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Ubuntulisation of mathematics classroom for the enhancement of learner's interest and achievement

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Abstract

Background: One of the primary challenges confronting African mathematics educators and students is the wholesale adoption of external methods, approaches, and ideas in the teaching and learning of mathematics. In response to this challenge, the concept of ethnomathematics has emerged, although it remains largely unadopted across many African countries. Recently, Social Justice Mathematics has been developed, a concept closely aligned with the principles of Ubuntu, which emphasizes equality and justice in all aspects of human life.
Aim: This paper aims to highlight the ubuntulisation of mathematics classrooms. Instead of fully adopting Social Justice Mathematics as a contemporary solution to enhance students' interest and achievement in mathematics, this paper proposes an Africanized approach by integrating Ubuntu as a foundational element of ethnomathematics. This approach is posited to achieve greater success among learners.
Methods: The study involves a comprehensive review of existing literature on ethnomathematics, Social Justice Mathematics, the benefits of Social Justice Mathematics in learning, Ubuntu pedagogy, and the ubuntulisation of mathematics classrooms.
Results: The paper presents relevant examples that emphasize the need for mathematics educators to incorporate African cultural contexts in the planning and teaching of mathematics.
Conclusion: The study concludes by recommending the ubuntulisation of mathematics classrooms as an effective alternative to Social Justice Mathematics for enhancing students' interest and achievement in mathematics.

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INTRODUCTION

The challenge faced by mathematics educators and students in Africa is the widespread adoption of external methodologies and concepts that often lack cultural relevance. This disconnect has spurred interest in the field of ethnomathematics, which emphasizes the teaching and learning of mathematics through cultural lenses (Owusu-Darko et al., 2023; Sunzuma & Maharaj, 2019). By linking mathematical concepts to students' cultural backgrounds and everyday experiences, ethnomathematics aims to make the subject more meaningful and accessible (Supriyadi et al., 2022; Trisnani & Utami, 2021). However, despite its potential benefits, ethnomathematics remains underutilized across the continent (Gebre et al., 2021). This underutilization underscores the necessity for more culturally relevant teaching methods in African mathematics education. Addressing this gap could enhance students' understanding and interest in mathematics. Therefore, exploring culturally relevant approaches is essential. This paper aims to address this gap by integrating ethnomathematics with Ubuntu principles.

A recent development in mathematics education is Social Justice Mathematics, which addresses equity and justice within the classroom (Fouze & Amit, 2019; Hayati et al., 2024; M. Ardiansyah et al., 2023). This approach aligns closely with Ubuntu, an African philosophy emphasizing humanity, compassion, and interconnectedness (Chetty & Price, 2024). Ubuntu promotes fairness and equity in all aspects of life, including education, making it a suitable framework for enhancing mathematics education in Africa (Mthimkhulu, 2024; Patel et al., 2024;

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Seely, 2020). The alignment between Social Justice Mathematics and Ubuntu presents a unique opportunity to develop inclusive and effective teaching methods. By integrating these concepts, educators can create learning environments that support all students equitably (Gargroetzi et al., 2021; Ngubane & Makua, 2021; Obiagu, 2023). This paper explores how Ubuntu can be applied within the context of ethnomathematics. Through this exploration, we aim to provide a culturally relevant alternative to traditional teaching methods. This approach not only addresses equity but also fosters a deeper connection to students' cultural contexts.

Given the alignment between Social Justice Mathematics and Ubuntu, this paper proposes integrating Ubuntu principles into mathematics education, referred to as ubuntulisation. Embedding Ubuntu into ethnomathematics allows educators to create learning environments that are equitable, just, and culturally resonant for African students (Buell & Shulman, 2019; Ergene & Yazıcı, 2020; Patari et al., 2022). This integration is anticipated to foster greater engagement, understanding, and overall achievement in mathematics (I. Fauzi et al., 2021; Widiarti et al., 2023). By providing a culturally relevant framework, ubuntulisation addresses the unique needs of African learners (Kotluk & Kocakaya, 2020). This approach stands in contrast to the wholesale adoption of external methods, which often overlook cultural nuances (Ololade Elizabeth Adewusi et al., 2024). Ubuntulisation emphasizes the importance of cultural context in education (Pavitola et al., 2024). This paper will demonstrate how this integration can transform mathematics classrooms. Such a transformation is essential for maximizing students' potential and interest in mathematics.

