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Evaluating the Impact of Ethnomathematics on Mathematics Achievement: A Meta-Analysis of Studies from 2014-2024

Linda Indiyarti Putri[a], Guldana Begimbetova[b], Nusrotus Sa'idah[c], Ali Murfi[d]

[a]Islamic Elementary Teacher Education Study Program, Universitas Wahid Hasyim, Indonesia; [b]Department of Special Education, Abai Kazakh National Pedagogical University, Kazakhstan; [c]Islamic Religious Education Study Program, Universitas Islam Nahdlatul Ulama Jepara, Indonesia; [d]Islamic Education Management Study Program, Universitas Islam Negeri Sunan Kalijaga, Indonesia

Abstract

Purpose – This study aims to address the persistent challenge of low mathematics comprehension among students, often attributed to culturally irrelevant and formal approaches in teaching. Despite the potential of ethnomathematics as a culturally contextualized pedagogical approach, comprehensive evaluations of its effectiveness remain limited. This research seeks to fill this gap by conducting a meta-analysis to measure the effect size of ethnomathematics in improving mathematics education over the past decade.

Methods/Design/Approach – A meta-analysis was conducted using data from 11 selected studies published between 2014 and 2024, which employed ethnomathematics in educational settings. The studies were screened based on rigorous inclusion criteria, focusing on experimental designs with control groups and sufficient statistical data for effect size calculation. Statistical analyses, including heterogeneity tests and publication bias assessments, were performed using JASP software.

Findings – The meta-analysis revealed that ethnomathematics significantly enhances students' mathematics achievement, with effect sizes ranging from 0.561 to 2.698. The average effect size of 1.22 indicates a strong positive impact, demonstrating that ethnomathematics is a highly effective approach in various educational contexts, including Indonesia and Zimbabwe. The analysis also identified some heterogeneity across studies, suggesting that the effectiveness of ethnomathematics may be influenced by factors such as intervention design and population characteristics.

Originality/Value – This study provides empirical evidence supporting the effectiveness of ethnomathematics as a pedagogical approach that bridges cultural contexts and mathematical concepts, enriching the curriculum and enhancing students' understanding. It contributes to the growing body of literature by validating ethnomathematics as a viable strategy for improving mathematics education, particularly in culturally diverse settings.

Practical Implications – The findings suggest that educators should consider integrating ethnomathematics into their teaching practices to make mathematics more relevant and engaging for students. The study also underscores the need for curriculum developers to incorporate cultural contexts into mathematics education, fostering inclusivity and relevance.

Keywords Ethnomathematics, mathematics education, meta-analysis, cultural context, educational effectiveness

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1. Introduction

Mathematics education is often perceived as challenging, leading to low levels of conceptual understanding among students (Mahmudah et al., 2021; Sili et al., 2018; Wibowo et al., 2023). This view is supported by research, which reveals that mathematics is typically taught through a formal approach due to a highly structured curriculum (Hendriyanto et al., 2023). This approach tends to adhere strictly to normative principles in schools, thereby neglecting the cultural realities of society as a contextual learning approach. As a result, mathematics education becomes less meaningful because students do not fully comprehend its utility, despite mathematics being crucial in everyday life. Additionally, it has been highlighted that mathematics teachers are often unprepared to address the diverse socio-cultural needs of students in the classroom (Meeran & Van Wyk, 2022). Many current education systems follow a universal curriculum that frequently overlooks the local cultural context as a medium for contextual learning. One proposed solution to this issue is the application of ethnomathematics as a teaching approach, which can transform the learning experience from daunting to enjoyable and enhance students' creativity in learning mathematics (D'Ambrosio, 2018; Risdiyanti & Prahmana, 2021).

It has been emphasized that ethnomathematics, as a field of study exploring the relationship between culture and mathematical concepts, has been recognized as an important method for facilitating a deeper understanding of mathematics and improving educational outcomes by respecting students' local wisdom and cultural contexts (Bart, 2007; Busrah & Pathuddin, 2021; Ergene et al., 2020; Fauzi et al., 2022; Nursyahidah et al., 2018; Wiryanto et al., 2022). According to The selection of ethnomathematics as an educational approach is appropriate, as it not only enriches the mathematics curriculum but also helps students integrate and understand mathematical material more inclusively and meaningfully by relating it to their cultural experiences and traditions (Wiryanto et al., 2022). Although ethnomathematics has been integrated into some educational programs and curricula, a comprehensive evaluation of its effectiveness in improving mathematics learning outcomes remains necessary. Research suggests that the ethnomathematical approach holds potential for bridging local knowledge with global mathematical concepts, enabling students to appreciate and apply mathematical knowledge within their cultural contexts while also gaining insight into other cultures on a global scale (Hariastuti et al., 2022). The significance of the ethnomathematical approach in learning practices lies in creating and developing didactic situations that bridge mathematical practice with culture, thereby eliminating the ambiguity of mathematical concepts (Umbara et al., 2021).

