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Teachers' Perceptions of Culturally Relevant Mathematics Education in Oromia's Colleges of Teacher Education, Ethiopia

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Abstract
Mathematics education in culturally diverse contexts faces challenges when teaching is disconnected from students' language, culture, and daily experiences. This study explored mathematics teachers' perspectives on the cultural significance of the mathematics curriculum in Ethiopia. A mixed-methods design with a convergent parallel approach was employed. Quantitative data were collected through questionnaires from 199 trainee mathematics teachers, selected using stratified followed by random sampling, while qualitative data were gathered through interviews with 8 lecturers, selected via purposive sampling, across four Colleges of Teacher Education in the Oromia Regional State. Questionnaire data were analyzed using percentages, means, standard deviations, and multiple linear regression for quantitative, and interviews were audio-recorded, transcribed, coded, and analyzed inductively and thematically for qualitative data. The study identified three major themes: the pivotal role of native language instruction, the contextualization of mathematics through ethno-mathematics, and the integration of local knowledge into the curriculum as effective teaching strategies. Regression results further revealed that these three predictors jointly explained 52.3% of the variance in overall perceptions, with local knowledge being the strongest contributor, followed by mother tongue and ethno-mathematics. These findings highlight their complementary influence on fostering culturally responsive mathematics education and underscore the need for curriculum reform, professional development, and institutional support to translate positive perceptions into effective classroom practice. The study contributes to the literature on the cultural dimensions of mathematics teaching, learning, and curriculum design.

Keywords
Cultural relevance, Curriculum, Pedagogy, Basic mathematics, Teacher educator

1. Introduction
Mathematics is not a culturally neutral discipline but a human construct shaped by language, symbols, values, social practices, and material artifacts (Banks, 2015). Historically, Eurocentric perspectives, particularly those emerging during the Renaissance and Enlightenment, have dominated the formalization and teaching of mathematics, often promoting abstract and decontextualized knowledge as superior (Joseph, 1987; Linnebo, 2017). This Eurocentric orientation has implicitly marginalized indigenous knowledge systems, detaching mathematics education from learners' cultural backgrounds, community practices, and lived realities (Alangui, 2017).

Ethno-mathematics, introduced by D'Ambrosio (1984, 1985), provides a critical counter-narrative by emphasizing how diverse cultural groups apply mathematics to address daily challenges. Research highlights that embedding mathematics in cultural contexts promotes equity, fairness, and achievement by enabling students to see the relevance of mathematics to their lives (Aronson & Laughter, 2016; D'Ambrosio & Rosa, 2017). Yet, despite the

recognition of indigenous systems such as traditional counting, measuring, and problem-solving, teacher education programs in Ethiopia have not sufficiently linked mathematics instruction to local culture. While courses on Gadaa or Moral education exist, they fail to connect mathematics trainees' experiences with community practices to address issues of equity and justice (Jackson et al., 2017).

Scholars further argue that mathematics is inseparable from the historical and cultural contexts in which it evolves (Lakoff & Nunez, 2002; Hersh, 1997; François, 2024). Its presence in art, crafts, and daily activities confirms that mathematical learning is socially and culturally embedded (Barton et al., 2006). Studies from outside Ethiopia show that culturally relevant pedagogy fosters motivation, cross-cultural communication, and meaningful learning by drawing on students' prior knowledge and experiences (Gay, 2007; Civil, 2016; Acharya et al., 2021; Ladson-Billings, 2014). However, in Ethiopia, research on this issue remains limited. For instance, Tegegne (2015) showed that mathematical practices in workplaces are distinct yet essential to real-life problem-solving; Gebre et al. (2021) documented the indigenous number systems of Kafa; and Weldeana (2016) argued that the potential of ethno-mathematics to enrich the curriculum has not been realized. These studies are point to promising directions but stop short of systematically examining how teacher educators and trainees perceive the cultural significance of mathematics education.

The gap is particularly evident in Colleges of Teacher Education (CTEs), where mathematics lecturers and trainees are key agents in shaping the next generation of teachers. While research affirms that mathematics education is socially and culturally situated (Barton et al., 2006; Bishop, 1988), evidence shows that many teachers fail to account for students' cultural contexts when teaching mathematics in K-12 classrooms (Morris & Matthews, 2011). As a result, Ethiopian mathematics education continues to be dominated by imported curricular models with little recognition of indigenous knowledge, local practices, or the potential of mother tongue instruction.

Addressing these gaps is crucial for advancing inclusivity, social justice, and cultural relevance in Ethiopian education (Prahmana & D'Ambrosio, 2020). Yet, little is known about how mathematics lecturers and trainee teachers in CTEs perceive the role of indigenous knowledge in basic mathematics education. Specifically, research has not adequately explored their views on three critical dimensions: (i) the role of mother tongue instruction, (ii) the importance of contextualized ethno-mathematics, and (iii) the significance of local knowledge in teaching mathematics.

1.2 Statement of the Problem

There is a growing recognition that mathematics education in Africa often suffers from a cultural disconnect. The mathematics curriculum, largely shaped by Eurocentric models, rarely reflects the daily lives, cultural contexts, and indigenous practices of African learners. This disconnect, frequently described as a "cultural gap," creates a misalignment between the expectations of the formal education system and the lived experiences of students (Larvor, 2018). Such misalignment undermines learners' ability to relate to mathematical concepts and contributes significantly to their low academic performance (Sunzuma & Maharaj, 2020).

In Ethiopia, this problem is especially acute. While mathematics is a universal discipline, it is also deeply cultural, drawing on language, values, symbols, social practices, and local knowledge. Yet, teacher education curricula and instructional practices seldom consider these cultural dimensions. The result is that learners are taught abstract mathematical concepts with limited relevance to their environments, traditions, and problem-solving practices. This neglect of cultural significance in mathematics education not only limits comprehension but also perpetuates inequities in access, participation, and achievement.

Recognizing these gaps, Ethiopia's Curriculum Framework for Education (CFWEE) (MoE, 2020) explicitly calls for a curriculum that is inclusive, child-centered, locally relevant, and responsive to community needs. The framework emphasizes the integration of cultural factors and indigenous knowledge into school mathematics curricula at all grade levels. In the case of basic education (Grades 1–8), mathematics is expected to address fundamental concepts such as numbers and operations, measurement, geometry, sets, equations and inequalities, ratios and proportions, percentages, and functions (MoE, 2020). However, the cultural relevance of these concepts in teaching and learning remains underexplored and inconsistently addressed.

In this context, mathematics lecturers and teacher trainees in Colleges of Teacher Education (CTEs) play a central role. They not only teach and prepare future mathematics teachers but also contribute to curriculum design, supervision, and in-service teacher training in partnership with the Ministry of Education. Despite this pivotal role, little research has systematically examined their views on the cultural significance of mathematics education. Exploring their perceptions of the use of mother tongue, ethno-mathematics, and local knowledge in teaching mathematics is critical for informing curriculum development and teacher preparation.

