Integration of Ethnomathematics in Teaching Geometry: A Systematic Review and Bibliometric Report

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Due to the growing interest in the integration of ethnomathematics in mathematics education, we undertook a systematic literature review and bibliometric analysis of research on the incorporation of ethnomathematics in geometry teaching from 2011 to 2021. The search for 37 relevant research articles was done on Google Scholar, Scopus, and by hand search of some key journals. Data retrieved were analyzed descriptively by using Excel and NVivo. The findings showed that literature on ethnomathematics in teaching geometry is mainly produced and consumed in Indonesia, Zimbabwe, Nigeria, and Israel. Also, the findings revealed that the research topics/themes addressed by literature on ethnomathematics integration in teaching geometry can be grouped into five themes: views, practices, effects, challenges, and development of competence. Most of the studies conducted in this area employed ethnography. From the present study, it was observed that the number of research article publications relevant to the present study has increased exponentially, especially from 2018 to 2021. Therefore, it is our belief that this review will aid in the creation of systematic review procedures and reviews that are specifically concerned with the incorporation of ethnomathematics into geometry instruction.

KEYWORDS: integration of ethnomathematics, geometry teaching, systematic review, bibliometric analysis

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Recognizing the part mathematics plays in societal stratification and addressing systemic injustices that marginalized people have been ongoing challenges in mathematics education (and education in general) (Bullock & Larnell, 2015). These challenges could be attributed to Martin and Larnell’s (2013) assertion that, the presence of urban mathematics education enterprise and its theoretical and empirical soundness are typically taken for granted by scholars due to different viewpoints and orientations. Milner (2012) explained that researchers, theoreticians, and practitioners do not all agree on what constitutes urban education. To reach a compromise, Milner advised these academics to conceptualize urban education “consistent with the population and social contexts studied” (Milner, 2012, p. 560). Milner argued that “urban education typically has some connections to the people who live and attend school in the social context, the characteristics of those people, as well as surrounding community realities where the school is situated” (p. 558).

Urban mathematics education has experienced several historical turning points over the past 60 years, including the emergence of social and sociopolitical movements that sought to challenge the long history of values, ideologies, and critical omissions that have characterized mainstream mathematics education (Martin & Larnell, 2013; Parks & Schmeichel, 2012). Through theoretically and empirically sound research, urban mathematics education focuses on issues of equity, power, race, class, and identity while also addressing geospatial concerns locally and globally (Martin & Larnell, 2013). This research informs teaching, learning, and policy in urban mathematics classrooms.

The historical moment of the social turn, as described by Stinson and Bullock (2012), acknowledged the significance of social variables, equity, discourse, and relationships. It is believed that learning and teaching mathematics are sociocultural phenomena that are best understood in their respective social and cultural contexts. The social-turn moment, a pivotal time in the development of urban mathematics education, was distinguished by the inclusion of socio-cultural and situative viewpoints as well as a focus on issues of equality and discourse acknowledgment of access to school mathematics. The sociopolitical turn moment on the other hand views identity, power, and knowledge as intertwined and originating from (and produced inside) social discourses (Gutiérrez, 2013). It focuses on themes relating to identity, power, and the social context of mathematics education.

These historical conceptions of mathematics education in urban settings can change the conversation about and enhance the experiences and results of children who have traditionally been underrepresented in mathematics education. The inclusion of social and political elements as crucial in understanding how these influence teaching and learning outcomes is made possible by these historical moments. Among the phrases frequently used in discussions of mathematics education are
equity and social justice. Although equity and social justice are receiving more recognition and focus in mathematics education scholarship and practice (Larnell et al., 2016), many of the concepts and viewpoints have been incorporated into the mainstream discourse with little generatively critical evaluation. This urges the development of innovative teaching strategies that promote social justice and equity in urban schools. In response to this appeal, Rubel (2017) suggested culturally relevant pedagogy and teaching mathematics for social justice as equity-directed instructional strategies for the context of urban schools.

The educational activities designed in accordance with culturally relevant pedagogy principles concentrate on the function of mathematics in a sociocultural framework that uses the theories and notions connected to an ethnomathematical perspective to address issues (Rosa & Orey, 2020). According to Rosa (2010), teaching mathematics for social justice and employing culturally relevant pedagogies in teaching mathematics are both examples of ethnomathematics. Given that mathematics was developed by humans and that its mathematization is a sociocultural phenomenon, ethnomathematics opens up to the social-turn. It was stated by Brandt and Chernoff (2014) that “by bringing ethnomathematics into the classroom, educators are empowering those whose voices and ideas have traditionally been marginalized” (p. 33).