Findings affirm that engaging in task design by teachers that incorporates ethnomathematics as an approach can enhance students' reasoning in mathematics learning (Cervantes-Barraza & Araujo, 2023). This aligns with findings that the use of an Android application based on wayang ethnomathematics, integrated with character education, can also improve academic achievement and the development of character traits exemplified in wayang, such as religiosity, discipline, hard work, enthusiasm, and patriotism (Nuryadi et al., 2023). The ethnomathematical approach in current mathematics learning practices has demonstrated success in various aspects, from increasing student engagement and achievement to supporting inclusivity and multiculturalism in education. It offers valuable perspectives on how mathematics education can be developed to meet the needs and aspirations of students in an increasingly diverse global era.

While ethnomathematics is recognized as an approach with the potential to enrich mathematics learning by integrating cultural aspects, there is a gap in the literature concerning a comprehensive evaluation of its effectiveness in enhancing educational outcomes in mathematics. This gap includes a limited understanding of how and why ethnomathematics contributes to positive learning outcomes, as well as the identification of factors influencing the success of its implementation in educational practice.

Furthermore, given the diverse educational contexts worldwide, it is crucial to understand the specific conditions that facilitate or hinder the effective application of ethnomathematics.

Relevant research literature acknowledges that the implementation of an ethnomathematical approach is an innovative way to integrate culture into mathematics learning and enhance student engagement and achievement. Over the past decade, there have been significant changes in social, technological, policy, and educational contexts. This time frame allows for the collection of sufficient data to provide a comprehensive overview without losing the relevance of ethnomathematics' application in the learning process. Along with these developments, a deeper analysis of the effectiveness and impact of ethnomathematics' innovative application becomes increasingly important. However, research integrating studies over the past decade to evaluate the success of the ethnomathematical approach in school mathematics learning by measuring effect size remains limited, particularly in terms of identifying trends and significant changes that have not been clearly explained.

Therefore, this study aims to fill this gap by collecting and analyzing data from various relevant studies, thereby generating new, deeper, and more holistic insights. The primary question this research seeks to answer is: What is the effect size of the ethnomathematical approach in influencing mathematics education success over the past decade?

This research has empirical significance, as it can help validate and expand the use of ethnomathematics as a pedagogical strategy, encouraging more educators to adopt this approach in mathematics learning practices. Additionally, this study will reveal critical factors that influence the successful implementation of ethnomathematics, stimulate innovation in curriculum development and teaching strategies by highlighting effective and creative ethnomathematical practices. Furthermore, this research can promote greater awareness and appreciation of cultural diversity within the educational context.

2. Methods

2.1 Research Design

This study adopts a meta-analysis technique to review various publications in both domestic and international journals, with the primary objective of evaluating the effect size of implementing ethnomathematics as an instructional approach within the realm of formal education. The procedures of meta-analysis, beginning with the establishment of selection criteria for the studies reviewed, have been outlined (Borenstein et al., 2009). Subsequently, strategies for collecting empirical data and coding techniques for research variables were determined, followed by the exposition of statistical methods. This research adheres to similar procedures.

2.2 Inclusion Criteria

All articles identified in the initial search were screened and evaluated for inclusion in the meta-analysis based on the following criteria: (a) publication years ranging from 2014 to 2024; (b) research conducted in both Indonesia and abroad; (c) educational levels including Primary, Secondary, and Higher Education; (d) use of the ethnomathematics approach; (e) experimental studies employing control classes; (f) sufficient statistical data to determine the effect size, and (g) complete articles providing enough data to calculate the effect size.

2.3 Data Collection

Primary studies were obtained using relevant terms from online databases such as ERIC, Scopus, and Google Scholar (see Figure 1). Keywords used included {ethnomathematics}, {ethnomathematic approach}, {ethnomathematic learning}, and {effectiveness ethnomathematic}. Data selection followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (see Figure 1). The PRISMA protocol is a systematic review method that supports high-quality meta-analyses (Pigott & Polanin, 2020).