The primary objective of this paper is to highlight the potential of ubuntulisation in transforming mathematics classrooms (Mokwana et al., 2024). Through a comprehensive review of existing literature on ethnomathematics, Social Justice Mathematics, and Ubuntu pedagogy, this study explores their intersections and implications for mathematics education (Mendrofa et al., 2024). Additionally, it presents case studies from various African schools to illustrate practical applications of ubuntulisation and its impact on student learning (Coleman et al., 2021). These case studies provide concrete examples of how ubuntulisation can be implemented effectively (Chimbunde & Kgari-Masondo, 2020). The findings from these examples will be analyzed to understand the broader implications for African education. By drawing on real-world applications, the paper aims to offer practical insights for educators (Katz & Allen, 2022). The discussion will also address potential challenges and solutions in implementing ubuntulisation. This comprehensive approach ensures that the proposed methods are both practical and scalable.

In summary, this paper seeks to demonstrate that ubuntulisation offers a promising alternative to traditional and contemporary mathematics teaching methods, particularly in enhancing the educational experiences and outcomes for African students (Allen et al., 2022; Oanda & Obonyo, 2021). By adopting a culturally relevant approach, educators can better address the challenges faced by students and create a more inclusive and effective mathematics education framework (Roos, 2023). This study aims to contribute to the ongoing discourse on improving mathematics education in Africa by providing practical insights and recommendations for implementing ubuntulisation in classrooms (Julie & Gierdien, 2019; Mbhiza, 2024). The integration of Ubuntu principles into mathematics education represents a significant step towards achieving this goal. The findings and recommendations from this study will be valuable for policymakers, educators, and researchers (Galadima et al., 2019; Rizqi & Dewi, 2022) Ultimately, the aim is to enhance students' interest and achievement in mathematics through culturally responsive teaching. This paper concludes with a call for further research and collaboration in this area.

METHOD

Design

This study employs a descriptive qualitative approach and case study method to explore and understand the implementation of ethnomathematics and ubuntulization in mathematics teaching and their impact on students' comprehension, interest, and performance (Creswell & Clark, 2017). A combination of methods such as literature review, participatory observation, in-depth interviews, and comparative analysis is used to obtain a comprehensive picture (Yin, 2018). The primary goal of this research is to illustrate how these concepts are applied in educational practice and to identify

the advantages and challenges encountered in the process. The Figure 1 below provides a visual representation of the research design and methodology employed in this study.

Participants

Participants in this study consist of secondary school students from various schools in specific regions of Africa, selected through purposive sampling to represent diverse cultural backgrounds (Patton, 2015). Approximately 30 students and 5 teachers from three different schools are involved to ensure sufficient data variation. The participating students are those engaged in mathematics classes incorporating the ethnomathematics approach, while the teachers involved have experience or training in using culture-based approaches in their teaching. These inclusion criteria ensure that participants have direct experience with the implementation of ethnomathematics and ubuntulization.

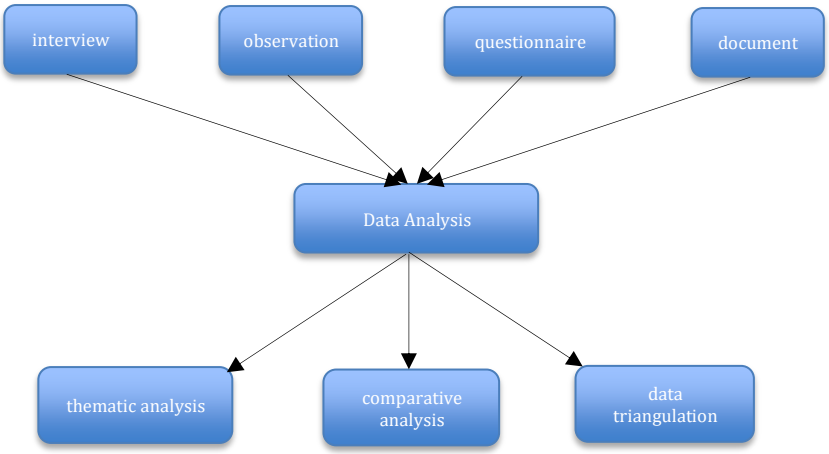

Figure 1. research design and methodology

Instruments

Several instruments are used to collect data in this study. In-depth interviews with semi-structured guides are conducted with teachers and students to explore their experiences, views, and perceptions of ethnomathematics and ubuntulization (Kvale & Brinkmann, 2009). Classroom observations are carried out using observation sheets to record classroom interactions, teaching methods used, and student responses during lessons. Questionnaires are distributed to students to gather quantitative data on their interest and understanding of mathematics material before and after the implementation of this approach. Additionally, documents and artifacts such as teaching materials, lesson plans, and student work products are analyzed to obtain additional data on the implementation of ethnomathematics.