Ethnomathematics uses the etymology of three Greek roots, ethno, mathema, and tics (Rosa & Orey, 2016). From the etymological point of view, Rosa and Orey (2011) defined ethnomathematics in the following:

“ethno refers to members of a group within a cultural environment identified by their cultural traditions, codes, symbols, myths, and specific ways used to reason and to infer. Mathema means to explain and understand the world in order to transcend, manage and cope with reality so that the members of cultural groups can survive and thrive, and tics refer to techniques such as counting, ordering, sorting, measuring, weighing, ciphering, classifying, inferring, and modeling” (p. 35).

This demonstrates how individuals of particular cultures have historically acquired skills that enable them to simulate social environment and situations in order to explain and comprehend these phenomena. D’Ambrosio (2001) considers ethnomathematics as the combination of cultural anthropology and mathematics. Ethnomathematics studies the relationship between mathematics and the whole cultural and social life (D’Ambrosio, 2016). Ethnomathematics offers the opportunity to link school mathematics to students’ meaningful cultural referents and lived experiences. This has resulted in the growing interest in integrating ethnomathematics in mathematics education to improve learners’ academic achievement (Mosimege,
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2012; Rosa & Orey, 2020), partly due to the opportunities that ethnomathematics offers for students to learn mathematics in a more meaningful and engaging way by connecting academic mathematics to their experiences, culture, and environment. To meet the constant and ongoing shift in the demographics of students in mathematics classrooms around the world (Rosa & Orey, 2020), a significant adjustment in mathematical instruction is required. It is therefore important for teachers to incorporate ethnomathematics into geometry teaching (Rosa & Orey, 2020).

Geometry, a branch of mathematics that deals with shapes and spaces and their properties has been considered a key aspect of academic mathematics (National Council of Teachers of Mathematics [NCTM], 2000). Its study helps people to depict the world in a systematic way. However, Geometry is perceived as one of the most complicated aspects of mathematics to learn and teach (Fouze & Amit, 2021). Some researchers (e.g., Gerdes, 2014; Rosa & Orey, 2020) attribute this challenge with the learning of geometry to the disconnections between the students’ real-life experiences and the learning process in the classroom. Integrating ethnomathematics in the teaching of geometry could have significant effect on students’ learning success in geometry and mathematics in general (Umar et al., 2019). This explains why there is a drastic shift of focus in the field of ethnomathematics on integration of ethnomathematics in the teaching of geometry (Lidinillah et al., 2022). The aim of our study is to establish the global research patterns for the past 10 years in studies that integrate ethnomathematics and geometry through systematic review and bibliometrics analysis.

Due to the recent large growth in the quantity of academic publications, researchers have found it difficult to stay current with research trends and update their expertise regarding the integration of ethnomathematics in teaching geometry (Briner & Denyer, 2012). In this review, we will provide an overview of recent re-search in the integration of ethnomathematics in geometry. We also aim to contribute to the development of systematic review methodologies, particularly the ap-proaches required for conducting reviews in the field of ethnomathematics, as well as reviews that have a specific focus on the integration of ethnomathematics in teaching geometry.

In our review, only one related systematic review (Lidinillah et al., 2022) was identified on the integration of ethnomathematics in mathematics curriculum and teaching. This study was delimited to Sundanese ethnomathematics and its integration into the mathematics curriculum. It appears that none of the previous studies or re-views have provided a comprehensive, systematic review, and bibliometric report on the integration of ethnomathematics in teaching geometry. Several indices, in-cluding the distribution of publications over the previous ten years, journals, coun-tries, and the primary topics garnering the most attention and their shifts in foci over time, were descriptively evaluated to map the patterns on the current subject.
For this study, we undertook a systematic literature review of ethnomathematics integration focusing on empirical research on the integration of ethnomathematics in geometry. In our quest to determine the patterns of research on this topic and potential research goals, the study sought to answer the following research questions: (1) What are the trends of topics or themes?; (2) Which research designs or approaches are mostly employed?; (3) What are the most researched countries?; and (4) What are the leading journals?

Methods

Inclusion Criterion

We only included research articles that focused on the integration of ethnomathematics in geometry that were written in English and published in peer reviewed journals from 2011 to 2021. We excluded conference proceedings, theses, reports, bibliographies, and other types of "grey literature", because they are typically regarded as being of lower quality, and less reliable (Hartling et al., 2017; Mahood et al., 2013; Nivens & Otten, 2017).