According to the search results, 523 studies applied the ethnomathematics learning approach. Of these, 229 studies passed the screening phase, but 124 studies did not meet the criteria. Subsequently, 93 studies were excluded from the analysis due to incomplete statistical data. As a result, 11 distinct studies were included in the analysis. Since the research involved more than one group, 11 independent samples were analyzed in this meta-analysis. The specific studies analyzed are listed in Appendix 1. The studies were further filtered based on the inclusion criteria established by the researchers. After screening, 11 studies were selected for further analysis.

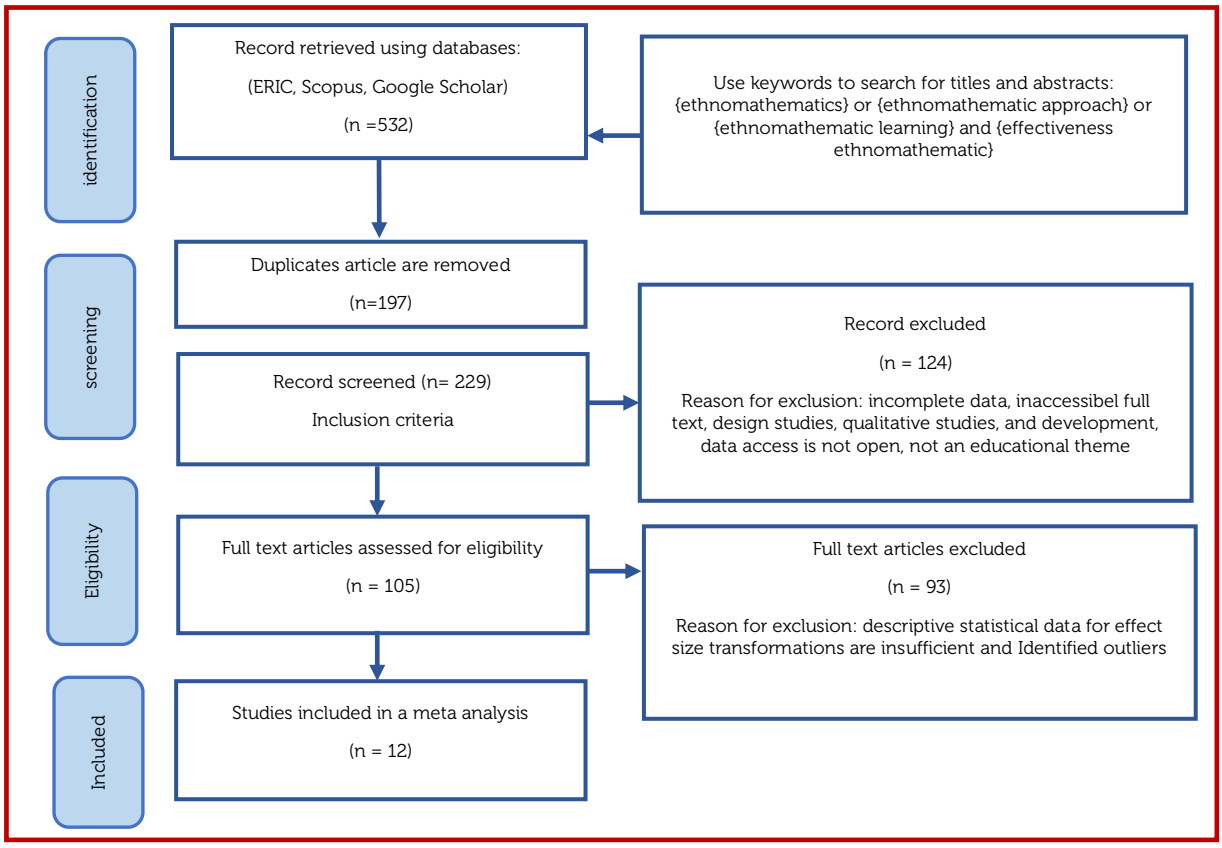

Figure 1. Flowchart illustrating the use of PRISMA for conducting a meta-analysis investigating the success of the ethnomathematics learning approach

2.4 Data Analysis

The data collected in this meta-analysis aimed to obtain effect sizes (Glass, 2015). The effect size in this study is an index measuring the magnitude of the effect of using the ethnomathematics approach in teaching. Each analysis was calculated using the JASP software. Calculating the effect size for each study found was intended to combine and statistically compare the impact across studies (Retnawati et al., 2018). The effect size was calculated using Hedges' g formula (Borenstein et al., 2009), while the interpretation was

based on Cohen's classification. The interpretation of effect sizes for differences between two independent groups follows Cohen's classification: $0 < d < 0.2$ (small); $0.2 < d \leq 0.5$ (medium); $0.5 < d \leq 0.8$ (large); $d > 0.8$ (very large). The summary effect size was obtained by calculating the effect size for each study to determine the success of the ethnomathematics teaching approach.