Data Analysis

The collected data are analyzed using thematic analysis techniques to identify themes and patterns from the interview and observation data (Braun & Clarke, 2006). The qualitative analysis process involves transcribing interviews and observation notes, coding the data to identify key themes, and grouping themes based on similarities and relevance to the research questions (Gibbs, 2018). Comparative analysis is conducted to compare learning outcomes and student responses between classes using traditional approaches and those using culture-based approaches. Data triangulation is performed by combining data from various sources to enhance the validity of the research findings. The analysis results are compiled in the form of narrative descriptions to provide an in-depth portrayal of participants' experiences and perceptions.

RESULTS AND DISCUSSION

Findings

The findings of this study highlight the significant impact of ubuntulisation on mathematics education in African classrooms. By integrating Ubuntu principles, the study found that mathematics education became more culturally relevant and engaging for students (Dewa & Ndlovu, 2022; McElveen, 2024). This cultural relevance was achieved through the inclusion of indigenous knowledge systems and practices that resonated with students' everyday experiences (Wassell et al., 2021). As a result, students were more interested and involved in their learning, which aligns with the study's aim to enhance student engagement and achievement in mathematics (Abdullahi & Sirajo, 2022). The study demonstrates that culturally relevant teaching methods are crucial for addressing the unique educational needs of African students. Enhanced student engagement was one of the most notable outcomes of implementing ubuntulisation in mathematics classrooms. Teachers reported increased student enthusiasm and active participation when Ubuntu principles were incorporated into lessons (Awofala et al., 2024). This engagement was facilitated by fostering a sense of community and mutual respect within the classroom environment. The increased engagement is essential for improving students' overall interest and performance in mathematics, which was a primary goal of this study (Doño & Mangila, 2021). These findings underscore the importance of a supportive and inclusive classroom culture.

Another key finding was the improvement in students' mathematical understanding when lessons were contextualized within their cultural framework. By linking abstract mathematical concepts to familiar cultural practices, students were able to grasp and retain information more effectively (Anyichie et al., 2023). For instance, using traditional African art to explain geometric patterns helped students see the practical applications of geometry in their lives (Zuliana et al., 2023). This improved understanding directly contributes to better academic performance, fulfilling the study's objective of enhancing student achievement in mathematics (Norhanis et al., 2024). The results highlight the effectiveness of culturally responsive teaching methods. The study also found that the integration of Ubuntu principles promoted the development of critical thinking and problem-solving skills among students. Activities that required collaborative group work and discussions encouraged students to explore multiple perspectives and solutions (Lai, 2023). This holistic approach to learning helped students develop essential skills that are critical for their academic and personal growth (Ferreira et al., 2020). The development of these skills is an important aspect of comprehensive education, further supporting the study's aims (Lakhvich, 2021). These findings suggest that Ubuntu-based education can foster well-rounded student development.

In summary, the findings of this study provide compelling evidence for the positive impact of ubuntulisation on mathematics education in African classrooms. By making education culturally relevant, enhancing engagement, improving understanding, and developing critical thinking skills, ubuntulisation addresses the unique needs of African students effectively (Thomas-Browne et al., 2020). These results are directly aligned with the study's objectives of improving student interest and achievement in mathematics (Arthur & Dogbe, 2022). The study contributes valuable insights into the benefits of culturally responsive teaching methods and the integration of Ubuntu principles in education.

Cultural Relevance in Curriculum Design

Integrating Ubuntu principles into the mathematics curriculum involves incorporating indigenous knowledge systems and culturally familiar practices. This approach ensures that the curriculum resonates with students' everyday experiences and cultural backgrounds (Mkosi et al., 2023; Risiro, 2019). For example, using traditional African games that involve mathematical concepts helps make learning more engaging and relevant for students. These culturally embedded activities provide practical examples that students can relate to, making abstract concepts more tangible. The inclusion of culturally relevant content has a significant impact on students' acceptance and enthusiasm for mathematics. When students see their cultural practices reflected in their lessons, they are more likely to engage with the material. This increased engagement is critical for enhancing their understanding and retention of mathematical concepts. Teachers reported that students were more motivated and enthusiastic about learning mathematics when lessons included familiar cultural references.