Thus, this study addresses a pressing gap: the lack of evidence on how mathematics lecturers and trainees perceive the cultural significance of basic mathematics education in Oromia Regional State. Understanding their perspectives can provide valuable insights for curriculum developers, policymakers, and educators in designing mathematics curricula that are not only academically rigorous but also culturally relevant, practically meaningful, and socially just.

1.3 Objectives of the Study

General Objective

The main objective of this study is to explore the views of mathematics teacher trainees and mathematics lecturers on the cultural significance of mathematics education in Colleges of Teacher Education (CTEs) in Oromia Regional State, Ethiopia.

Specific Objectives

1. To examine mathematics lecturers' and trainees' perceptions of the significance of using the mother tongue as a medium of instruction in teaching basic mathematics.
2. To assess the extent to which mathematics lecturers and trainees value the integration of contextualized ethno-mathematics in the teaching of basic mathematics concepts.
3. To investigate mathematics lecturers' and trainees' views on the importance of incorporating local knowledge into the teaching of basic mathematics in CTEs.
4. To determine the extent to which mother tongue instruction, contextualized ethno-mathematics, and local knowledge integration jointly predict mathematics teacher trainees' overall perception of the cultural significance of mathematics education in Colleges of Teacher Education (CTEs) in Oromia Regional State.

1.4 Research Questions

General research question to examine the views of mathematics lecturers and mathematics teacher trainees on the cultural significance of basic mathematics education in Colleges of Teacher Education (CTEs) in Oromia Regional State, Ethiopia

Specific Research Questions

1. To what extent do mathematics lecturers and trainees perceive the use of the mother tongue as significant in teaching basic mathematics?
2. How do mathematics lecturers and trainees perceive the importance of integrating contextualized ethno-mathematics into the teaching of basic mathematics concepts?
3. What are the views of mathematics lecturers and trainees regarding the role of local knowledge in the teaching of basic mathematics in CTEs?
4. To what extent do mother tongue instruction, contextualized ethno-mathematics, and local knowledge integration jointly predict mathematics teacher trainees' overall perception of the cultural significance of mathematics education in Colleges of Teacher Education (CTEs) in Oromia Regional State?

1.5 Significance of the Study

This study is significant for several reasons. First, it provides valuable insights into how mathematics lecturers and teacher trainees perceive the cultural relevance of basic mathematics education in Colleges of Teacher Education (CTEs). By highlighting these perspectives, the study enables educators to critically reflect on their own practices and the extent to which they incorporate culturally grounded approaches in teaching mathematics.

Second, the findings will help reveal the gaps between the current mathematics curriculum and students' cultural experiences. Such evidence is crucial for curriculum developers, as it identifies weaknesses in the existing approach and informs the design of more culturally responsive and contextually meaningful curricula.

Third, the study contributes to improving classroom practices by encouraging the integration of indigenous knowledge, mother tongue, and ethno-mathematical practices in teaching. This integration not only makes mathematics more engaging and relevant but also strengthens learners' ability to connect mathematical concepts with their everyday cultural contexts.

Fourth, the research provides a foundation for equipping students with meaningful and lifelong learning skills. By situating mathematics in their cultural realities, learners can develop deeper understanding, problem-solving abilities, and an appreciation of the role of mathematics in their daily lives.

Finally, the findings will guide policymakers, curriculum designers, and teacher education programs in adopting innovative approaches to mathematics instruction at the primary level. In doing so, the study promotes equity, inclusivity, and cultural responsiveness, thereby contributing to national efforts to improve the quality and relevance of basic education in Ethiopia.

1.6 Conceptual and Theoretical Framework Model

Culturally relevant education offers a practical way to address educational challenges by asking key questions about who is affected and how to respond. It encourages collaboration between teachers, students, and communities, creating inclusive spaces that value diverse cultures (Nicol, Archibald, & Baker, 2013). A key part of this model is connecting students' cultural backgrounds and everyday experiences with critical mathematical thinking. It links informal and cultural practices in mathematics with the goals of the Ethiopian curriculum (MoE, 2020), as shown in Figure 1.

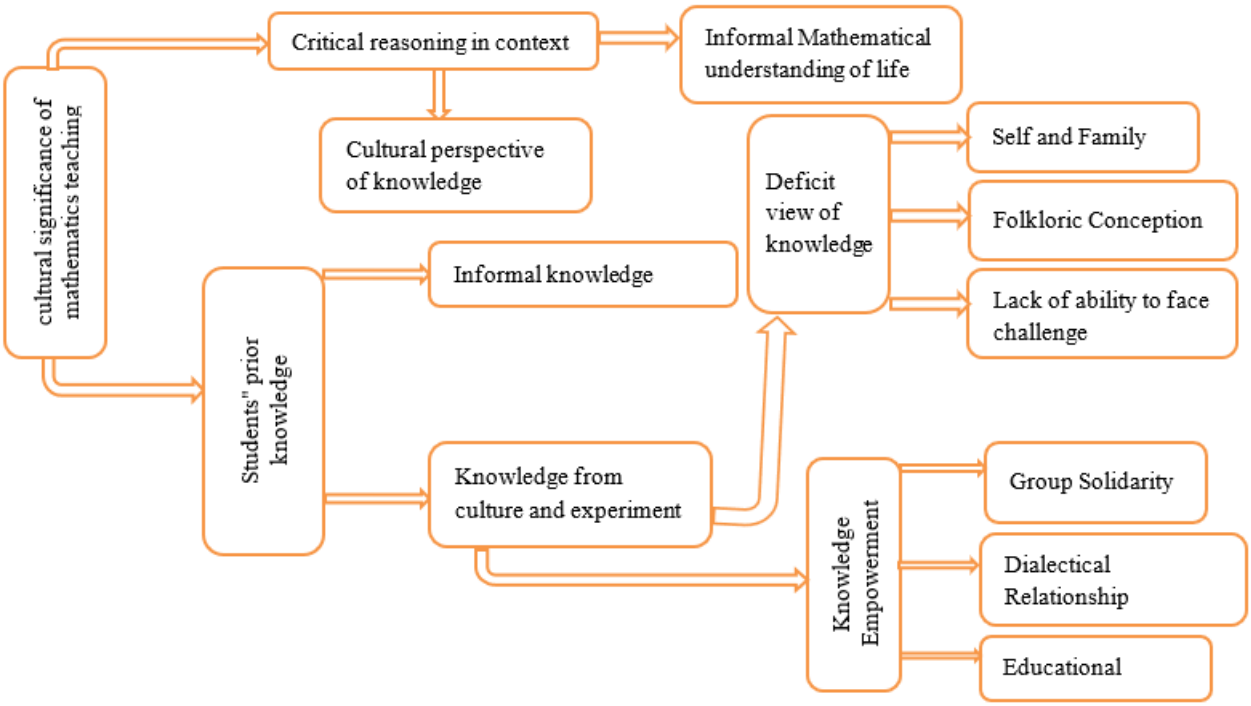

Figure 1: Culturally significant teaching aligns with the CFWEEM standards in Ethiopia
[***Adapted from*** Gutstein et al. (1997)]

Students should develop a deep understanding of mathematical concepts by thinking critically, forming logical arguments, and explaining their problem-solving processes key expectations outlined by the Ministry of Education (MoE, 2020). Teachers are encouraged to support diverse viewpoints and foster students' questioning abilities to strengthen mathematical understanding (Gutstein et al., 1997).

