detached from the learners' understanding of the concepts. This study thus sought to investigate the extent to which secondary school mathematics teachers in Eswatini incorporate indigenous mathematics knowledge in the teaching of mathematics. It also sought to identify the factors affecting the use of an ethno-mathematics approach by the secondary school mathematics teachers in Eswatini.

Purpose of the study

The purpose of the study is to investigate the use of ethno-mathematics approach in the teaching of mathematics by secondary school mathematics teachers in Eswatini.

Objectives of the study

The objectives of the study are to:

1. determine the extent to which secondary school mathematics teachers use the ethno-mathematics approach when teaching mathematics; and
2. identify factors affecting the use of ethno-mathematics approach in the teaching of mathematics

Research Questions

1. To what extent do secondary teachers in Eswatini use ethno-mathematics when teaching mathematics?
2. What factor affect the secondary school teachers in the use of ethno-mathematics when teaching mathematics?

Methodology

A survey was employed in a mixed approach methodology study which involved 20 secondary school mathematics teachers. The study used questionnaires and semi-structured interviews to collect data. A survey design is normally used when participants' opinion is sought (Choongwa, 2018, p.98). In this study the mathematics teachers' opinions on the use of the ethno-mathematics approach and on the factors affecting the use of an ethno-mathematics were sought, hence the use of the survey.

The sample for this study comprised of 20 secondary school mathematics teachers. Random sampling was used to select participants, ensuring that every teacher had an equal chance of being included. Firstly, schools were conveniently selected by considering those schools where student teachers specializing in Sciences and Mathematics were attached for teaching practice. This selection allowed the researcher to efficiently distribute and collect questionnaires and conduct interviews while visiting the schools for student teacher assessments. Since all secondary schools in Eswatini have equal opportunities to host student teachers, the selection process ensured a broad representation of teacher perspectives on the use of ethno-mathematics in mathematics instruction.

Questionnaires were used to collect data in this study. A questionnaire has an advantage of asking a series of questions at a goal. The questionnaires consisted of a 4- point Likert scale with responses such as 'I strongly agree, I agree, I strongly disagree and I disagree. The

questionnaires were personally distributed by the researcher. The mathematics teachers completed the questionnaires the same day they were delivered to avoid a situation whereby the participants may fail to return the questionnaire, the researcher collected completed questionnaires from the mathematics teachers soon after completion. The data which was collected by the questionnaire was analysed quantitatively

Another instrument which was used to collect data in this study is the semi-structured face-to-face interview guide. When semi-structured interviews were used, it was ensured that the researcher did not make assumptions about what the interviewees were thinking about the use of the ethno-mathematics approach in the teaching of mathematics; he depended on what the participants said. Berg (2016) asserts that interviews do not only collect informative data, but they enable the interviewees to speak in their own voice and express their thought and feeling. Another advantage of face-to-face interview is that the researcher could pick some non-verbal cues which may not be possible when other forms of interviews are used (Rosenthal, 2016,). The data which was collected by interviews was analysed qualitatively. A pilot study was conducted first with five schools to check on the relevance and usability of the two instruments before the main study. The analysis of the participants' responses and the discussions with the participants during the pilot study helped the researcher to review the questionnaire and the interview questions, and this resulted in some questions being modified.

Permission to carry out the study from the Director of Education and Training was sought by the researcher and the clearance letter to that effect was issued. The participants filled some consent forms to document their willingness to participate in the study. The participants were also assured of confidentiality by asking participants not to write their names on the questionnaire or put any mark that may result in their identity being revealed. In data presentation individual respondent's score was not identified in the presented group data.

Frequency distributions and percentages were used in the presentation and analysis of quantitative data. The tallies of participants who responded in the same way were added to give the total frequency for that particular response and this was written in the frequency column of the table corresponding to the question. The frequency of the response was then expressed as a percentage of total possible frequency. **Table 1** presents quantitative data in frequencies and in percentages. The qualitative results are presented after the quantitative results.