Incorporating Ubuntu principles into the curriculum also helps bridge the gap between students' home environments and their school experiences. By validating and celebrating students'

cultural backgrounds, educators can create a more inclusive and supportive learning environment. This approach not only improves students' academic performance but also boosts their self-esteem and sense of belonging. The cultural relevance of the curriculum thus plays a crucial role in fostering a positive attitude towards mathematics (Boboyi, 2024; Chimbi & Jita, 2022). Examples from various African schools demonstrate the effectiveness of this approach. In South Africa, a school that integrated traditional storytelling into mathematics lessons observed significant improvements in student engagement and comprehension. Similarly, in Kenya, community-based projects that involved measuring and mapping local resources helped students apply their mathematical knowledge to real-world problems. These examples highlight the practical benefits of a culturally responsive curriculum.

The impact of integrating Ubuntu principles extends beyond academic achievement. It also fosters critical thinking and problem-solving skills. Students are encouraged to explore multiple perspectives and solutions, reflecting the holistic nature of Ubuntu. This approach aligns with the broader educational goals of developing well-rounded individuals who can contribute meaningfully to their communities (Costa & Ntsobi, 2023). By making mathematics education culturally relevant, educators can address the unique needs of African students more effectively. This relevance not only enhances students' interest and engagement but also promotes deeper understanding and retention of mathematical concepts. The positive outcomes observed in schools that have adopted this approach underscore the importance of culturally responsive teaching methods. These findings support the argument for a broader implementation of Ubuntu-based education in mathematics (Acharya et al., 2021) . In conclusion, integrating Ubuntu principles into the mathematics curriculum significantly enhances its cultural relevance and acceptance among students. This approach not only improves academic performance but also fosters a more inclusive and supportive learning environment. By validating students' cultural backgrounds and incorporating familiar practices into lessons, educators can create a curriculum that is both engaging and effective. This cultural relevance is key to achieving the study's goals of enhancing student interest and achievement in mathematics.

Teacher Professional Development

The implementation of ubuntulisation in mathematics education necessitated significant professional development for teachers. This professional development aimed to equip educators with the skills and knowledge to effectively integrate Ubuntu principles into their teaching practices. By engaging in comprehensive training programs, teachers were able to enhance their pedagogical skills and cultural competence (Malik & Susanti, 2021). This training included workshops, seminars, and collaborative learning sessions focused on Ubuntu pedagogy and culturally responsive teaching methods. The professional development programs provided teachers with a deeper understanding of Ubuntu principles and how to apply them in the classroom. Teachers learned to create inclusive learning environments that celebrate and validate students' cultural backgrounds. This approach not only improved teachers' cultural awareness but also their ability to connect with students on a more personal level. As a result, teachers were better equipped to foster a sense of community and mutual respect in their classrooms.

One of the key outcomes of the professional development was the enhancement of teachers' pedagogical skills. The training emphasized the importance of using culturally relevant examples and practices in teaching mathematics. Teachers were encouraged to incorporate indigenous knowledge systems and everyday cultural practices into their lessons. This approach made mathematical concepts more relatable and understandable for students, thereby improving their engagement and comprehension (Bhandari, 2021; Taranto et al., 2021). Teachers also developed better classroom management skills through the professional development programs. By adopting Ubuntu principles, teachers learned to create a supportive and respectful classroom environment. This environment encouraged positive behavior and reduced instances of disruption. Teachers reported that students were more cooperative and respectful towards each other and their teachers, which contributed to a more conducive learning atmosphere.

The professional development programs fostered a collaborative spirit among teachers. They had opportunities to share their experiences, challenges, and successes with their peers. This collaboration led to the exchange of best practices and innovative teaching strategies. Teachers were able to learn from each other and collectively improve their teaching methods. This sense of

community among educators mirrored the Ubuntu principle of interconnectedness and mutual support.

Furthermore, the training programs included components on critical thinking and problem-solving. Teachers were taught how to design activities that encourage students to explore multiple perspectives and solutions. This approach not only enhanced students' critical thinking skills but also helped teachers to adopt a more holistic teaching method. By integrating these skills into their teaching, teachers could better prepare students for real-world challenges.

