



A SYSTEMATIC LITERATURE REVIEW: ETHNOMODELLING AS CULTURALLY SITUATED MATHEMATICAL MODELLING

Melkior Wewe^{1*}, I Gde Wawan Sudatha², I Kadek Suartama³, Made Hery Santosa⁴

^{1,2,3,4}Universitas Pendidikan Ganesha, Singaraja Indonesia

*Corresponding Author: melkiorwewe1@gmail.com

Article History

Received : 17/12/2025

Revised : 12/03/2026

Accepted : 07/04/2026

Keywords:

Ethnomodelling,
Culturally situated,
Mathematical modelling,
Conceptual synthesis.

Abstract. Ethnomodelling has emerged as a bridge between ethnomathematics and mathematical modelling, yet its conceptual boundaries and methodological applications remain fragmented. This review examines how culturally situated mathematical practices are transformed into mathematical models, learning tasks, digital resources, learning trajectories, and curriculum designs in mathematics education. Guided by PRISMA 2020 principles, this study employed a systematic review and conceptual synthesis. Relevant studies were identified through database searching and citation chasing using multilingual keywords in English, Indonesian, Portuguese, and Spanish. After duplicate removal, title and abstract screening, full-text assessment, and quality appraisal, 26 empirical, design-based, and conceptual studies were included. A hybrid SPIDER/PICo framework guided study selection, data extraction, and thematic-conceptual analysis. The synthesis revealed four major trajectories: theoretical ethnomodelling grounded in emic, etic, and dialogical translation; modelling of cultural artifacts such as architecture, calendars, Indigenous number systems, games, food practices, and symbolic patterns; classroom and digital design through worksheets, GeoGebra, and learning trajectories; and equity-oriented humanization of mathematics through local and Indigenous knowledge. Ethnomodelling should be understood as culturally situated mathematical modelling, not decorative cultural contextualization. Future studies need stronger designs, clearer outcomes, and ethical engagement with the communities from which cultural knowledge is derived.

How to Cite: Wewe, M., Sudatha, I. G. W., Suartama, I. K., & Santosa, M. H. (2026). A SYSTEMATIC LITERATURE REVIEW: ETHNOMODELLING AS CULTURALLY SITUATED MATHEMATICAL MODELLING. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 7(3), 540-555. <https://doi.org/10.37478/jpm.v7i3.8079>

Correspondence address:

Jln. Udayana No. 11, Singaraja, Kabupaten Buleleng, Bali.

melkiorwewe1@gmail.com

Publisher:

Program Studi PGSD Universitas Flores. Jln. Samratulangi,
Kelurahan Paupire, Ende, Flores.

primagistrauniflor@gmail.com

INTRODUCTION

Ethnomathematics challenges the assumption that school mathematics is culturally neutral by showing that mathematical ideas, representations, measurement systems, spatial reasoning, counting practices, and problem-solving strategies are historically and socially situated. This perspective has become particularly influential in mathematics education because it helps teachers and researchers recognize mathematical knowledge embedded in local, Indigenous, rural, occupational, and community-based practices. However, a recurring limitation in classroom applications is that culture is sometimes used only as a motivational context, while the mathematical structure and modelling logic of the cultural practice remain weakly developed.

Ethnomodelling addresses this limitation by connecting ethnomathematics with mathematical modelling. Rather than asking only what mathematics exists in a cultural practice, ethnomodelling asks how cultural knowledge can be translated, represented, negotiated, and transformed into mathematical models that remain meaningful to local communities while becoming productive for formal mathematics learning (Rosa & Orey, 2012, 2013). In this sense, ethnomodelling is not simply a contextualization strategy; it is a dialogical process that connects emic meanings, etic mathematical tools, and classroom-oriented learning designs (Orey & Rosa, 2021; Rosa & Orey, 2016).