Subsequently, a heterogeneity test was conducted by examining the Q statistic and p-value to observe the variance in effect sizes between the studies, analyzed using JASP software. The data information obtained comes from samples (not populations), leading to the assumption that the true effect size varies from one study to another. Therefore, the Random Effects model estimation approach is more suitable for determining the Q value to test data heterogeneity. The calculation parameter in this study used an alpha value of 5% ($p < 0.05$) as the significance level. Thus, if $p < 0.05$, it indicates that all studies are different (heterogeneous), and therefore, homogeneity (H0) is rejected, meaning it is not possible to estimate the same population parameter (Suparman et al., 2021). Heterogeneity among study groups suggests that different moderators affect the effect size of the studies (Juandi et al., 2022).

This study's publication bias analysis used the Hedges' g formula. Hedges' g accounts for potential bias in estimating effect sizes and is generally considered to provide more accurate results (Harwell, 2020). The examination of publication bias was conducted to prevent the misrepresentation of findings. A funnel plot and Rosenthal's Fail-safe N (FSN) statistics were examined to assess the potential number of biases (Borenstein et al., 2009; Juandi et al., 2022). The study is considered bias-resistant if it shows a symmetric distribution along the vertical line in the funnel plot (Borenstein et al., 2009). If the impact sizes are not symmetrically distributed, the Fail-safe N (FSN) statistic is used. If $FSN/(5k+10) > 1$, where k is the number of studies included in the meta-analysis, the study is considered resistant to publication bias (Mullen et al., 2001).

3. Results

This meta-analysis utilized data from contrast groups, which means that only experimental studies employing an independent t-test were included in the analysis. This criterion was selected not only because experimental research is crucial for evaluating the effectiveness of specific interventions or treatments but also to ensure that all analyzed studies had a similar design in terms of hypothesis testing, thus allowing for valid and consistent comparison and aggregation of results. The descriptive statistical data required included measures of central tendency, such as the mean, standard deviation, and sample size from both groups (experimental and control), which were used to measure the treatment effect.

A total of 532 studies were initially identified and screened, but only 11 studies met the inclusion criteria. The central tendency data from each study were tabulated and analyzed to calculate their effect sizes (see the database in Appendix 1). Of these, 9 studies were conducted in Indonesia, and 2 in Zimbabwe. Calculations and analyses were performed using JASP software. Table 1 presents the study findings, including author names, publication year, sample size (N), effect size (ES), and classification of each study.

Table 1. Summary of Individual Studies Analyzed

No.	Author	Year	N	ES	Classification
1	Andi et al.	2020	60	0.561	Strong
2	Gladys et al. study 1	2021	90	0.815	Very strong
3	Gladys et al. study 2	2021	90	0.785	Strong
4	Suherman et al.	2020	60	2.007	Very strong
5	Mefa Indriati et al.	2022	62	1.791	Very strong

No.	Author	Year	N	ES	Classification
6	Novitasari et al.	2022	60	2.698	Very strong
7	Dianne Amor Kusuma et al.	2019	60	0.837	Very strong
8	Nur Atikah et al.	2020	48	1.128	Very strong
9	Erika Laras Astutiningtyas et al.	2017	48	0.829	Very strong
10	Linda et al.	2021	46	0.722	Strong
11	Supriadi et al.	2019	75	1.500	Very strong

The studies found, which were published within the last ten years (from 2017 to 2022), had effect sizes ranging from 0.561 to 2.007. According to Cohen's classification, the effect sizes calculated from these 11 studies indicate that 27.27% have a strong impact and 72.73% have a very strong impact on mathematical understanding through the ethnomathematics approach.

The first test conducted was the heterogeneity test. The heterogeneity test showed that the effect sizes from the 11 analyzed studies were heterogeneous ($Q = 47.140$; $p < 0.001$), supporting the use of a Random Effects model. The results of the heterogeneity test are shown in Table 2.