The impact of professional development on teachers' competence was evident in their improved teaching practices and student outcomes. Teachers who participated in the training reported greater confidence and effectiveness in their teaching. They were able to create more engaging and culturally relevant lessons, which led to higher student achievement in mathematics. The professional development thus played a crucial role in the successful implementation of ubuntulisation in mathematics education (Fauth et al., 2019; Zayyadi, 2020). In conclusion, the professional development of teachers was a critical component of the ubuntulisation initiative. By enhancing their pedagogical skills and cultural competence, the training programs enabled teachers to create more inclusive and effective learning environments. This professional growth was essential for fostering student engagement and achievement in mathematics. The positive outcomes observed underscore the importance of ongoing professional development in supporting educational innovations.

CONCLUSION

The study underscores the significant impact of incorporating Ubuntu principles into mathematics education, known as ubuntulisation. This approach enhances student engagement, understanding, and achievement by making education culturally relevant. Embedding Ubuntu principles into the curriculum creates a learning environment that aligns with students' cultural backgrounds and everyday experiences, thereby making mathematics more relatable and accessible. Crucially, professional development programs were essential in preparing teachers to adopt culturally responsive teaching methods, enhancing their pedagogical skills and cultural awareness. This method fostered a sense of community and mutual respect among students, which increased their engagement and motivation, and also developed their critical thinking and problem-solving skills. Evidence from various African schools demonstrated the positive effects of ubuntulisation, supporting its broader adoption in mathematics education across the continent. In conclusion, ubuntulisation offers a compelling alternative to traditional mathematics teaching methods, addressing the specific needs of African students, boosting their interest and achievement, and creating a more inclusive and effective educational environment.

REFERENCES

Abdullahi, U., & Sirajo, M. (2022). ICT and Learning of Mathematics in Nigeria. *Journal of Mathematics Instruction, Social Research and Opinion*, *1*(3). https://doi.org/10.58421/misro.v1i3.40

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). https://doi.org/10.22342/jme.12.1.12955.17-48

Allen, P. C., Butler-Barnes, S. T., Robinson, H., & Jackson, A. N. (2022). Simply Put, I'm Tired: Efficacy to Combat Racism among African American Adolescent Boys and Girls. *Journal of Child and Family Studies*, *31*(2). https://doi.org/10.1007/s10826-021-02190-0

Anyichie, A. C., Butler, D. L., Perry, N. E., & Nashon, S. M. (2023). Examining Classroom Contexts in Support of Culturally Diverse Learners' Engagement: An Integration of Self-Regulated Learning and Culturally Responsive Pedagogical Practices. *Frontline Learning Research*, *11*(1). https://doi.org/10.14786/flr.v11i1.1115

Arthur, Y. D., & Dogbe, C. S. K. (2022). Enhancing Performance in Mathematics Through Motivation, Peer Assisted Learning, And Teaching Quality: The Mediating Role of Student Interest. *Eurasia Journal of Mathematics, Science and Technology Education*, *18*(2). https://doi.org/10.29333/ejmste/11509

Awofala, A. O., Olaguro, M., Fatade, A. O., & Arigbabu, A. A. (2024). Learning engagement as a predictor of performance in mathematics among Nigerian senior secondary school students. *International Journal of Innovation in Science and Mathematics Education*, *32*(3). https://doi.org/10.30722/IJISME.32.03.004

Bhandari, B. A. (2021). Activities Undertaken by the English Language Teachers for Professional Development. *Journal of NELTA Gandaki*, *4*(1–2). https://doi.org/10.3126/jong.v4i1-2.42645

Boboyi, A. (2024). Exploring Ubuntu Philosophy as a Foundation for Holistic School Social Work in South Africa. *Research in Social Sciences and Technology*, *9*(1). https://doi.org/10.46303/ressat.2024.14

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Buell, C. A., & Shulman, B. (2019). An Introduction to Mathematics for Social Justice. *Primus*, *29*(3–4). https://doi.org/10.1080/10511970.2018.1530707

Chetty, K., & Price, G. (2024). Ubuntu leadership as a predictor of employee engagement: A South African study. *SA Journal of Human Resource Management*, *22*. https://doi.org/10.4102/sajhrm.v22i0.2462

Chimbi, G. T., & Jita, L. C. (2022). Reforming the school curriculum for Ubuntu (humanness). *International Journal of Research in Business and Social Science (2147- 4478)*, *11*(5). https://doi.org/10.20525/ijrbs.v11i5.1862

Chimbunde, P., & Kgari-Masondo, M. C. (2020). Representation of the Zimbabwean 2015-2022 Social Studies curriculum: Teachers' perspectives on challenges and 'Ubuntulising' curriculum change and implementation. *Perspectives in Education*, *38*(1). https://doi.org/10.18820/2519593X/pie.v38i1.19

Coleman, S. T., Hurley, E. A., & Boykin, A. W. (2021). Teacher Implemented Communal Learning in Math: Boosting Learning with African American Elementary Students. *Urban Education*, *58*(8). https://doi.org/10.1177/0042085921998745

Costa, K., & Ntsobi, M. P. (2023). *A Systematic Review of the Potential for Promotion of Southern Epistemologies in Educational Research: Ubuntu Philosophy as a Research Paradigm, a Conceptual Model*. Scite.Ai. https://doi.org/10.31730/osf.io/qshp8

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.