A second component of the model emphasizes the value of students' existing knowledge and lived experiences. According to the MoE (2020), integrating informal knowledge into teaching enhances learning and highlights the cultural relevance of mathematics.

The third element contrasts deficit-based views with empowerment-based approaches (Aguirre et al., 2016). Teachers are urged to understand students' cultural backgrounds and local contexts, even when cultural differences pose challenges. Knowledge for empowerment promotes connecting mathematics to students' lives (Gutstein et al., 1997).

Ladson-Billings (2009) identifies three pillars of culturally responsive teaching: academic success through critical thinking, cultural competence, and critical consciousness to challenge social inequities.

This framework ties together critical thinking, culture, and student knowledge, shaping the study's ontological, epistemological, methodological, and axiological foundations. These guided the research design, data collection (quantitative and interviews), and analysis, aiming to explore the cultural significance of mathematics education from participants' perspectives.

2. Research Methodology

2.1 Research Method and Design

This study employed a concurrent triangulation mixed-methods design**,** combining quantitative and qualitative approaches to gain a comprehensive understanding of the cultural significance of mathematics education. As noted by Creswell et al. (2012), this design strengthens the validity and reliability of findings by allowing researchers to cross-check data from multiple sources.

Quantitative data were gathered through questionnaires, while qualitative insights were drawn from in-depth interviews. Both data types were collected simultaneously, analyzed separately, and then integrated during interpretation (Creswell & Clark, 2017). Quantitative data were analyzed using descriptive statistics; qualitative data were analyzed thematically. This approach enabled a richer interpretation of the experiences and perceptions of mathematics lecturers and trainees, enhancing the depth and credibility of the study (Roulston & Halpin, 2022; Cohen et al., 2021).

2.2 Sample and Sampling Techniques

A combination of probability and non-probability sampling was used. From 13 Colleges of Teacher Education (CTEs) in Oromia Regional State, four CTEs Robe, Asella, Bule Hora, and Sebbeta were selected through simple random sampling**.**

Within each CTE, stratified random sampling was used to select 199 first- and second-year mathematics teacher trainees for the questionnaire. For the qualitative phase, purposive sampling was used to select eight mathematics lecturers (two from each CTE), chosen for their deep experience in curriculum development, teaching, and supervising practicum. These lecturers were expected to bring culturally grounded insights based on their lived experiences and educational roles.

2.3 Sources of Data

Data for this study were collected from primary sources**,** specifically mathematics teacher trainees and mathematics lecturers working in selected Colleges of Teacher Education. These groups were purposefully chosen because of their direct involvement in the teaching and learning process of mathematics, as well as their practical experiences with culturally diverse classrooms. By gathering data from both trainees and lecturers, the study was able to capture multiple perspectives on how mathematics is taught, learned, and understood in culturally varied contexts. According to Tashakkori and Teddlie (2010), incorporating data from multiple sources enhances the credibility and trustworthiness of a study by allowing researchers to triangulate findings and reduce potential biases associated with relying on a single source.

2.4 Data Collection Tools

To effectively capture both the breadth and depth of the research problem, the study employed two primary data collection tools**:** questionnaires and in-depth interviews**.** The questionnaires were designed to gather quantitative data, offering measurable insights into the perceptions and attitudes of mathematics teacher trainees across different colleges. These structured instruments allowed for statistical analysis and comparison of responses across participants. In contrast, in-depth interviews were used to collect qualitative data, providing rich, detailed narratives from mathematics lecturers. These interviews offered deeper understanding of the participants' lived experiences, cultural perspectives, and teaching practices. By using both tools concurrently, the study ensured methodological triangulation, which enhances the reliability and comprehensiveness of the findings.

2.4.1 Questionnaire

The questionnaire was carefully developed based on a thorough review of relevant literature, ensuring both content validity and alignment with the study's objectives. Several items were adapted from the Nunavut Science Education Project (Lewthwaite et al., 2010), which provided a valuable model for exploring cultural relevance in education. Additional items were self-constructed by the researcher to reflect the specific educational and cultural context of mathematics instruction in the Oromia region. To enhance accessibility and comprehension, the questionnaire was translated from English into Afan Oromo, the medium of instruction in the participating Colleges of Teacher Education. This step was essential to ensure participants fully understood each item and could respond accurately. A five-point Likert scale was used to measure responses, ranging from 1 (strongly disagree) to 5 (strongly agree), allowing for the quantification of attitudes, perceptions, and beliefs related to the cultural significance of mathematics teaching and learning.

2.4.2 In-depth Interviews

An interview guide was developed and employed to facilitate the in-depth exploration of participants' experiences and perspectives regarding the cultural dimensions of mathematics teaching (McNamara, 1999; Gay, 2007). The guide included semi-structured, open-ended questions designed to encourage detailed responses, while also allowing flexibility to probe further based on individual participants' answers. This approach enabled the researcher to gain deeper insight into how mathematics lecturers perceive, interpret, and integrate cultural relevance in their teaching practices and curriculum development.

Interviews were conducted face-to-face in Afan Oromo, the language of instruction in the participating institutions, to ensure clear communication and comfort for the participants. The responses were audio-recorded, transcribed verbatim, and then translated into English for analysis. This process allowed the researcher to capture the rich contextual meanings embedded in the participants' experiences, ensuring that cultural nuances were retained and accurately reflected in the findings. The use of in-depth interviews provided thick, descriptive data that complemented the quantitative findings and contributed to a holistic understanding of the cultural significance of mathematics education.

2.5 Validity and Reliability of Data Collection Instruments

Validity of Instruments

To ensure content validity, the instruments were reviewed by three research education experts (two associate professors and one assistant professor). Based on their feedback, revisions were made to improve clarity, eliminate redundancy, and ensure alignment with the study's objectives. This included modifying ambiguous wording, refining thematic divisions, and adding more items. Key themes addressed were lecturers' perceptions**,** experiences**,** classroom practices**,** and trainee teachers' views on the cultural significance of mathematics.

Reliability of Instruments

Reliability, or internal consistency, was assessed using Cronbach's Alpha, which is appropriate for Likert-scale items (Whitley, 2002; Robinson, 2009). According to Hair et al. (2013), alpha values above 0.70 indicate acceptable reliability.