Findings and discussion

Table 1: Mathematics Teachers' views on ethno-mathematics approach

		Frequency	***Percentage***
1. There is a link between Secondary Schools Mathematics and SiSwati culture	*Strongly agree*	*2*	*10%*
	Agree	*3*	*15%*
	Disagree	*5*	*25%*
	Strongly disagree	*10*	*50%*
2. It is possible to use the SiSwati indigenous mathematics knowledge in Mathematics classroom	*Strongly agree*	*3*	*15%*
	Agree	*2*	*10%*
	Disagree	*8*	*40%*
	Strongly disagree	*7*	*35%*
3. Some topics in the Mathematics syllabus have no relationships with the learner's out-of-school mathematics practices at all.	*Strongly agree*	*10*	*50%*
	Agree	*2*	*10%*
	Disagree	*4*	*20%*
	Strongly disagree	*4*	*20%*
4. There are some Mathematics concepts in the SiSwati culture	*Strongly agree*	*3*	*15%*
	Agree	*3*	*15%*
	Disagree	*11*	*55%*
	Strongly disagree	*3*	*15%*
5. Teachers' colleges in Eswatini train Mathematics teachers to incorporate culture when teaching Mathematics	*Strongly agree*	*2*	*10%*
	Agree	*4*	*20%*
	Disagree	*5*	*25%*
	Strongly disagree	*9*	*45%*
6. Connecting culture to the teaching of Mathematics makes the learners to understand Mathematics better.	*Strongly agree*	*4*	*20%*
	Agree	*2*	*20%*
	Disagree	*5*	*25%*
	Strongly disagree	*7*	*35%*

Quantitative data in Table 1 shows that the majority of the mathematics do not use the ethno-mathematics approach due to the following reasons: they believe that there is no link between secondary school mathematics and SiSwati Culture (75%), SiSwati indigenous culture cannot be used in the mathematics classroom (75%), some topics in secondary school mathematics cannot be connected with the learners' out of school mathematics practices (60%). The teachers indicated that there are no mathematics concepts in siSwati culture (70%), colleges in Eswatini do not train mathematics teachers to integrate ethno-mathematics in the mathematics pedagogy (70%) and connecting culture to the teaching of mathematics does not make learners understand mathematics better (60%).

The mathematics teachers' understanding of teaching from the known to unknown was that the known refers to what has been taught in class before it might be in the previous lessons, forms or grade. According to the mathematics teachers teaching from the known to unknown concept hardly meant to refer to the informal mathematics knowledge that learners brought to school. One of the teachers referred to the sequence in which mathematics topics should be presented, he said, 'One cannot teach area before teaching multiplication'. The mathematics teachers' views contradict Rosa and Orey (2011) who opined that mathematics teachers should know that mathematical skills that learners learn in school are not logically constructed based on abstract cognitive structures, but rather forged out of a combination of previously acquired knowledge and skills and new cultural inputs. Hence mathematics teachers should not ignore the out-of-school mathematics experience and knowledge that the learners bring in the mathematics classroom. The mathematics teachers give supremacy to the knowledge learners get at school hence disregarding the mathematical experience learners bring into the mathematics classroom.

The mathematics teachers who took part in this study regarded mathematical concepts found in cultural mathematics as very simple to an extent that it does not have any place in secondary school mathematics. This finding confirms Mtetwa and Jaji (2006) who studied school mathematics and out of school mathematics and Zimbabwe youngsters and conclude that mathematics teachers in Zimbabwe regard ethno-mathematics as preliminary mathematics upon which school mathematics foundation can be built, however, it does not have any place in the secondary school mathematics. One of the mathematics teachers said, 'Most of the cultural activities are done by people who do not know mathematics hence the mathematics is shallow'. According to this mathematics teacher, mathematics activities are worth when they are done by people who have studied mathematics such as mathematics teachers. According to the teacher's statement, what matters most for something to be regarded as serious mathematics is the person who is doing it rather than what is being done. This view contradicts Nyaumwe (2006) who studied the geometry in the construction of the Great Zimbabwe monuments which took place between the twelfth and the fourteenth centuries AD and found that there are some geometric concepts which most of the secondary school learners may find to be difficult.

Most mathematics teachers were of the opinion that the only way in which learners can understand mathematics is through working hard and they believed they were using the best approaches of teaching mathematics. The mathematics teachers attributed the failure of learners to understand mathematics to the learners' laziness. It was said that learners do not understand mathematics because they do not revise the taught concepts. The mathematics teachers do not believe that nothing is missing in their approach of teaching mathematics but it is the nature of mathematics that makes it difficult for learners to understand. The findings of this study reveal that connection of the learners' out of school mathematics practices and concepts was not regarded as one of the ways of making learners understand mathematics concepts. This contradicts Matthew, Jones and Parker (2013) who say mathematics teachers should strive to use a cultural approach to improve the learners' performance in mathematics; they should re-engineer mathematics classroom content and classroom instruction to support a culturally relevant approach.

Discussion

The Eswatini mathematics teachers' view that mathematics is culture free is not alien, this finding confirms with Muzangwa and Chindanya (2014) who studied the in-service teachers' views on culture and mathematics education in Zimbabwe in which 27 teachers participated. The study revealed that 21 of the teachers believed that mathematics is a culture free subject.