Literature Search and Evaluation

Our searches for relevant research articles were done on Google Scholar and Scopus databases in February 2022. There exists empirical evidence suggesting that Google Scholar is a highly effective tool for locating specific scholarly literature, and continues to be a widely utilized resource among researchers (De Winter et al., 2014; Gehanno et al., 2013). Similarly, Scopus is considered the most extensive database for peer-reviewed literature (Niven & Otten, 2017). We therefore deem Google Scholar and Scopus as important databases for our primary source of data. A hand search of the issues published in the key academic journals in the field of ethnomathematics, such as Journal of Mathematics and Culture; Revista Eletrônica de Educação Matemática – REVEMAT; and Revista Latinoamericana de Etnomatemática, was also done. This was done in an effort to draw publications that were not already in the aforementioned electronic databases. To locate all pertinent research publications, a backward and forward search was done in Google Scholar and Scopus.

We started the literature search by using the keywords “integration of ethnomathematics in teaching geometry”, “integration of ethnomathematics”, “use of ethnomathematics”, “geometry teaching”, and “ethnomathematics.” The words “geometry,” “plane,” and “solid shapes” were combined with the words above as search keywords because of our focus strictly on geometry. In our pursuit to ascertain the preliminary relevance of the research articles, we engaged in the practice of briefly skimming the entire documents. During this procedure, we examined the titles and abstracts in relation to the study's objectives and criteria. These were done to find
out whether the articles met the set criteria. In order for a research article to be deemed eligible, it must satisfy the following conditions: (1) it must have undergone publication in peer-reviewed scholarly journals; (2) it must have been published within the timeframe of the past decade (2011 – 2021); (3) it must center its focus on the integration of ethnomathematics in the teaching of geometry; and (4) it must have been based on empirical research methodology. A total of 37 relevant research articles were found to meet the study criteria.

The searches identified 2,204 articles. Google and Scopus databases provided 2,198 articles (see Figure 1), and handsearching from some key peer-reviewed journals in the field of ethnomathematics yielded 6 more articles. We screened the abstracts of the 1,311 studies to further decide their relevance to the research topic for data extraction and analysis. The data extraction was independently performed by two review authors. Any discrepancies were documented and settled through arbitration by the other review author or by consensus. We developed data extraction forms with the review purpose in mind in capturing information needed for descriptive analysis.

Following the exclusion of 1,110 articles, a comprehensive corpus of 201 studies was obtained for the purpose of assessing their quality. We included 37 relevant research articles (see Figure 1). Two author reviewers read the fulltexts of 37 relevant research articles to carefully assess each study in light of the standards for quality. This was also done in a parallel and independent manner, and differences between the results were discussed and settled. Based on the criteria used for inclusion/exclusion, a checklist was employed in the evaluation of the relevant research articles. To ensure quality assessment of reviews, scholars recommend the use of checklists in evaluating research studies (Templier & Paré, 2015). These texts were classified according to the kind of research questions addressed, methodology used and country researched. Figure 1 provides an overview of the study’s selection process.
Figure 1
Flow chart of study selection process

Articles identified from Google database, n = 2,130
Hand searched articles identified, n = 6
Articles identified from Scopus database, n = 68

Total articles, n = 2,204

Articles excluded, n = 893
Duplicates = 893

Titles and abstracts identified and screened, n = 1,311

Articles excluded, n = 1,110
Grey literature =1,098
Foreign language =12

Full texts assessed for eligibility, n = 201

Articles excluded, n = 164
Irrelevant =153
Duplicates = 11

Research articles included in the review, n = 37

Note. A chart showing article selection processes
Findings

**Figure 2**

*Number of Publications from 2011 to 2021*

*Note.* Research publications from 2011 to 2021

From Figure 2, a total of 37 relevant research articles were published from 2011 to 2021. Among these articles, 27 were published within the period of 3 years from 2019 to 2021 (e.g., Age & Akaazua, 2021; Maryati & Prahmana, 2019; Pathuddin et al., 2021; Prahmana & D’Ambrosio, 2020; Shahbari & Daher, 2020; Sunzuma & Maharaj, 2021; Umar et al., 2019). By 2018, only 10 relevant articles had been published (e.g., Abdullah, 2017; Abiam et al., 2015; Haryanto et al., 2016; Maryati & Prahmana, 2018; Massarwe et al., 2012; Ogunkunle, & Nchelem, 2015; Unodiaku, 2013; Verner et al., 2013). From Figure 2, it could be observed that, the number of research article publications relevant to the study has increased exponentially.
### Table 1