Table 1 Scale-wise Reliability Test for Mathematics Teacher Trainees' Questionnaire

Scale	No. of Items	Cronbach's Alpha (α)	Inter-item Correlation Range
Mother Tongue	5	0.803	0.22 – 0.77
Ethno-mathematics	8	0.854	0.13 – 0.71
Local Knowledge	8	0.854	0.28 – 0.72

Table 1 shows the reliability of the mathematics teacher trainees' questionnaire. The Mother Tongue scale (5 items) had a Cronbach's alpha of 0.803 with inter-item correlations of 0.22–0.77, indicating good internal consistency. The Ethno-mathematics (8 items) and Local Knowledge (8 items) scales both showed high reliability with α = 0.854 and inter-item correlations of 0.13–0.71 and 0.28–0.72, respectively. These results demonstrate that all three scales are internally consistent and suitable for measuring trainee teachers' perceptions of mother tongue instruction, ethno-mathematics, and local knowledge in mathematics education.

2.6 Methods of Data Analysis

This study used both quantitative and qualitative data analysis to examine the cultural significance of mathematics from the perspectives of trainees and lecturers in basic education. Prior to data collection, permission was obtained from college deans with a formal support letter from Hawassa University, and informed consent was secured from all participants.

Quantitative data were collected via questionnaires and analyzed using descriptive statistics, including frequencies, percentages, means, standard deviations and multiple linear regression**.** The results were organized in tables and interpreted accordingly.

Qualitative data from in-depth interviews (conducted in Afan Oromo in April 2024) were recorded, transcribed, and translated into English. Transcripts were read repeatedly, and key ideas were coded to identify patterns related to the study's research questions. Coding helped form themes linked to the theoretical framework's four domains: critical thinking, children's knowledge, deficit, and empowerment**.**

To strengthen findings, Mishler's (1995) narrative analysis was used to interpret participants' stories, emphasizing meaning construction through storytelling. Follow-up interviews were conducted to deepen understanding of the three emerging themes within the theoretical framework. Finally, triangulation was applied by integrating qualitative insights with the questionnaire data to ensure validity and coherence across data sources.

3. Results and Discussion

3.1 General Characteristics of Study Respondents

This section addresses the research question: How do mathematics lecturers and trainee teachers perceive the cultural significance of basic mathematics education in CTEs? Three main themes emerged from the data analysis: teaching in the mother tongue, contextualized ethno-mathematics, and integrating local knowledge into the curriculum as a teaching approach.

The study involved two participant groups: mathematics teacher trainees and lecturers from CTEs. After obtaining authorization from Hawassa University, 21 questionnaires were distributed and all were completed (100% response rate). Additionally, eight key mathematics lecturers participated in structured in-depth interviews. These interviews explored lecturers' views on the cultural relevance of mathematics education across pre-primary, primary, and middle primary levels.

Findings from both quantitative and qualitative data converged on the importance of mother tongue instruction, ethno-mathematics grounded in local contexts, and the use of indigenous knowledge in teaching mathematics.

3.1.1 Trainee Views on Native Language Instruction for Teaching Mathematics

Ethiopia is a multilingual country with over 80 languages (MoE, 2020). Mathematics teacher trainees in CTEs come from diverse cultural and linguistic backgrounds within the same ethnic groups. Table 2 summarizes trainees' views on the use of native language instruction in teaching mathematics, measured on a five-point Likert scale: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA).

Table 2 Trainees' views on native language instruction for teaching and learning Mathematics (N=199).

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)	Mean	SD
Teaching math in the mother tongue develops competencies and improves achievement.	14.6	7.5	13.1	38.2	26.6	3.55	1.35
Curriculum allowing mother tongue creates a culture-friendly math classroom.	4.0	29.1	6.5	33.7	26.6	3.50	1.27
Using mother tongue clarifies math concepts and improves performance.	0.0	5.0	13.6	48.2	33.2	4.10	0.81
Learners are motivated and effective when taught in their language of instruction.	8.0	14.6	22.6	41.2	13.6	3.38	1.13
Teaching in mother tongue makes learning easier.	10.6	22.6	22.6	30.7	13.6	3.14	1.22
Grand Mean	**7.44**	**15.56**	**15.68**	**38.4**	**22.72**	**3.53**	**1.16**

As shown in Table 2, the majority of trainee teachers agreed that teaching mathematics in the mother tongue enhances competencies, improves achievement, clarifies mathematical concepts, fosters a culture-friendly environment, and motivates effective learning. Specifically, 22.72% agreed and 38.4% strongly agreed that native language instruction significantly benefits mathematics learning. The mean score (3.534) indicates positive recognition of its importance, while the standard deviation (1.157) reflects relatively consistent views among respondents. This aligns with UNESCO (2003), which emphasizes that instruction in students' first language strengthens skill development and academic performance, particularly in subjects like mathematics.

The qualitative findings from mathematics lecturers further reinforced these results. L1 (Robe CTE) highlighted that using the mother tongue supports students' active participation and eases the transition from home to school language, thereby improving outcomes. L2 (Asella CTE) stressed that learning mathematical concepts in a second language poses difficulties, as symbols are introduced through written language rather than familiar speech; hence, integrating the mother tongue enhances comprehension. L3 (Bule Hora CTE) pointed out that mother tongue instruction not only promotes attendance and participation but is also supported by Ethiopia's Constitution and the integrated curriculum, despite implementation challenges in a multilingual setting. Similarly, L4 (Sebbeta CTE) underscored that children's familiarity with their first language enhances expression, academic success, and adaptation, provided teachers are competent in the local language and culture.

Overall, both survey and interview data reveal that the mother tongue is central to meaningful and effective mathematics learning**.** Key themes identified include the strength of the mother tongue**,** the barriers created by second language instruction**, t**he role of language in conceptual understanding**,** and the need for teachers' linguistic and cultural competence**.** Thus, the evidence strongly supports that mathematics instruction should be conducted in students' native language to maximize comprehension and achievement.

3.1.2 Trainee Teachers' Views on Contextualized Ethno-mathematics

To examine trainee teachers' perspectives on integrating mathematical concepts with real-life activities such as agriculture, carpentry, business, tailoring, homemaking, and children's games, quantitative data were collected using a five-point rating scale. The results are presented in Table 3 below.

Table 3 Trainee teachers' views on contextualized ethno-mathematics

Item	Strongly Disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly Agree (%)	Mean	SD
Cultural contextualization motivates students	14.6	7.5	13.1	38.2	26.6	3.55	1.35
Curricula must shift to ethno-mathematics	4.0	29.1	6.5	33.7	26.6	3.50	1.27
Mathematical ideas from cultural activities	0.0	5.0	13.6	48.2	33.2	4.10	0.81
Indigenous knowledge improves achievement	8.0	14.6	22.6	41.2	13.6	3.38	1.13
Contextual IK makes curriculum relevant	10.6	11.1	11.1	42.7	24.6	3.60	1.26
Traditional practices are mathematical	14.6	7.5	13.1	38.2	26.6	3.55	1.35
Link between academic mathematics and students' experience	4.0	29.1	6.5	33.7	26.6	3.50	1.27
Ethno-mathematics shows role in real life	0.0	5.0	13.6	48.2	33.2	4.10	0.81
Overall	**7.0**	**13.6**	**8.5**	**40.5**	**26.4**	**3.66**	**1.16**

As presented in Table 3, most trainee teachers expressed positive attitudes toward the contextualization of mathematics education. Specifically, 40.5% agreed and 26.4% strongly agreed that embedding mathematics within cultural contexts enhances students' motivation, achievement, and understanding, while also making the curriculum more relevant. The overall mean score (M = 3.66, SD = 1.16) indicates general support for ethno-mathematics as a means of linking school mathematics to students' lived experiences. These findings align with Luitel (2014), who emphasized that contextualizing

mathematics promotes a pluralistic approach that values non-Western knowledge traditions, thereby advancing equitable mathematics education.