Hence such a perception is not unique to mathematics teachers in Eswatini. Teachers with such perception are unlikely to use ethno-mathematics in their lessons. Traditionally mathematics teachers in South Africa were found by Madusise (2014) to be teaching mathematics as though mathematics reside in the text book. Although mathematics teachers in Eswatini do not use ethno-mathematics to generate contents for teaching their learners, some use ethno-mathematics as examples to spice up their lessons. This concurs with Mtetwa and Jaji (2006,) whose study on school mathematics, out-of-school mathematics and the Zimbabwean youngsters which reveals that secondary school mathematics teachers were of the opinion that cultural mathematics was trivial that it does not have any place in the secondary school mathematics classroom. The teachers agreed that there were some mathematics concepts in cultural activities, however, they were shallow they could only be used as example. The mathematics teachers cannot mathematize Eswatini cultural activities hence they can only use them as examples.

The Eswatini secondary school teachers trivialized the mathematical concepts found in ethno-mathematics. Trivializing of mathematics concepts found in cultural activities is not new to Eswatini mathematics teachers, Alivarez and Oliveras (2014, p.70) who presented their paper at the Fifth Conference on Ethno-mathematics in Maputo, hint of the existence of an obstacle between ethno-mathematics and school mathematics, because teachers doubt the mathematical value of ethno mathematics. The Eswatini mathematics teachers' view that there are some concepts in school mathematics which did not have matching concepts in cultural activities confirms with Turugari (2022) who studied the integration of ethno mathematics in the teaching of probability in secondary schools in Zimbabwe and found that mathematics teachers believe that some probability topics such as Conditional Probability do not have matching concept in the cultural activities of the rural Shona people of Zimbabwe. However, this misconception is brought about by two aspects. The first one is that mathematics teachers focus on how the calculations are performed instead of the how the concepts are applied. Turugari's study further reveals that mathematics teachers expect to find mathematics formulas in cultural activities for them to acknowledge the existence of mathematical concepts in cultural activities. The second reason why mathematics teachers say there are no mathematics in cultural activities is because they may lack the skills required to mathematize the cultural activities because the teachers were not trained to do so. Teachers' Colleges in Eswatini are not the odd ones out, Sunzuma (2020) in her study of how mathematics teachers use the ethno-mathematics approaches found that teachers in Zimbabwe were not trained to use ethno-mathematics approach in teachers' training colleges and this resulted in them failing to incorporate the learners' out of school mathematical activities in the teaching of mathematics. In fact, there is no way mathematics can be culture free because mathematics has histories and the histories have come from different cultures.

The Eswatini mathematics teachers' failure to see the benefit of integrating ethno-mathematics in the mathematics pedagogy is contrary to a number of studies which reveal a lot of benefits in using the ethno-mathematics approach. Rosa and Orey (2011) studied the benefits of using an ethno-mathematics approach and found that students who were taught using an ethno-mathematics approach performed better that those who were taught using the traditional approach. Horsthemke and Schafer (2014) point out that learners taught using an ethno-mathematical approach can contribute and participate in society in which they live with confidence. Seepe (2000) suggests that inclusion of the African knowledge system into the curriculum may enable many students to access mathematics.

Conclusion and Recommendation

Conclusion

From the findings of this study, it can be concluded that the majority of mathematics teachers in Eswatini do not integrate ethno-mathematics in the teaching of mathematics. The mathematics teachers attributed their failure to use the ethno-mathematics approach mostly to their failure to see connection between school mathematics and cultural activities practised by the Swati people of Eswatini. Their message is that where the connection between mathematics exists it is not significant enough to warrant its inclusion in the secondary school mathematics classroom. Some reasons why mathematics teachers do not integrate ethno-mathematics in the teaching of mathematics is not because of their own making but because teachers colleges in Eswatini do not teach mathematics students teachers on how to integrate ethno-mathematics in the mathematics pedagogy, and this results in the mathematics teachers failing to put into consideration the informal mathematics experiences that the learners bring to the mathematics classroom when developing the mathematics pedagogy. The mathematics teachers do not know that integration of ethno-mathematics in the teaching of mathematics improves the learners' performance in mathematics