Dewa, A., & Ndlovu, N. S. (2022). Use of information and communication technologies in mathematics education lecturers: Implications for preservice teachers. *The Journal for Transdisciplinary Research in Southern Africa*, *18*(1). https://doi.org/10.4102/td.v18i1.1165

Doño, M. J. A., & Mangila, B. B. (2021). Mathematics Teacher's Engagement and Students' Motivation to Learn Mathematics. *Infinity Journal*, *10*(2). https://doi.org/10.22460/infinity.v10i2.p285-300

Ergene, Ö., & Yazıcı, E. Z. (2020). Ethnomathematics Activities: Reflections from the Design and Implementation Process. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*. https://doi.org/10.16949/turkbilmat.688780

Fauth, B., Decristan, J., Decker, A.-T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education*, *86*. https://doi.org/10.1016/j.tate.2019.102882

Fauzi, I., Mauhibah, R., & Jupri, A. (2021). Learning Designs for the Addition and Subtraction of Two-Digit Numbers based on Realistic Mathematics Education Principles Using Snakes and Ladders Game. *Al Ibtida: Jurnal Pendidikan Guru MI*, *8*(1). https://doi.org/10.24235/al.ibtida.snj.v8i1.7741

Ferreira, M., Martinsone, B., & Talić, S. (2020). Promoting Sustainable Social Emotional Learning at School through Relationship-Centered Learning Environment, Teaching Methods and Formative Assessment. *Journal of Teacher Education for Sustainability*, *22*(1). https://doi.org/10.2478/jtes-2020-0003

Fouze, A. Q., & Amit, M. (2019). Ethnomathematics and Geometrical Shapes in Bedouin Women's Traditional Dress. *Creative Education*, *10*(07). https://doi.org/10.4236/ce.2019.107112

Galadima, U., Ismail, Z., & Ismail, N. (2019). A New Pedagogy for Training the Pre-service Mathematics Teachers Readiness in Teaching Integrated STEM Education. *International Journal of Engineering and Advanced Technology*, *8*(5c). https://doi.org/10.35940/ijeat.E1181.0585C19

Gargroetzi, E., Hendry, I., Jeffreys, A., Patel, A., Wei, G. S., & Collaborative, C. M. T. (2021). Chapter 6: "I Have Gotten Braver": Growing and Sustaining Critical Mathematics Pedagogies through a Teacher Community of Praxis. *Teachers College Record: The Voice of Scholarship in Education*, *123*(13). https://doi.org/10.1177/016146812112301307

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 &Amp; Behavioral Research*, *5*(3). https://doi.org/10.30935/mjosbr/11291

Gibbs, G. R. (2018). *Analyzing qualitative data*. https://doi.org/10.4135/9781526441867

Hayati, R., Syahputra, E., & Surya, E. (2024). Systematic Literature Review: Cultural Integration in Learning Concepts With an Ethnomathematics Approach. *Proceedings of International Conference on Education*, *2*(1). https://doi.org/10.32672/pice.v2i1.1333

Julie, C., & Gierdien, F. (2019). Reflections on Realistic Mathematics Education from a South African Perspective. *International Reflections on the Netherlands Didactics of Mathematics*. https://doi.org/10.1007/978-3-030-20223-1_5

Katz, S., & Allen, J. V. (2022). Open with intention: Situating equity pedagogy within open education to advance social justice. *Journal for Multicultural Education*, *16*(5). https://doi.org/10.1108/JME-07-2022-0089

Kotluk, N., & Kocakaya, S. (2020). Examining Teachers' Culturally Relevant Education Self-Efficacy Perceptions in Turkey. *Discourse and Communication for Sustainable Education*, *11*(2). https://doi.org/10.2478/dcse-2020-0023

Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. sage. https://doi.org/10.4135/9781849208963

Lai, Y.-H. (2023). Multi-ethnic computational thinking and cultural respect in unmanned aerial vehicle-assisted culturally responsive teaching. *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1098812