The movement from ethnomathematics to ethnomodelling is visible in several streams of research. Foundational work conceptualizes ethnomodelling through emic, etic, and dialectical approaches, while classroom and community studies demonstrate how cultural artifacts and practices can be mathematized through functions, geometry, modular arithmetic, statistics, and modelling cycles (Cortes & Orey, 2020; Orey & Rosa, 2013; Rosa & Orey, 2012, 2013; Umbara et al., 2021; Yusran et al., 2021). Recent studies in Indonesia, Brazil, Chile, Guatemala, Ethiopia, South Africa, and other contexts have extended this discussion into learning trajectories,

culturally responsive tasks, digital worksheets, GeoGebra-supported designs, MatCityMap activities, and computational thinking (Hidayat et al., 2025; Huencho & Chandía, 2023; López Leiva et al., 2023; Meeran et al., 2024; Nursyahidah & Albab, 2021; Nursyahidah et al., 2025; Robinson et al., 2023; Sastrawati et al., 2026; Tesfamicael et al., 2021). This growth indicates that ethnomodelling has become a field of conceptual, pedagogical, technological, and ethical importance.

Despite this growth, the field remains unevenly synthesized. Previous conceptual papers have clarified the theoretical meaning of ethnomodelling and its humanistic, glocal, and intercultural orientations, but they have not systematically mapped how the concept has been operationalized across empirical, design-based, digital, and classroom-oriented studies (de Freitas Madruga, 2025; Orey & Rosa, 2021; Rosa & Orey, 2013, 2016). Similarly, many ethnomathematics studies identify mathematical ideas in cultural practices but do not always explain the mechanism by which cultural knowledge becomes a mathematical model, task, assessment, or learning trajectory (Prahmana & D'Ambrosio, 2020, 2022; Rodríguez-Nieto & Alsina, 2022). This creates a gap between cultural identification and rigorous culturally situated mathematical modelling.

This review addresses that gap by combining systematic mapping with conceptual synthesis. It examines not only what has been studied, but also how cultural knowledge is transformed into mathematical learning, what mechanisms are claimed, what methodological limitations remain, and how future research can move beyond cultural illustration toward ethically grounded and methodologically robust ethnomodelling. The contribution of this review is therefore twofold: first, it maps the corpus of ethnomodelling and adjacent culturally situated modelling studies; second, it synthesizes a four-process mechanism recognition, translation, mathematization, and recontextualization that explains how ethnomodelling may support both mathematical learning and cultural recognition.

Table 1. SPIDER/PICo review framework and operational definitions

Element	Operational definition in this review	Role in eligibility and coding
Sample/ Population	Students, teachers, teacher candidates, cultural knowledge holders, cultural artifacts, communities, and mathematics learning designs.	Defined the educational and cultural units considered relevant.
Phenomenon of Interest	Translation of ethnomathematical practices into mathematical models, representations, tasks, learning trajectories, assessment situations, or curriculum resources.	Required evidence of explicit mathematical translation or modelling potential.
Design	Qualitative studies, ethnographic studies, design research, development studies, mixed-methods studies, quasi-experiments, evaluations, and original papers.	Allowed heterogeneous evidence while excluding reviews and non-original opinion papers.
Evaluation	Mathematical modelling, mathematical literacy, conceptual understanding, critical thinking, numeracy, computational thinking, pedagogical quality, curriculum implication, cultural recognition, and epistemic legitimacy.	Guided outcome coding and synthesis of mechanisms.
Research type	Original empirical studies and original conceptual papers in mathematics education.	Conceptual papers were appraised separately for theoretical clarity and coherence.

The review was guided by a hybrid SPIDER/PICo framework because the corpus includes qualitative, design-based, mixed-methods, quasi-experimental, development, evaluative, and original conceptual studies. A conventional PICO structure was considered less suitable because many included studies did not involve controlled interventions or comparable outcome measures. Table 1 outlines the SPIDER/PICo review framework along with the operational definitions that inform the scope of the review, inclusion criteria, data extraction categories, and the logic underlying the synthesis process.