Table 2. Heterogeneity Test

Fixed and Random Effects	Q	df	p
Omnibus test of Model Coefficients	39.465	1	< .001
Test of Residual Heterogeneity	47.140	10	< .001

Note: p-values are approximate.
Note: The model was estimated using the Restricted ML method.

Subsequently, a summary effect test was conducted by examining the coefficient table presented. The analysis results using the Random Effects model indicated a significant positive impact of the ethnomathematics approach on student learning outcomes (estimate = 1.219, z = 6.282, $p < 0.001$, 95% CI: [0.839, 1.599]). The impact of ethnomathematics learning was categorized as high. The analysis results are shown in Table 3.

Table 3. Analysis of Mean Effect Size

Coefficients	Estimate	Standard Error	z	p	95% Confidence Interval
					Lower
Intercept	1.219	0.194	6.282	<.001	0.839

Note: Wald test

The analysis results of the 11 studies can be depicted using a forest plot (Figure 2). Using a 5% significance level for each confidence interval bar, it is observed that the effect sizes of all studies are to the right of the null criterion line, indicating statistically significant high effect sizes. The effect size displayed measures the magnitude of the influence or difference made by the intervention being studied. In the context of this research, the

effectiveness of implementing ethnomathematics in the learning process is shown to be 1.22. The size of the black boxes represents the relative weight, with larger studies contributing more weight to the combined effect size calculation.

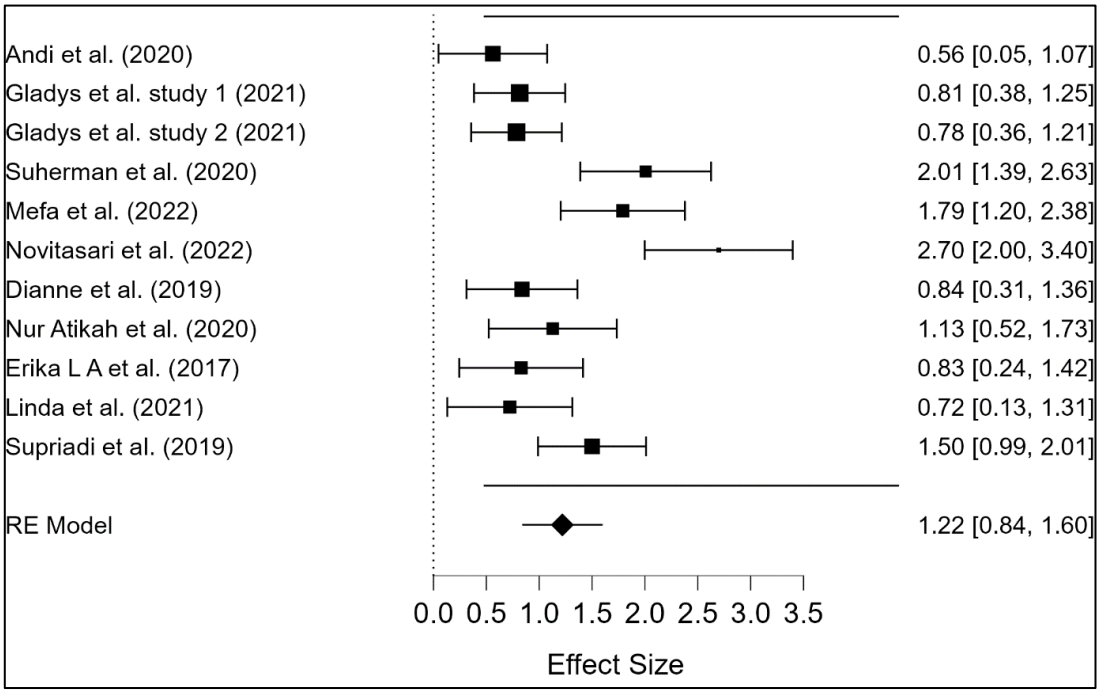

Figure 2. Forest Plot

An evaluation of publication bias was also conducted to identify the possibility of publication bias in the included studies through three methods: funnel plot, Egger's test, and Fail-Safe N. The first method, by plotting the effect sizes of each study against their statistical precision, the funnel plot provides information on how much individual study results deviate from the overall effect estimate, which is often represented by the midpoint of the plot. Figure 2 shows the forest plot of the 11 analyzed studies. Each confidence interval bar indicates the effect size of each study, all of which are to the right of the null line, indicating a significant positive impact of the ethnomathematics approach.