The qualitative data from lecturers further enriched these survey results**.** L5 (Robe CTE) stressed the need to connect mathematics with real-world practices and local knowledge through culturally relevant curriculum design, despite structural challenges such as inadequate implementation and teacher workload. L6 (Asella CTE) highlighted how indigenous practices like traditional house construction can illustrate geometric patterns, thereby motivating students and deepening conceptual understanding. Similarly, L7 (Bule Hora CTE) underscored that ethno-mathematics reflects community lifestyles, making learning more relatable and empowering, while L8 (Sebbeta CTE) emphasized the role of indigenous practices in affirming identity and engaging learners with culturally grounded mathematics.

Across these narratives, common themes emerged: empowerment through cultural connection**,** motivation and engagement in mathematics**,** curriculum relevance, and contextual illustrations (e.g., geometry in local architecture, counting, and measuring in daily practices)**.** These results indicate that ethno-mathematics can transform mathematics from an abstract subject into a meaningful tool that supports students' daily problem-solving and nurtures cultural pride. This perspective is supported by Acharya (2020), who argued that mathematics education should empower learners to manage real-life challenges, and Gallivan (2017), who advocated for culturally rich pedagogies that build on students' funds of knowledge.

In summary, both quantitative and qualitative findings strongly suggest that contextualized ethno-mathematics is vital for creating culturally responsive, engaging, and empowering mathematics education in Ethiopia.

3.1.3 Trainee Teachers' Views on Local Knowledge for Teaching Mathematics

Trainee teachers' perceptions of incorporating local knowledge into mathematics teaching and learning were collected and are summarized in Table 4 below.

Table 4 Trainee teachers' views on local knowledge for teaching mathematics

Item	Strongly Disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly Agree (%)	Mean	SD
Indigenous knowledge is crucial in teaching mathematics concepts	10.6	11.1	11.1	42.7	24.6	3.60	1.26
Focus should be on students' familiar daily activities and materials	14.6	7.5	13.1	38.2	26.6	3.55	1.35
Curricula should reflect local people's viewpoints	4.0	29.1	6.5	33.7	26.6	3.50	1.27
Incorporating indigenous knowledge makes mathematics interesting and easier to understand	0.0	5.0	13.6	48.2	33.2	4.10	0.81
Indigenous mathematical concepts must be used in teaching	14.6	7.5	13.1	38.2	26.6	3.55	1.35
Teachers should consider students' prior out-of-school knowledge	4.0	29.1	6.5	33.7	26.6	3.50	1.27
Cultural heritage and artifacts should be linked to mathematics	0.0	5.0	13.6	48.2	33.2	4.10	0.81
Curriculum should relate topics to students' daily lives	8.0	14.6	22.6	41.2	13.6	3.38	1.13
Overall	**7.0**	**13.6**	**8.5**	**40.5**	**26.4**	**3.66**	**1.16**

The data in Table 4 reveal trainee teachers' perspectives on the role of local knowledge in teaching mathematics. Overall, the results indicate a positive attitude toward integrating indigenous and local knowledge into mathematics instruction, as reflected in the total mean score of 3.66 (SD = 1.158), which is above the neutral point of 3 on the five-point scale.

A large proportion of respondents agreed or strongly agreed that *indigenous knowledge is crucial in teaching mathematics concepts* (67.3%), with a mean of 3.60. Similarly, 81.4% of respondents supported the view that incorporating indigenous knowledge into mathematics makes the subject more interesting and facilitates better understanding, yielding the highest mean score of 4.10 (SD = 0.814). A comparable level of agreement (81.4%) was also observed for the statement on using *cultural heritage and artefacts to contextualize mathematics teaching*, which recorded the same mean (4.10) and low variability, suggesting a strong consensus.

Regarding the use of familiar activities and materials from daily life during teaching, 64.8% of respondents agreed, with a mean score of 3.55 (SD = 1.347). Likewise, 60.3% agreed that mathematics teachers should consider students' prior knowledge acquired outside of school (mean = 3.50, SD = 1.271). These findings highlight recognition among trainee teachers that learning is enhanced when instruction connects to learners' everyday experiences.

However, relatively lower agreement was observed for the item stating that *curricula should focus on the local people's viewpoints*, where only 60.3% of respondents agreed, and the mean stood at 3.50 (SD = 1.271). Similarly, the statement that *the curriculum should be developed so every topic can be related to students' daily life* scored the lowest

mean (3.38, SD = 1.134), indicating that while teachers value contextualization, they may recognize challenges in consistently aligning every topic with daily practices.

In general, the results suggest that trainee teachers strongly value the inclusion of indigenous knowledge, cultural heritage, and students' lived experiences in teaching mathematics. This reflects a belief that contextualized teaching not only enhances understanding but also increases learners' interest and engagement. Nonetheless, the lower means for curriculum-related items point to potential challenges in systematic integration at the policy and design levels.

Multiple Regression Assumptions

RQ4: To what extent do mother tongue instruction, contextualized ethno-mathematics, and local knowledge integration jointly predict mathematics teacher trainees' overall perception of the cultural significance of mathematics education in Colleges of Teacher Education (CTEs) in Oromia Regional State*?*

Before conducting the regression analysis, the assumptions of multiple linear regression were examined. Visual inspection of the residuals versus fitted values plot and the Ramsey RESET test indicated that the relationship between the predictors and the outcome was linear. The Durbin–Watson statistic was approximately 2.0, suggesting independence of residuals. The Shapiro–Wilk test, skewness, and kurtosis values, together with the Q–Q plot, showed that residuals were approximately normally distributed. The Breusch–Pagan test failed to reject the null hypothesis of homoscedasticity, indicating constant error variance. Variance Inflation Factor (VIF) values for all predictors were below 2, suggesting no serious multicollinearity. Finally, Cook's distance identified a few influential cases, but their presence did not substantially alter the regression results. Overall, the assumptions of multiple regressions were adequately satisfied, and the model was deemed appropriate for addressing the research question (Hair et al., 2013; Whitley, 2002).