Lakhvich, F. A. (2021). Public Science Education: Some More Roles and Contributions. *Journal of Baltic Science Education*, *20*(6). https://doi.org/10.33225/jbse/21.20.864

M. Ardiansyah, Mohamad Lutfi Nugraha, & Budi Santoso. (2023). Mathematic Disposition of Students on the Aplication of Ethnomathematics Interactive Mathemathics Learning. *JUMLAHKU: Jurnal Matematika Ilmiah STKIP Muhammadiyah Kuningan*, *9*(2). https://doi.org/10.33222/jumlahku.v9i2.2982

Malik, A., & Susanti, S. (2021). Learning Designing for Establishment Physics Content and Teacher Pedagogic Aspects Through Lesson Study-based In-House Training. *Jurnal Penelitian &Amp; Pengembangan Pendidikan Fisika*, *7*(2). https://doi.org/10.21009/1.07206

Mbhiza, H. W. (2024). Behind the Love and Stories: Rural Learners' Reasons and Motivations for Learning Mathematics. *Interdisciplinary Journal of Sociality Studies*, *4*. https://doi.org/10.38140/ijss-2024.vol4.08

McElveen, T. L. (2024). Communal socialization: (Re)imagining the role of communal socialization on african american high schoolers' engagement and performance in mathematics. *Journal of Educational Psychology*, *116*(4). https://doi.org/10.1037/edu0000862

Mendrofa, R. N., Dewi, I., & Simamora, E. (2024). Philosophy-Infused Culture-Based Learning Models In Mathematics Education. *Mathline : Jurnal Matematika Dan Pendidikan Matematika*, *9*(1). https://doi.org/10.31943/mathline.v9i1.562

Mkosi, N., Mavuso, M. P., & Olawumi, K. B. (2023). Using Ubuntu Values in Integrating African Indigenous Knowledge into Teaching and Learning: A Review of Literature. *International Journal of Learning, Teaching and Educational Research*, *22*(5). https://doi.org/10.26803/ijlter.22.5.7

Mokwana, L., Maoto, S., & Chuene, K. (2024). Transforming sociomathematical norms in a South African grade 11 classroom to enhance learners' mathematical proficiency. *Eurasia Journal of Mathematics, Science and Technology Education*, *20*(3). https://doi.org/10.29333/ejmste/14281

Mthimkhulu, S. (2024). Ubuntugogy as a Viable Pedagogical Construct in African Education: A Literature Review. *Journal of Culture and Values in Education*, *7*(1). https://doi.org/10.46303/jcve.2024.6

Ngubane, N. I., & Makua, M. (2021). Intersection of Ubuntu pedagogy and social justice: Transforming South African higher education. *Transformation in Higher Education*, *6*. https://doi.org/10.4102/the.v6i0.113

Norhanis, C. A., Ainon Zarina, M. N., & Zarith Sofiah, O. (2024). Cooperative learning methods and algebraic proficiency: Insights from secondary school education. *Jurnal Intelek*, *19*(1). https://doi.org/10.24191/ji.v19i1.24418

Oanda, I. O., & Obonyo, M. M. (2021). The Multiple Waves of the African Academic Diaspora's Engagement with African Universities. *International Journal of African Higher Education*, *8*(2). https://doi.org/10.6017/ijahe.v8i2.13471

Obiagu, A. (2023). Toward a Decolonized Moral Education for Social Justice in Africa. *Journal of Black Studies*, *54*(3). https://doi.org/10.1177/00219347231157739

Ololade Elizabeth Adewusi, Foluke Eyitayo Adediran, Beatrice Adedayo Okunade, Bukola A, O., Rosita Ebere Daraojimba, & Justice Chika Igbokwe. (2024). Educational approaches in African social work: Implications for U.S. social work training. *International Journal of Science and Research Archive*, *11*(1). https://doi.org/10.30574/ijsra.2024.11.1.0182

Owusu-Darko, I., Sabtiwu, R., Doe, F., Owusu-Mintah, B., & Ofosu, E. K. (2023). Akan ethnomathematics: Demonstrating its pedagogical action on the teaching and learning of mensuration and geometry. *Journal of Mathematics and Science Teacher*, *3*(2). https://doi.org/10.29333/mathsciteacher/13281

Patari, N. M. C., Risalah, D., Sandie, S., Bahri, S., & Lestari, E. T. (2022). Etnomathematics Exploration in the Culture System of Malay Culture in Naga Mahap Village. *Daya Matematis: Jurnal Inovasi Pendidikan Matematika*, *10*(2). https://doi.org/10.26858/jdm.v10i2.34218

Patel, M., Mohammed, T. A. S., & Koen, R. (2024). Ubuntu in Post-Apartheid South Africa: Educational, Cultural and Philosophical Considerations. *Philosophies*, *9*(1). https://doi.org/10.3390/philosophies9010021

Patton, M. Q. (2015). What to observe: Sensitizing concepts. *Qualitative Research and Evaluation Methods*, 358–363.