*Number of Publications per Journal and Journals’ Impact Factor*

<table>
<thead>
<tr>
<th>Name of the Journal</th>
<th>PUB</th>
<th>IF</th>
<th>Name of the Journal</th>
<th>PUB</th>
<th>IF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal on Mathematics Education</td>
<td>5</td>
<td>4.3</td>
<td>European Scientific Journal</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Journal of Mathematical Behaviour</td>
<td>2</td>
<td>2.6</td>
<td>MaPan: Jurnal Matematika dan Pembelajaran</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Journal of Mathematics &amp; Culture</td>
<td>2</td>
<td>0.9</td>
<td>Applied Sciences</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>Jurnal Iqra’: Kajian Ilmu Pendidikan</td>
<td>2</td>
<td>8.1</td>
<td>International Journal of Inclusive Education</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td>Creative Education</td>
<td>2</td>
<td>1.0</td>
<td>EURASIA Journal of Mathematics, Science and Technology Education</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>International Journal of Mathematical Education in Science and Technology</td>
<td>2</td>
<td>1.0</td>
<td>Indomath: Indonesia Mathematics Education</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Bolema, Rio Claro (SP)</td>
<td>1</td>
<td>0.4</td>
<td>Acta Didactica Napocensia</td>
<td>1</td>
<td>6.2</td>
</tr>
<tr>
<td>Ethnomathematics Journal</td>
<td>1</td>
<td>0</td>
<td>IJAEDU- International E-Journal of Advances in Education</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td>Abacus (Mathematics Education Series)</td>
<td>1</td>
<td>2.3</td>
<td>Indonesian Journal of Science and Mathematics Education</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Australian Journal of Teacher Education</td>
<td>1</td>
<td>1.5</td>
<td>Journal of Teaching and Learning in Elementary Education</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Journal of Scientific Research &amp; Reports</td>
<td>1</td>
<td>4.0</td>
<td>International Journal of Research and Innovation in Applied Science</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>International Journal of Education in Mathematics, Science, and Technology</td>
<td>1</td>
<td>1.5</td>
<td>Educational Research Reviews</td>
<td>1</td>
<td>7.8</td>
</tr>
<tr>
<td>Turkish Journal of Computer and Mathematics Education</td>
<td>1</td>
<td>0.2</td>
<td>IOSR Journal of Research &amp; Method in Education (IOSR-JRME)</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>International Journal of Scientific &amp; Technology Research</td>
<td>1</td>
<td>0.3</td>
<td>Journal of Education and Practice</td>
<td>1</td>
<td>7.2</td>
</tr>
<tr>
<td>Journal of Curriculum Studies</td>
<td>1</td>
<td>2.1</td>
<td></td>
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</tbody>
</table>
As depicted in Table 1, 37 relevant research articles were published by a total of 29 peer-reviewed journals. Six of the peer-reviewed journals have more than 1 relevant article publication. From Table 1, the *Journal on Mathematics Education* was found to be the leading journal in number of research article publications with 5 publications, followed by the *Journal of Mathematical Behaviour; Journal of Mathematics & Culture; Jurnal Iqra’: Kajian Ilmu Pendidikan; Creative Education; and International Journal of Mathematical Education in Science and Technology* with 2 research articles each.

The remaining peer-reviewed journals namely *Bolema, Rio Claro (SP); Ethnomathematics Journal; Abacus (Mathematics Education Series); Australian Journal of Teacher Education; Journal of Scientific Research & Reports; International Journal of Education in Mathematics, Science, and Technology; Turkish Journal of Computer and Mathematics Education; International Journal of Scientific & Technology Research; European Scientific Journal; MaPan: Jurnal Matematika dan Pembelajaran; Applied Sciences; International Journal of Inclusive Education; EURASIA Journal of Mathematics, Science and Technology Education; Indomath: Indonesia Mathematics Education; Acta Didactica Napocensia; IJAEDU- International E-Journal of Advances in Education; Indonesian Journal of Science and Mathematics Education; Journal of Teaching and Learning in Elementary Education; International Journal of Research and Innovation in Applied Science; Educational Research Reviews; IOSR Journal of Research & Method in Education (IOSR-JRME); Journal of Education and Practice; and Journal of Curriculum Studies* have 1 relevant research article each. Again, Table 1 shows that 24 of the 29 peer-reviewed journals have an impact factor.
Figure 3. Trends of Topics or Themes