Table 5 Model Summary for Multiple Linear Regressions Predicting Overall Perception of Cultural Significance of Mathematics Education

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.723	.523	.515	3.42

Table 6 Overall Perception of Cultural Significance of Mathematics Education (N = 199)

Predictor	B (Unstd.)	SE B	β (Std.)*	t	p	95% CI	
						Lower	Upper
Mother Tongue	0.279	0.051	0.27	5.47	<.001	0.178	0.380
Ethno-mathematics	0.253	0.052	0.26	4.87	<.001	0.150	0.356
Local Knowledge	0.300	0.053	0.29	5.66	<.001	0.196	0.404

Table 5 and table 6 reveled that the multiple linear regression model was statistically significant, $F(3, 195) = 71.3$, $p < .001$, and explained approximately 52.3% of the variance in overall perceptions of the cultural significance of mathematics education ($R^2 = 0.523$, Adjusted $R^2 = 0.516$). Standardized beta coefficients (β) indicated that all three predictors Mother Tongue instruction, Ethno-mathematics, and Local Knowledge integration were significant and positively associated with overall perception. Among them, Local Knowledge had the strongest influence (β = .29), followed closely by Mother Tongue (β = .27) and Ethno-mathematics (β = .26). These results suggest that the combined contributions of these culturally responsive teaching approaches substantially predict teacher trainees' perceptions, highlighting the importance of integrating local and indigenous knowledge into mathematics education.

Among the three predictors, Local Knowledge emerged as the strongest contributor, followed closely by Mother Tongue and Ethno-mathematics. This pattern suggests that teacher trainees perceive culturally grounded practices, such as community artifacts and everyday experiences slightly more central to shaping meaningful mathematics education than language or ethno-mathematical contextualization alone. Nonetheless, the relatively balanced betas (.26–.29) indicate that all three constructs are interrelated and jointly essential for advancing culturally responsive mathematics education (Gay, 2007; Ladson-Billings, 2014).

These findings are highly consistent with both the quantitative and qualitative evidence reported earlier in the study. The descriptive results showed strong agreement among trainees that native language instruction, contextualized cultural practices, and local knowledge integration each enhance comprehension, motivation, and engagement (UNESCO, 2003; Abdulrahim & Orosco, 2020). Similarly, interview data from lecturers emphasized the empowering role of these dimensions for student participation and identity formation (Clark et al., 2013; Tsindoli et al., 2018). The regression results support these insights by demonstrating that each factor makes a significant and independent contribution to trainees' overall perception.

While the regression identified Local Knowledge as the strongest predictor, the qualitative narratives sometimes highlighted Mother Tongue as the most critical factor for comprehension and participation (Harrison & Tanner, 2018; Luitel, 2014). This discrepancy suggests that while trainees as a group, value local knowledge slightly more, individual lecturers may emphasize language due to their practical classroom experiences. In addition, the regression model captured only perceptions and did not account for systemic challenges (e.g., curriculum rigidity, lack of teacher training, heavy

workload) that the study identified as barriers to implementation (Sharma et al., 2009; Weldeana, 2016). These limitations caution that positive perceptions do not automatically translate into effective practice without structural support.

Taken together, the regression analysis confirms that mother tongue instruction, contextualized ethno-mathematics, and local knowledge integration are significant and complementary predictors of trainees' perceptions of culturally relevant mathematics education. The consistency with prior findings strengthens the argument that integrating these cultural dimensions into the mathematics curriculum is not only desirable but also necessary for making mathematics education more inclusive, engaging, and socially meaningful in the Ethiopian context (Aronson & Laughter, 2016; Prahmana & D'Ambrosio, 2020). At the same time, the inconsistencies and caveats highlight the need for curriculum reform, professional development, and institutional support to ensure that these positive perceptions are effectively translated into practice.

The qualitative data obtained from lecturers of different CTEs strongly support and validate the quantitative results presented in Table 4, showing that trainee teachers highly value the role of local knowledge in the teaching of mathematics. The lecturers' perspectives highlight the cultural, social, and pedagogical importance of indigenous knowledge in enriching mathematics education.

L4 emphasized that indigenous knowledge is deeply rooted in the customs, traditions, and occupational experiences of communities, which makes it highly valuable for contextualizing mathematics lessons. He argued that connecting mathematics with social, cultural, and historical contexts can spark students' interest and help them understand abstract concepts more meaningfully. This view aligns with the literature, which asserts that mathematics identity is closely tied to cultural identity (Abdulrahim & Orosco, 2020). By integrating cultural referents into classroom practices, teachers can bridge students' cultural experiences with formal mathematics learning (Clark et al., 2013).

Similarly, L6 pointed out the lack of integration of local knowledge into school curricula despite its potential to enrich children's understanding and decision-making skills. He stressed that practices such as farming, cooking, greeting, and social interactions provide valuable mathematical insights that should be embedded in classroom teaching. This highlights the need for teachers to tap into students' lived experiences, which can make learning more meaningful and contextual. Such an approach reflects Nergaard's (2017) claim that teachers who utilize local knowledge can foster deeper student engagement in classroom activities.

L8 further emphasized the role of teachers as facilitators who guide students through culturally relevant activities such as puzzles and home arithmetic. He argued that these methods not only connect mathematics to students' daily experiences but also enhance critical thinking, motivation, and comprehension. His point underscores the argument of Tsindoli et al. (2018), who suggest that teachers' indigenous knowledge contributes to culturally responsive pedagogy by shaping classroom practices, assessments, and creating environments of self-respect and respect for diversity.

Taken together, the lecturers' viewpoints underscore that the incorporation of local and indigenous knowledge into mathematics instruction can motivate learners by validating their community practices and experiences. Since informal mathematics knowledge arises directly from real-life activities, its recognition in formal school settings strengthens students' mathematics identity, promotes cultural pride, and enriches classroom engagement. These findings reinforce the argument that effective mathematics education should not only be cognitive but also culturally relevant, ensuring that students see their lived realities reflected in what they learn.

4. Discussion

This study employed questionnaires and in-depth interviews to examine three key themes: language, contextualization, and local knowledge in teaching mathematics for culturally relevant education in the Oromia Regional State of Ethiopia.

4.1 Language and Mathematics Learning

Quantitative findings indicated that teaching mathematics in the mother tongue enhances students' skills, improves academic performance, fosters a culturally supportive environment, clarifies concepts, and motivates engagement. Interview data reinforced these results, highlighting the advantages of native language instruction, challenges of second-language teaching, and the necessity for teachers to understand students' linguistic backgrounds. These findings are consistent with Harrison and Tanner (2018), who reported that aligning classroom language with students' native language strengthens their sense of belonging and participation.

4.2 Contextualization and Ethno-mathematics

The study revealed that integrating cultural context into mathematics instruction promotes motivation, improves understanding and performance, connects academic concepts to students' daily experiences, and fosters culturally responsive learning. Lecturer interviews supported these findings, emphasizing that ethno-mathematics encourages critical thinking, self-reflection, and appreciation of students' everyday mathematical practices. These results align with Brown and Crippen (2017), who found that problem-solving rooted in students' cultural contexts enhances engagement and makes mathematics more meaningful.

4.3 Local Knowledge in Teaching Mathematics

Quantitative data showed that incorporating local knowledge is essential for linking mathematics to students' daily activities, prior experiences, and community resources, thereby clarifying concepts and generating interest. Lecturers confirmed that using indigenous practices and cultural artefacts engages students and contextualizes learning, making mathematics both understandable and motivating. This finding is consistent with Haris and Ilma (2011), who emphasized drawing contexts from students' real-life experiences to bridge formal and informal mathematics.