Pavitola, L., Latsone, L., & Usca, S. (2024). The Transformation of Educational Values via Cultural Offerings in the Context of Teacher Education. *Social Sciences*, *13*(4). https://doi.org/10.3390/socsci13040188

Risiro, J. (2019). The challenges of Integrating Indigenous Knowledge in the teaching of weather and climate in Geography in Manicaland province of Zimbabwe. *The Journal of Geography Education in Africa*, *2*(1). https://doi.org/10.46622/jogea.v2i1.2483

Rizqi, N. R., & Dewi, I. (2022). Mathematics Learning in the Era of Society 5.0 in Terms of the Objectives and Ideology Of Mathematics Education. *EDUTEC : Journal of Education and Technology*, *6*(2). https://doi.org/10.29062/edu.v6i2.487

Roos, H. (2023). Students' voices of inclusion in mathematics education. *Educational Studies in Mathematics*, *113*(2). https://doi.org/10.1007/s10649-023-10213-4

Seely, S. D. (2020). Queer theory from the South: A contribution to the critique of sexual democracy. *Sexualities*, *23*(7). https://doi.org/10.1177/1363460719893618

Sunzuma, G., & Maharaj, A. (2019). Teacher-related Challenges Affecting the Integration of Ethnomathematics Approaches into the Teaching of Geometry. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(9). https://doi.org/10.29333/ejmste/108457

Supriyadi, E., Dahlan, J. A., Juandi, D., Turmudi, T., Ginanjar, J., & Sugiarni, R. (2022). Ethnomathematics and Music Studies from Scopus Database: Systematic Literature Review. *Triple S (Journals of Mathematics Education)*, *5*(1). https://doi.org/10.35194/ts.v5i1.2826

Taranto, E., Jablonski, S., Recio, T., Mercat, C., Cunha, E., Lázaro, C., Ludwig, M., & Mammana, M. F. (2021). Professional Development in Mathematics Education—Evaluation of a MOOC on Outdoor Mathematics. *Mathematics*, *9*(22). https://doi.org/10.3390/math9222975

Thomas-Browne, C. G., Boston, M. D., & Parke, C. S. (2020). Developing a Tool to Capture Productive and Unproductive Mindsets About Teaching Mathematics to African American Students: An Initial Review. *Urban Education*, *58*(8). https://doi.org/10.1177/0042085920934859

Trisnani, N., & Utami, W. T. P. (2021). Ethnomathematics-Based Learning Tools. *International Journal of Elementary Education*, *5*(4). https://doi.org/10.23887/ijee.v5i4.40574

Wassell, B. A., Coleman, N., Browne, S., & Chen, X. (2021). Families, Resources, and Community: Illuminating the Structures of Culturally Relevant Education in an Urban Early Childhood Center. *Education and Urban Society*, *54*(5). https://doi.org/10.1177/00131245211004573

Widiarti, Y., Hanifah, H., & Haji, S. (2023). The Effect of Blended Learning Model with Realistic Mathematics Education (RME) Approach on Concept Understanding and Mathematics Problem Solving Ability of Students of Junior High School 11 Bengkulu City. *Advances in Social Science, Education and Humanities Research*. https://doi.org/10.2991/978-2-38476-012-1_49

Yin, R. K. (2018). *Case study research and applications*. Sage Thousand Oaks, CA.

Zayyadi, M. (2020). Content and Pedagogical Knowledge of Prospective Teachers in Mathematics Learning: Commognitive Framework. *Journal for the Education of Gifted Young Scientists*, *8*(1). https://doi.org/10.17478/jegys.642131

Zuliana, E., Dwiningrum, S. I. A., Wijaya, A., & Purnomo, Y. W. (2023). The Geometrical Patterns and Philosophical Value of Javanese Traditional Mosque Architecture for Mathematics Learning in Primary School: An Ethnomathematic Study. *Journal of Education Culture and Society*, *14*(2). https://doi.org/10.15503/jecs2023.2.512.532