From the funnel plot, it was found that there was a symmetric distribution of studies around the peak, ideally indicating no significant publication bias. The peak in the middle indicates the average effect size, and the studies scattered around the peak with increasing standard error at the bottom show greater variation in effect size estimates in smaller studies. Ideally, larger studies would be closer to the average effect size and have a lower standard error.

However, there are some points that are far from the peak symmetry, especially on the right side of the plot. This may indicate studies with larger effect sizes than expected based on their standard error or might suggest heterogeneity among studies or the possibility of minor bias in some of these studies.

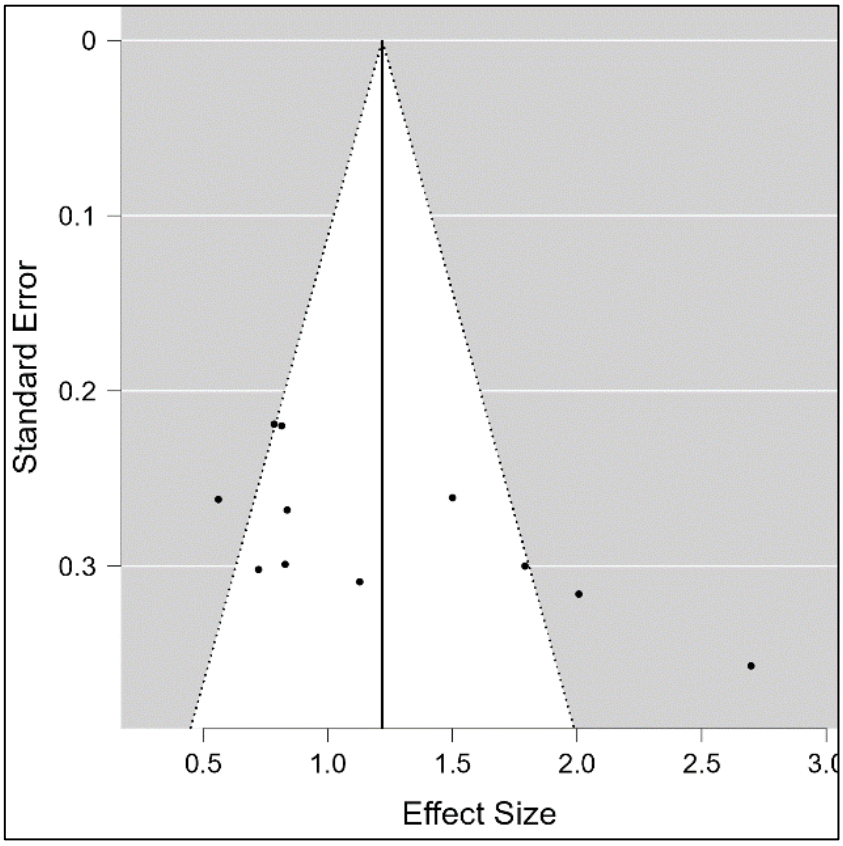

Figure 3. Funnel Plot

Due to the difficulty of justifying whether the funnel plot is symmetric, Egger's test was necessary to test the symmetry of the funnel plot. The Egger's test method detects slope or bias in meta-analysis by focusing on the relationship between effect size and study precision using regression to assess asymmetry in the funnel plot, where significant slope may indicate publication bias. The results of Egger's test provide statistical evidence that can support or reject the hypothesis of bias in this study, as shown in Table 4.

The funnel plot shows a symmetric distribution of studies around the peak, indicating no significant publication bias. However, Egger's test ($z = 2.783$; $p = 0.005$) indicates statistical evidence of asymmetry, which can be interpreted as an indication of publication bias. Since the p-value is less than 0.05, this suggests that there is little chance that these results occurred by chance, thus providing strong support for the existence of bias in the analyzed studies.

Table 4. Egger's Test Results

Regression test for Funnel plot asymmetry ("Egger's test")	z	p
Sei	2.783	0.005

Given the asymmetric distribution of effect sizes, it was decided to analyze publication bias using Rosenthal's fail-safe N (FSN) statistical test. This method provides an overview of how "robust" the meta-analysis results are against the potential bias of unpublished studies or studies with very small effects. By comparing the results of the Rosenthal formula calculation (5K+10), with K=11, the value from the Rosenthal calculation is 65. Rosenthal's

fail-safe N (FSN) test showed an FSN value of 806,000, much larger than the value of 5K+10 (65), indicating that the results of this meta-analysis are resistant to publication bias.