Note. Trends of topics or themes

Figure 3 illustrates the topics/themes addressed by literature on ethnomathematics integration in geometry can be grouped into 5 topics/themes: Views, Practices, Effects, Challenges, and Development of Competence. The figure shows the dominance of the practice of ethnomathematics as a theme with 20 (54%) of the 37 research articles published (e.g., Supiyati et al., 2019; Fouze & Amit, 2019, 2021; Munthahana & Budiarto, 2020; Prahmana & D’Ambrosio, 2020; Huang et al., 2021). These studies explored ethnomathematics in different cultures and how that rich knowledge can be harnessed for the teaching and learning of geometry in schools. There were 6 (16%) relevant article publications (e.g., Mania & Alam, 2021; Sevgi & Erduran, 2020; Sunzuma & Maharaj, 2020a, 2020d, 2021a) that explored the views of teachers regarding the incorporation of ethnomathematics in geometry teaching in schools.

Figure 3 shows that, 5 (14%) of the relevant research article publications (e.g., Age & Akaazua, 2021; Farokhah et al., 2017; Fouze & Amit, 2021; Iluno &
Taylor, 2013) sought to determine the effects of integrating ethnomathematics approaches in geometry classroom. Also, 4 (11%) of the relevant research article publications (e.g., Capua, 2021; Massarwe et al., 2012; Mutagin et al., 2021; Verner et al., 2013) examined the development of competencies through modules for teaching geometry using ethnomathematical approach. From Figure 3, only 2 (5%) relevant research publications (Sunzuma & Maharaj, 2019; 2021b) explored teachers’ challenges with regards to the incorporation of ethnomathematical approaches into the teaching of geometry.

**Figure 4**
Research Designs

As it is evident in Figure 4, 13 (35%) of the studies employed ethnography whereas 7 (19%) employed quasi-experimental designs. Ethnography was used by studies exploring ethnomathematics in different cultures that can be used in teaching geometry in schools (e.g., Fredy et al., 2020; Maryati & Prahmana, 2018, 2019;
Pathuddin et al., 2021; Prahmana & D’Ambrosio, 2020) while quasi-experimental designs were employed by studies (e.g., Age & Akaazua, 2021; Iluno & Taylor, 2013; Umar et al., 2019) determining the effects of integrating ethnomathematics approaches in geometry classroom.

Also, Figure 4 showed that 7 (19%) of the studies employed convergent/concurrent mixed methods while 4 (11%) employed development. Convergent/concurrent mixed methods were used by studies (Shahbari & Daher, 2020; Sunzuma & Maharaj, 2019, 2020a, 2020b, 2020c, 2021b) to investigate the views, practices and challenges faced by teachers when incorporating ethnomathematics approaches into geometry instruction. On the other hand, development research designs employed by studies (e.g., Capua, 2021; Massarwe et al., 2012; Mutagin et al., 2021) were utilized to create modules aimed at enhancing competencies in teaching geometry through the use of an ethnomathematical approach.

From Figure 4, 4(11%) of the studies employed case study whereas 2 (5%) employed phenomenology. The case study was used by studies (e.g., Mania & Alam, 2021; Sevgi & Erduran, 2020; Sunzuma & Maharaj, 2020d) to explore students’ and teachers’ views about the integration of ethnomathematics approaches in geometry teaching while phenomenology (Haryanto et al., 2016; Muhammad et al., 2021) was used in studying ethnomathematics in cultural artefacts.
From Figure 5, it could be observed that Indonesia emerges as the most extensively researched country in this particular field of study with 14 relevant research article publications. These findings could be attributed to the significant efforts made to disseminate state-of-art knowledge in the field of mathematics education, particularly with a focus on ethnomathematics through the establishment of several peer-reviewed international journals such as *Journal on Mathematics Education; Jurnal Iqra*: Kajian Ilmu Pendidikan; *Indomath: Indonesia Mathematics Education; Indonesian Journal of Science and Mathematics Education; MaPan: Jurnal Matematika dan Pembelajaran* etc. These journals are hosted or affiliated to research institutions and professional bodies such as Universitas Sriwijaya, Indonesian Mathematical Society (IndoMS) etc. Indonesia was followed by Zimbabwe which had 7 relevant research article publications. Then followed by Nigeria and Israel in terms of the number of relevant research article publications. These countries had 6 research article publications each. The remaining countries (Ethiopia, Philippines,
Turkey and China) have been less explored by research focusing on this study. Each of these countries had only 1 relevant research article publication between the period of 2011 to 2021.