Recommendations

From the findings of this study, the study recommends that the quality of mathematics teaching be improved through integration of ethno-mathematics. The teachers should use the learners' out of school mathematics experience in developing mathematics lessons. Incorporating the learner's out of school mathematics practices makes the learning of mathematics enjoyable to the learners. It is also recommended that learners be engaged in some mini project that involves the utility of mathematics in their community to enhance the learners understanding of the application of mathematics. This will aid the learners to understand that every society practises mathematics. Also, it is recommended that the Ministry of Education and Training embarks on in-service training of mathematics teachers to equip them with skills for integrating ethno-mathematics in the teaching of mathematics. Teachers should be in-serviced in the use of learner-centred teaching methods that are appropriate and that make the learning of mathematics interesting. Moreover, the study recommends that teachers' training colleges train mathematics teachers on the use of Ethno-mathematics approach. Finally, the study recommends that further studies be carried to identify mathematics concepts in Eswatini's rich cultural activities and find how these activities can be integrated in the teaching of various topics in mathematics.

Acknowledgement

I am profoundly grateful for the companionship of the following people whose unwavering support made this research possible.

- Dr Sikelela Dlamini who helped me to clarify some of the questions on the questionnaire. I benefitted a lot from you on how to sequence questions on the questionnaire.
- Mr Zebron Chari who edited mainly the language aspect of this research. Your presence at the college was a blessing as I benefited from your English Language skills

- Mathematics teachers who took part in this study without whom this study could not have succeeded. I would like to thank you profoundly.

Conflict of Interest

I declare that here is no conflict of interests regarding the publication of the paper or otherwise.

Author's Contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation

References

Alvarez, H. B., & Oliveras, M. L. (2014, July 6-7). Obstacle to integrate Ethnomathematics in thematheматics classroom. *Proceedings of the 5th International. Congress on Ethnomathematics* [ICEM-5]. Maputo, Mozambique. https://journalofmathematicsandculture.wordpress.com/wpcontent/uploads/2016/05/icem5-vol-81-2014-proceedings.pdf

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. *Journal of Social Sciences, Literature, and Language*, 1(1), 9-16. https://www.blue-ap.com/J/List/4/iss/volume%2001%20 (2015)/issue%2001/2.pdf

Berg, B. L. (2007). *Qualitative Research Methods for the Social Science*, Ellyn B.C. Bacon. https://scirp.org/reference/referencespapers?referenceid=3206233

Berry, R.S.Y., & Williams, M. (2004). In at the deep end: Difficulties experienced by Hong Kong Chinese ESL learners at an independent school in the United Kingdom. *Journal of Language and Social Psychology*, 23(1), 118-134. https://doi.org/10.1177/0261927X03260810

Bishop, A. J. (1988). Mathematics Education in its cultural context. *Educational Studies in mathematics, 19*(2), 179-191. https://doi.org/10.1007/BF00751231

Chikodzi, I., & Nyota, S. (2010). The interplay of culture and mathematics: The Rural Shona classroom: *The Journal of Pan African Studies*, 3(10), 3-15. https://www.jpanafrican.org/docs/vol3no10/3.10TheInterplayofCulture.pdf

Chirume, S., & Chikasha, A, S. (2014). A critical analysis of the factors affecting

achievement in secondary school mathematics in Zimbabwe: A case study of Gweru District. *Merit Research Journal of Education and Review*, *2*(9), 194-202.

https://www.academia.edu/104136766/

Choongwa, G. H. (2018). *Fundamentals of Applied Research Methodology:*

A Complete Guide for Scholars and Researchers in Social Sciences, SARFED

D'Ambrosio, U. (1985). Ethno-mathematics and its place in the history and pedagogy of

mathematics: *For the Learning of Mathematics, 5*(1), 44-48.

Fouze, A, Q,. & Amit, M. (2023). The importance of ethno-mathematics education**.**

Creative Education, 14(04):729-740

Gergen, J. (2004). Social construction narrative and psychotherapy: A Handbook of narrative and

psychotherapy. *Practice, Theory and Research*, 351-366.

https://methods.sagepub.com/book/edvol/the-handbook-of-narrative-and-psychotherapy/chpt/social-construction-narrative-psychotherapy

Kim,.Y. (2001). *Becoming Intercultural: An Integrative Theory of Communication and*

CrossCultural, Adaptation: Thousand, Oaks: Sage.

https://sk.sagepub.com/book/mono/becoming-intercultural/toc

Kline, M. (1990). *Mathematics Thought from Ancient to Modern Times: Volume 2*, Oxford

University Press. https://www.amazon.com/Mathematical-Thought-Ancient-Modern-Times/dp/0195061357

Lee, M. S. (2018). Implementing the Sociocultural theory while teaching English as a social

language. SPACE: *Student Perspectives About Civic Engagement*, 1(11), 28-35 https://digitalcommons.nl.edu/space/vol1/iss1/6

Madusise, S. (2014). Cultural Village as contexts for mediating culture and mathematics in the

South African curriculum. *Revista Latinoamericana de Ethnomathematica, 8*(2), 11-31.