Table 5. Rosenthal's Fail-safe N (FSN) Results

File Drawer Analysis	Fail-safe N	Target Significance	Observed Significance
Rosenthal	806,000	0.050	< .001

4. Discussion

This study aims to evaluate the effectiveness of the ethnomathematics approach in enhancing students' mathematics learning outcomes through a meta-analysis of studies published over the last decade. The results indicate that the ethnomathematics approach has a significantly positive impact on students' academic achievements across various educational levels, both in Indonesia and Zimbabwe. These findings provide strong empirical evidence that integrating cultural contexts into mathematics education can enhance students' understanding and application of mathematical concepts in contexts relevant to their everyday lives.

The primary findings of this study reveal that the ethnomathematics approach significantly improves students' academic performance, with effect sizes ranging from 0.56 to 2.70. An average effect size of 1.22 indicates that this approach consistently leads to substantial improvements in students' mathematics learning outcomes compared to traditional teaching models. This aligns with the hypothesis that culturally integrated learning can enhance students' comprehension and retention of mathematical concepts.

These findings are consistent with previous research demonstrating that ethnomathematics can enhance students' reasoning and problem-solving abilities in more meaningful and contextualized ways (Hanik & Nurtamam, 2017; Herawati, 2018; Kusuma, 2019). However, variations in effect sizes across studies suggest that the effectiveness of this approach may be influenced by several factors, including research methodologies, population characteristics, and the types of interventions employed. This study also corroborates findings showing that the ethnomathematics approach can be effectively implemented across various educational levels, including higher education.

Theoretically, this research expands our understanding of how ethnomathematics can be applied as an effective pedagogical approach to enhance mathematics learning outcomes. The findings support the theory that culturally relevant and contextualized learning approaches can deepen students' understanding of abstract mathematical concepts. These results also underscore the importance of integrating local wisdom into mathematics teaching as a means to bridge global and local knowledge.

From a practical perspective, this study suggests that teachers should consider implementing ethnomathematics in their instruction to improve students' understanding of mathematics. Utilizing this approach can help students connect mathematical concepts to their cultural experiences and traditions, which, in turn, can enhance their engagement and academic performance. Additionally, the integration of ethnomathematics with other learning models, such as Realistic Mathematics Education (RME), has been shown to provide added benefits, particularly at the elementary school level.

This research has several limitations that should be acknowledged. First, the studies analyzed were limited to Indonesia and Zimbabwe, which restricts the generalizability of the findings to a global context. Second, the data sources used in this meta-analysis were limited to journal articles, which may limit the scope and representation of the existing research outcomes. Third, the number of studies analyzed was relatively small, indicating a need for further research that includes more studies from various countries and other data sources such as conference proceedings, theses, and dissertations.

Based on the findings and limitations of this research, several directions for future research are suggested. First, further research is needed to evaluate the effectiveness of the ethnomathematics approach in a broader range of cultural and geographical contexts. Second, research that incorporates data from various sources, including conference proceedings, theses, and dissertations, could provide a more comprehensive picture of the impact of the ethnomathematics approach. Third, in-depth studies on the factors influencing the effectiveness of ethnomathematics, such as variations in intervention design and population characteristics, are also necessary to optimize the application of this approach in mathematics education.

Overall, this study makes a significant contribution to the development of theory and practice in mathematics education, particularly in the application of ethnomathematics as an effective approach to improving student learning outcomes. By providing empirical evidence supporting the positive impact of ethnomathematics, this research encourages more educators to adopt this approach in their teaching practices and fosters innovation in the development of more inclusive and contextualized curricula.

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5. Conclusion

This study has successfully evaluated the effectiveness of the ethnomathematics approach in enhancing students' mathematics learning outcomes through a meta-analysis of studies published over the last decade. The findings demonstrate that ethnomathematics significantly improves students' understanding and academic performance, with generally strong to very strong effect sizes. The integration of local culture into mathematics teaching has proven to bridge the gap between mathematical theory and students' everyday experiences, making learning more meaningful and contextualized.

These findings not only reinforce the argument for the importance of ethnomathematics as an effective pedagogical approach but also highlight its significant potential for application across various educational levels. This approach supports the theory that culturally relevant mathematics education can deepen students' understanding and increase their engagement in the learning process.