Consistent Findings with Literature: The study supports prior research asserting that culturally responsive pedagogy strengthens students' critical thinking, identity, and sense of agency (Kurniati et al., 2015; Larson, 2016; Lim et al., 2019; Ulbricht et al., 2024). Indigenous mathematics, learned through experiential, informal, and culturally grounded practices, plays a key role in connecting students' lived experiences with formal instruction (Akullo et al., 2007).

Inconsistent Findings: Despite strong support for integrating local knowledge and ethno-mathematics, the study also revealed challenges in systematically embedding these practices in formal curricula. As Sharma et al. (2009) noted indigenous mathematics often receives limited attention in education systems dominated by modern, imported knowledge, reflecting a gap between culturally grounded teaching ideals and practical curriculum implementation.

In summary, this study demonstrates that native language instruction, contextualization, and local knowledge integration are critical for culturally relevant mathematics education. While the findings largely align with existing research, practical implementation challenges persist, highlighting the need for curriculum reform, teacher training, and culturally responsive pedagogical practices to fully realize these educational goals.

5. Summary, Conclusions, and Recommendations

5.1 Summary

This study explored the role of native language, contextualization, and local knowledge in enhancing culturally relevant mathematics education in the Oromia Regional State, Ethiopia. Data were collected from trainee teachers using questionnaires and from mathematics lecturers through in-depth interviews. The findings revealed that teaching mathematics in students' mother tongue significantly improves comprehension, academic performance, engagement, and creates a culturally supportive classroom environment. Contextualized ethno-mathematics was found to motivate students, strengthen their understanding, and link mathematical concepts to real-life activities, fostering critical thinking and problem-solving skills. Furthermore, integrating local knowledge into teaching such as traditional practices, community artifacts, and students' everyday experiences made learning more meaningful, relatable, and culturally grounded. Both quantitative and qualitative data emphasized the importance of culturally responsive teaching, although challenges were noted in terms of curriculum design and teacher preparedness.

The multiple linear regressions (MLR) analysis confirmed that mother tongue instruction, ethno-mathematics, and local knowledge integration each make significant and positive contributions to teacher trainees' perceptions of mathematics education, jointly explaining 52.3% of the variance. Among these, local knowledge exerted the strongest influence, followed closely by mother tongue and ethno-mathematics. This highlights the complementary nature of these culturally responsive approaches and their combined role in improving comprehension, engagement, and cultural relevance. However, differences in emphasis such as lecturers prioritizing language revealed diverse perspectives in practice.

5.2 Conclusions

The study concludes that mother tongue instruction is crucial for effective mathematics learning, as it enhances students' comprehension, participation, and cultural inclusion. Ethno-mathematics and contextualized teaching play a key role in motivating learners, connecting academic concepts to daily life, and improving achievement. The incorporation of local knowledge allows students to engage with mathematics in culturally meaningful ways, promoting both understanding and identity formation.

The MLR results provide further confirmation that these three dimensions are significant and complementary predictors of teacher trainees' perceptions, with local knowledge identified as the strongest factor. This finding aligns with qualitative evidence while also highlighting nuanced differences, such as lecturers emphasizing language for classroom practice. Overall, the results affirm the necessity of systematically integrating these cultural dimensions into the mathematics curriculum to make it more inclusive, engaging, and socially meaningful. At the same time, the study underscores persistent challenges including inadequate curriculum frameworks, limited teacher training, and insufficient institutional support that hinder the effective implementation of culturally responsive mathematics education in Ethiopia.

5.3 Recommendations

The study recommends curriculum reforms that systematically integrate mother tongue instruction, ethno-mathematics, and local knowledge into mathematics teaching, with particular emphasis on local knowledge as the strongest predictor of positive perceptions. Teacher professional development should equip educators with skills for culturally responsive pedagogy, while schools need access to instructional materials that reflect students' daily lives and community practices. Strong policy and institutional support are essential to reduce curriculum rigidity and provide resources for implementation. In addition, community engagement should be strengthened by involving elders and local practitioners in

curriculum design and teaching. Finally, ongoing research and evaluation are necessary to assess the effectiveness of these approaches and address systemic barriers such as teacher training gaps and resource limitations.

6. Limitation of the Study

This study has two main limitations. First, the theoretical framework, which focused on deficits and empowerment orientations, was informed by interviews with only eight mathematics lecturers from CTEs in the Oromia Regional State. While their insights highlighted aspects of culturally relevant teaching and the integration of mathematics with culture, they reflected the perspectives of a small, educated group rather than practical classroom applications. Consequently, the framework's potential to inform the implementation of culturally relevant mathematics in Ethiopian schools is limited.
Second, the qualitative analysis relied on interpretive accounts from participants and researchers. In emphasizing dominant patterns and themes to support quantitative findings, some data—including nuanced verbal expressions and body language were inevitably excluded. As a result, the identified themes may not fully represent all ideas present in the interviews, limiting the comprehensiveness of the qualitative insights.

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Conflict of interest

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Data availability

The data was incorporated into analysis and the researcher's submit raw data on request

References

1. Abdulrahim, N. A., & Orosco, M. J. (2020). Culturally Responsive Mathematics Teaching: A Research Synthesis. *Urban Review*, *52*(1), 1–25.
2. Acharya, B. R., Kshetree, M. P., Khanal, B., Panthi, R. K., & Belbase, S. (2021). Mathematics educators' perspectives on cultural relevance of basic level mathematics in Nepal. *Journal on Mathematics Education*, *12*(1), 17–48.
3. Akullo, D., Birungi, P., Alum, W., Aliguma, L., & Barwogeza, M. (2007). 10.1.1.151.1228. *World Library and Information Congress:73Rd Ifla General Conference and Council 19-23*, *73*(120), 6–10.
4. Alangui, W. V. (2017). *Ethnomathematics and Culturally Relevant Mathematics Education in the Philippines*. 183–208.
5. Aronson, B., & Laughter, J. (2016). The Theory and Practice of Culturally Relevant Education: A Synthesis of Research Across Content Areas. *Review of Educational Research*, *86*(1), 163–206.
6. Banks, J. A. (2015). Cultural diversity and education: Foundations, curriculum, and teaching. *Cultural Diversity and Education: Foundations, Curriculum, and Teaching*, 1–342.
7. Barton, B., Poisard, C., & Domite, M. D. C. (2006). Cultural Connections and Mathematical Manipulations. *For the Learning of Mathematics*, *26*(2), 21–24.
8. Bishop, A. J. (1988). Mathematics education in its cultural context. *Educational Studies in Mathematics*, *19*(2), 179–191.
9. Civil, M. (2016). STEM learning research through a funds of knowledge lens. *Cultural Studies of Science Education*, *11*(1), 41–59.
10. Clark, L. M., Badertscher, E. M., & Napp, C. (2013). African american mathematics teachers as agents in their african american students' mathematics identity formation. *Teachers College Record*, *115*(2), 1–36.
11. Cohen, L., Manion, L., & Morrison, K. (2021). *in Education Eighth edition*. 5103697.
12. Creswell, J. W., & Clark, V. L. P. (2017). *Third Edition: Designing and conducting mixed methods research approarch*. 520.
13. Creswell, J. W., Columbus, B., New, I., San, Y., Upper, F., River, S., Cape, A., Dubai, T., Madrid, L., Munich, M., Montreal, P., Delhi, T., Sao, M. C., Sydney, P., Kong, H., Singapore, S., & Tokyo, T. (2012). *Planning, Conducting, and Eva I uati ng Quantitative and Qua I itative Research FIFTH EDITION*. 10–12.
14. D'AMBROSIO, U. (1984). *The intercultural transmission of mathematical knowledge: Effects on mathematical education. UNICAMP.*
15. D'Ambrosio, U., & Rosa, M. (2017). *Ethnomathematics and Its Pedagogical Action in Mathematics Education*.
16. D'ambrosio Ubiratan. (1985). FLM Publishing Association Ethnomathematics and Its Place in the History and Pedagogy of Mathematics. *Source: For the Learning of Mathematics*, *5*(1), 44–48.
17. Dr. Bed Raj Acharya. (2020). Promoting Inclusive Mathematics Classroom Practices in the Schools of Nepal: an Ethnographic Inquiry. *International Journal of Research-Granthaalayah*, *8*(3), 223–237.