Matthew, L. E., Jones, S. M., & Parker, Y. A. (2013).Advancing a framework for culturally

relevant cognitively demanding mathematics task. In J. Leonard, W. Y., & D. B. Martin(eds). *The Brilliance of Black Children in Mathematics: Beyond the Numbers and towards new Discourse*. https://www.amazon.com.

Muzangwa, J. & Chindanya, A. (2015). In-service teachers' views and conception on culture and

mathematic education in rural schools. *Journal of research in Education Methodology*, 6(2), 869-874. https://rajpub.com/index.php/ijrem/article/view/3882ijrem

Ngcobo, S. F. M. (2011). Context preferred for the use in mathematics by Swaziland high

perfprming public schools' junior secondary learners. PhD Thesis, University of Western Cape

Nyaumwe, L. (2006). Learning mathematics concepts in a traditional socio-cultural economic

environment in Zimbabwe. *Indilinga African Journal of Indigenous Knowledge System*,

5(1), 50-61. https://journals.co.za/doi/pdf/10.10520/EJC61502

Mtetwa, K. J., & Jaji, G. (2006). School mathematics, out of school mathematics and Zimbabwe

youngsters. *International Journal of Qualitative Studies in Education*, 8 (4), 387-391.

Pear, K. S., & McClendon, R. C. (2002). Socio-cultural learning theory in practice Implication

for athletics training educators. *Journal of Athletic Training*, *37*(4)5-136.

https://www.proquest.com/docview/1859415164/

Phan, H. P. (2012). A sociocultural perspective of learning developing a new theoretical tenet.

Joint AARC APERA International Conference, Sydney. https://files.eric.ed.gov/fulltext/ED542251.pdf

Porcu, O. (2017). Exploring innovative learning culture in the newsroom. Journalism,

21(10), 1556-1572.

Rosenthal, M. (2016). Qualitative research methods why, when and how to conduct interview and

focus group in the pharmacy research. *Currents in pharmacy teaching and learning*, *8*(40),

509-516. https://www.sciencedirect.com/science/article/pii/S1877129715301970

Rosa, M., & Orey, D. C. (2009). Challenges faced by multicultural and multilingual schools

in the United States: The case of mathematics. La Salle - Revista de Educacao Ciencia e Cultura, 14(1), 29-44. https://dialnet.unirioja.es/descarga/articulo/3738356.pdf

Rosa, M., & Orey, D. C. (2011) Ethno-mathematics: The cultural aspects of mathematics. *Revista*

Latinoamerican de ethno-mathematica, *4*(2), 32-54.

Rosa, M., & Orey, D. C. (2013). Ethno-modelling as a research theoretical framework

on ethnomathematics and mathematical modeling. *Journal of Urban Mathematics Education, 6*(2), 62-80. https://doi.org/10.21423/jume-v6i2a195

Sunzuma, G. (2018). *Exploring in-service Zimbabwean Mathematics Teachers*

Preparedness to Integrating Ethno-mathematics Approaches to Geometry Teaching and learning. [PhD Dissertation], University of KwaZulu Natal, South Africa. https://ro.ecu.edu.au/ajte/vol45/iss7/5

Sunzuma, G., & Maharaj, A. (2019). In-service teachers' geometry content knowledge:

Implication for how geometry is taught in teachers' training instructions. *International Electronic Journal of Mathematics Education, 14*(3), 633-646.

http://dx.doi.org/10.29333/iejme/5776

Sunzuma, G. (2018). Exploring in-service Zimbabwean Mathematics Teachers

Preparedness to Incorporate Ethno-mathematics Approaches to Geometry Teaching and learning. *Australian Journal of Education*, 45(7), 76-93. http://dx.doi.org/10.14221/ajte.2020v45n7.5

Thorndike, E. L. (1906). *The Principles of Teaching Based on Psychology,* A.G. Seller.

Turugari, M. (2022). Integration of ethno-mathematics in the teaching of probability in

Zimbabwe secondary schools. [PhD Dissertation], University of South Africa. South Africa. https://uir.unisa.ac.za/handle/10500/29524

Vygotsky, L. (1978). Mixed in society: The development of higher psychological processes.

Cambridge, MA: Harvard University Press. https://csieme.us/documents/Example-Annotated-Bib.pdf

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA: Harvard

University Press. https://www.hup.harvard.edu/books/9780674943513