Practically, the results of this research offer recommendations for educators to consider implementing ethnomathematics in their teaching. This approach can help students connect abstract mathematical concepts with their cultural backgrounds and life experiences, thereby enhancing their motivation and learning outcomes. For curriculum development, integrating ethnomathematics can be a strategy to make mathematics education more inclusive and relevant.

Theoretically, this study enriches the educational literature with empirical evidence supporting the importance of contextual approaches in mathematics teaching. Ethnomathematics not only serves as a tool for improving academic performance but also as a means to preserve and value local wisdom in the educational process.

This study has some limitations, including the limited generalizability of the findings to the contexts of Indonesia and Zimbabwe, as well as the relatively small number of studies analyzed. Furthermore, only journal articles were used as data sources, which may limit the scope of the findings. Therefore, further research is needed to evaluate the application of ethnomathematics in a wider range of cultural and geographical contexts, as well as to include more data sources such as conference proceedings, theses, and dissertations.

For the future, more in-depth research identifying the factors that influence the success of ethnomathematics, as well as combining this approach with other learning models, can help optimize its application in mathematics education across various contexts. Thus, this study makes an important contribution to the development of more inclusive, relevant, and effective theory and practice in mathematics education.

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Declarations

Author contribution statement

Linda Indiyarti Putri: Conceptualization, Writing - Original Draft, Writing - Review & Editing, Project Administration. **Guldana Begimbetova:** Methodology, Investigation, Writing - Review & Editing. **Nusrotus Sa'idah:** Formal Analysis, Resources, Data Curation, Writing - Review & Editing, Visualization **Ali Murfi:** Formal Analysis, Resources, Data Curation, Writing - Review & Editing, Visualization

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of interest statement

No potential conflict of interest was reported by the authors.

Additional information

Correspondence and requests for materials should be addressed to the **Corresponding Author**, Linda Indiyarti Putri, at ✉ lindaputri@unwahas.ac.id

ORCID

Linda Indiyarti Putri https://orcid.org/0000-0003-3219-7744
Guldana Begimbetova https://orcid.org/0000-0002-0435-1014
Nusrotus Sa'idah https://orcid.org/0000-0002-2234-8476
Ali Murfi https://orcid.org/0000-0001-5879-6476

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Appendix

Appendix 1. Meta-Analysis Database and Summary of Research Data Calculations for the Control Group

No	author	year	n1	M1	S1	n2	M2	S2	D	S_{within}	d	V_d	SE_d	J	g	V_g	SE_g
1	Andi et al.	2020	30	69.17	17.13	30	60.30	13.94	8.87	15.617	0.568	0.069	0.263	0.987	0.561	0.068	0.262
2	Gladys et al. study 1	2021	50	53.90	19.00	40	39.90	14.20	14.00	17.040	0.822	0.049	0.221	0.991	0.815	0.048	0.220
3	Gladys et al. study 2	2021	50	67.20	19.00	40	50.20	24.20	17.00	21.461	0.792	0.048	0.220	0.991	0.785	0.048	0.219
4	Suherman et al.	2020	30	80.30	6.96	30	65.40	7.68	14.90	7.327	2.034	0.101	0.318	0.987	2.007	0.100	0.316
5	Mefa Indriati et al.	2022	31	55.14	9.30	31	40.28	6.92	14.86	8.194	1.814	0.091	0.302	0.987	1.791	0.090	0.300
6	Novitasari et al.	2022	30	85.40	4.99	30	70.47	5.89	14.93	5.463	2.733	0.129	0.359	0.987	2.698	0.127	0.357
7	Dianne Amor et al.	2019	30	59.37	17.49	30	45.57	14.97	13.80	16.280	0.848	0.073	0.270	0.987	0.837	0.072	0.268
8	Nur Atikah, et al.	2020	24	78.42	15.19	24	59.13	18.32	19.29	16.828	1.146	0.097	0.311	0.984	1.128	0.095	0.309
9	Erika Laras A. et al.	2017	24	84.72	7.54	24	77.92	8.57	6.80	8.070	0.842	0.091	0.301	0.984	0.829	0.089	0.299
10	Supriadi et al.	2019	37	12.21	1.90	38	9.10	2.19	3.11	2.052	1.516	0.069	0.262	0.990	1.500	0.068	0.261
11	Linda et al.	2021	22	79.55	13.18	24	69.67	13.70	9.88	13.454	0.734	0.093	0.305	0.983	0.722	0.091	0.302