18. François, K. (2024). The Interest of Philosophy of Mathematics (Education). *Philosophia Mathematica*, *32*(1), 137–142.
19. Gay, G. (2007). 理论框架-Preparing_for_Crt-_Geneva_Gay-2. *Journal of Teacher Education.*
20. Gebre, D. G., Kassa, S. A., & Wodeyesus, K. M. (2021). Ethnomathematics in Kafa, Ethiopia: Number Sense and its Level of Inclusion in School Curriculum. *Mediterranean Journal of Social & Behavioral Research*, *5*(3), 41–50.
21. Gutstein, E., Lipman, P., Hernandez, P., & De Los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, *28*(6), 709–737.
22. Haris, D., & Ilma, R. (2011). The role of context in third graders' learning of area measurement. *Journal on Mathematics Education*, *2*(1), 55–66.
23. Harrison, C., & Tanner, K. D. (2018). Language Matters: Considering Microaggressions in Science. *CBE Life Sciences Education*, *17*(1), 1–8.
24. Jackson, C., Roberts, S. A., Jackson, C., & Roberts, S. A. (2017). *Dimensions of Equity within Preservice Teachers ' Responses to Equity Quotations Discussion And Reflection Enhancement (DARE) Pre-Reading Questions Dimensions of Equity within Preservice Teachers ' Responses to Equity Quotations*. *8*(1).
25. Joseph, G. G. (1987). Foundations of Eurocentrism in mathematics. *Race & Class*, *28*(3), 13–28.
26. Kurniati, Kusumah, Y. S., Sabandar, J., & Herman, T. (2015). Mathematical critical thinking ability. *Journal on Mathematics Education*, *6*(1), 53–62. https://eric.ed.gov/?id=EJ1079602
27. Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: A.k.a. The remix. *Harvard Educational Review*, *84*(1), 74–84.
28. Lakoff & Nunez. (2002). *Where Mathematics Comes From*. https://samba.huji.ac.il/+CSCO+0h756767633A2F2F7666766772662E756E65696E65712E727168++/fs/docs/icb.topic861364.files/Lakoff.Nunez.where.math.comes.from.2004.pdf
29. Larvor, B. (2018). Ethnomathematics and its discontents. *Springer, Cham*, *June*. https://uhra.herts.ac.uk/bitstream/handle/2299/22013/MMU_Larvor_Francois_BL_KF_March_2017.pdf?sequence=1&isAllowed=y
30. Lewthwaite, B., McMillan, B., Renaud, R., Hainnu, R., & MacDonald, C. (2010). Combining the Views of "Both Worlds": Science Educatino in Nunavut Piqusiit Tamainik Katisugit. *Journal of Educational Administration and Policy*, *98*, 1–71.
31. Lim, L., Tan, M., & Saito, E. (2019). Culturally relevant pedagogy: Developing principles of description and analysis. *Teaching and Teacher Education*, *77*, 43–52.
32. Linnebo, Ø. (2017). Philosophy of Mathematics. *Philosophy of Mathematics*, 1–204.
33. Luitel bcluitel@kusoed.edu.np, B. C. (2014). CULTURE, WORLDVIEW AND TRANSFORMATIVE PHILOSOPHY OF MATHEMATICS EDUCATION IN NEPAL: A Cultural-Philosophical Inquiry. *Philosophy of Mathematics Education Journal*, *28*, 1–413.
34. Ministry of Education. (2010). Curriculum framework for Ethiophian Education (K - 12). *Review Paper*, *May*, 46.
35. MoE. (2020). *Ethiopian general education curriculum framework (EGECF)*. *December*, 1–85.
36. Morris, C., & Matthews, C. (2011). Numeracy , mathematics and Indigenous learners : Not the same old thing. *Conference of Indigenous Education: Pathways to Success*, 29–33.
37. Prahmana, R. C. I., & D'Ambrosio, U. (2020). Learning geometry and values from patterns: Ethnomathematics on the batik patterns of yogyakarta, indonesia. *Journal on Mathematics Education*, *11*(3), 439–456.
38. Roulston, K., & Halpin, S. N. (2022). Designing Qualitative Research Using Interview Data. In *The SAGE Handbook of Qualitative Research Design*.
39. Sharma, S., Bajracharya, R., & Sitaula, B. (2009). Indigenous technology knowledge in Nepal - A review. *Indian Journal of Traditional Knowledge*, *8*(4), 569–576.
40. Sunzuma, G., & Maharaj, A. (2020). Exploring Zimbabwean Mathematics Teachers' Integration of Ethnomathematics Approaches into the Teaching and Learning of Geometry. *Australian Journal of Teacher Education*, *45*(7), 77–93.
41. Tegegne, H. R. (2015). Everyday Mathematics in Ethiopia : The Case of the Khimra People. *(Unpublished Doctoral Thesis). Addis Ababa University,Addis Ababa, Ethiopia)*.
42. Tsindoli, S., Ongeti, K., & Chang'ach, J. . (2018). Integration of Existing Indigenous Knowledge Within Mathematics Curriculum for Primary Schools in Kenya. *International Academic Journal of Social Sciences and Education*, *2*(1), 74–87.
43. Ulbricht, J., Schachner, M. K., Civitillo, S., & Juang, L. (2024). Fostering Culturally Responsive Teaching Through the Identity Project Intervention: A Qualitative Quasi-Experiment with Pre-Service Teachers. *Identity*, *24*(4), 307–330.
44. Weldeana, H. N. (2016). Ethnomathematics in Ethiopia: Futile or Fertile for Mathematics Education? *Momona Ethiopian Journal of Science*, *8*(2), 146.