**Conclusion**

Ethnomathematics is a thriving field of study. There is no denying its significance for teaching geometry and mathematics in general. It is remarkably intercultural and cross-disciplinary. It is based on study in a number of areas of mathematics, including anthropology, ethnography, cultural studies, cognitive sciences, history, and social dynamics. We find the beauty, recognition, and analysis of research on the use of ethnomathematics in geometry instruction in the context of academic discourse and analysis to be fascinating. The quality research by Maryati and Prahmana (2018), Massarwe et al. (2012), Prahmana and D’Ambrosio (2020), Sunzuma and Maharaj (2020a, 2021a), and some others are classical references about the research recognition about the integration of ethnomathematics in teaching geometry under different cultures. The increasing interest in the ethnomathematics research results in various research article publications identified by this review study. There are many ongoing studies in this area of ethnomathematics research that are pre-sented at conferences and not get published, that are not even known to most re-searchers. From the study, it could be observed that the number of research article publications relevant to the study has increased exponentially especially from 2018 to 2021. Upon examining the individuals and groups responsible for developing and consuming content relevant to the integration of ethnomathematics into geometry teaching, it became evident that Indonesia, Zimbabwe, Nigeria, and Israel emerged as prominent contributors in this field.

In ascertaining the role of ethnomathematics as a key to maximizing the teaching and learning of geometry in Nigeria, Iluno and Taylor (2013) used a quasi-experimental design. The study’s results revealed that students who received instruction through an ethnomathematics approach, which involved leveraging traditional and local shapes to teach conic sections, demonstrated higher levels of academic performance compared to students who were taught using a conventional instructional method. In a comparable setting, Ogunkunle and Nchelem (2015) used a quasi-experimental design to examine the impact of including ethnomathematics in the secondary mathematics curriculum for efficient artisan creative skill development in Abia State, Nigeria. When taught utilizing an ethnomathematics instructional approach vs. a traditional instructional approach, there was a noticeable difference in the creative talents that students acquired for the development of artisan skills. The effectiveness of a geometry instruction strategy based on ethnomathematics was investigated by Abiam et al. (2015) using a quasi-experimental design. The results of the study indicated that using an instructional strategy rooted in
ethnomathematics was more effective in enhancing the geometric competency of Nigerian students compared to the conventional approach.

Fouze and Amit (2021) conducted a study in Israel to examine the incorporation of Bedouin values into geometry teaching. According to the study, students' conception, understanding, success, and motivation to study geometry all improved as a result of employing an ethnomathematical approach in teaching geometry. Shahbari and Daher (2020) in a similar context looked at the impact of ethnomathematics on Israeli middle school pupils' acquisition of triangle congruence through activities based on Islamic geometrical ornamentation. According to the research, students were successful in developing congruence and congruent triangle conceptions with the use of ethnomathematics.

The findings of these studies affirm Rubel’s (2017) assertion that “contextualizing mathematics in students’ cultural practices can lend a sense of practical utility to mathematics, often interests students, mediates between students’ formal and informal knowledge, and supports mathematics identity development” (p. 73). In light of this, we encourage teachers to always think about the possibility for instructional approach (such as ethnomathematics) that both considers students' sociocultural backgrounds and offers a more fulfilling and powerful mathematical learning experience. This calls for teachers to gain knowledge about the demographics (culture, environment and experiences) of their students if they are to effectively relate school mathematics to students’ realities.

Limitations of the Study

The utilization of a review methodology that exclusively incorporates relevant research articles published between 2011 and 2021 may introduce a potential publication bias, as this approach is unlikely to capture studies produced prior to or subsequent to the specified timeframe. Also, limiting searches for relevant research articles to studies that are published in the English language could introduce bias. As this strategy is unlikely to find studies that have not been published in peer-reviewed journals, limiting reviews to research articles published in peer-reviewed journals could subject the review to publication bias.

Suggestions for Future Studies

Future studies can broaden the scope of review of more relevant studies to include grey literature (such as conference proceedings, theses, reports, bibliographies, records of ongoing research etc.), thereby giving a more comprehensive picture of the evidence that is available. Also, future studies can extend databases to other databases that contain collections of non-English language studies in the field of ethnomathematics.
References


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Gehanno, J. F., Rollin, L., & Darmoni, S. (2013). Is the coverage of Google Scholar enough to be used alone for systematic reviews. BMC Med Inform Decis Mak, 13(7), Article pmid:23302542


http://dx.doi.org/10.1016/j.jmathb.2013.06.002

https://doi.org/10.1016/j.jmathb.2019.05.002