Research questions

- 1) RQ1 Conceptual: How is ethnomodelling conceptualized as a bridge between ethnomathematics and mathematical modelling in mathematics education?
- 2) RQ2 Empirical-pedagogical: What cultural practices, artifacts, communities, and knowledge



systems have been translated into mathematical models or learning designs?

- 3) RQ3 Methodological: What research designs, educational levels, mathematical domains, outcomes, and quality patterns characterize existing ethnomodelling and adjacent culturally situated modelling studies?
- 4) RQ4 Explanatory: What mechanisms explain how ethnomodelling supports mathematical learning and cultural recognition?
- 5) RQ5 Agenda-setting: What methodological, pedagogical, technological, and ethical research directions emerge from the corpus?

RESEARCH METHODS

Protocol and PRISMA orientation

The review was reported in accordance with PRISMA 2020 principles, including identification, screening, retrieval, eligibility assessment, inclusion, and transparent reporting of exclusion reasons (Page et al., 2021). Because ethnomodelling is an emerging and multilingual field, the search combined structured database searching with supplementary citation chasing. A review protocol was prepared before final screening, coding, and synthesis. The protocol specified the search concepts, eligibility criteria, data extraction categories, appraisal criteria, and synthesis strategy. However, the protocol was not formally registered in PROSPERO, OSF, or another public review-protocol registry. This absence of prospective registration is acknowledged as a methodological limitation because it may reduce external verification of the review procedures. To strengthen transparency, the search log, eligibility decisions, extraction matrix, coding notes, and quality-appraisal summary were retained as audit materials. These audit materials are available as supplementary materials accompanying this article. If the journal system does not support supplementary files, the materials will be made available from the corresponding author upon reasonable request.

Search strategy

The search strategy combined core ethnomodelling terms with broader ethnomathematics and mathematical modelling terms to capture both explicitly named ethnomodelling studies and adjacent culturally situated modelling studies. The final search was completed on 13 May 2026. Search terms were adapted for English, Indonesian, Portuguese, and Spanish terminology because relevant work appears across English-language, Portuguese, Spanish, and Indonesian scholarly traditions (Rosa & Orey, 2012; Umbara et al., 2021). Searches were conducted in Scopus, ERIC, Google Scholar, and relevant Indonesian, Portuguese, and Spanish-language sources. To improve transparency, records were documented separately by database before duplicate removal. No strict beginning-year limit was applied because foundational ethnomodelling theory predates recent empirical applications; however, recent empirical and design-oriented studies were prioritized in the synthesis of trends. The main search concepts were: ethnomodelling/ ethnomodeling/ etnomodelagem; ethnomathematics/ etnomatematika/ etnomatemática; mathematical modelling/ modeling; learning trajectory; realistic mathematics education; mathematical literacy; culturally responsive mathematics education; classroom; curriculum; student; and teacher. The literature search employed the following search string: (ethnomodelling OR ethnomodeling OR etnomodelagem OR “ethno-modelling”) AND (“mathematics education” OR “mathematics learning” OR “mathematical modelling” OR “mathematical modeling”).

Inclusion and exclusion criteria

Eligibility decisions were based on relevance to mathematics education and the presence of explicit mathematical translation from cultural practice, artifact, community knowledge, or culturally situated activity into mathematical concepts, models, representations, learning designs, or curriculum resources. Studies were not included merely because they mentioned culture; they had to show how cultural knowledge was mathematically interpreted, represented, modelled, transformed into a learning trajectory, or connected to school mathematics. Conceptual papers were included only when they offered original theoretical clarification of ethnomodelling rather than general commentary on culture and mathematics. Table 2 presents the stages of the inclusion and exclusion criteria



Table 2. Inclusion and exclusion criteria

Criterion	Included	Excluded
Publication type	Peer-reviewed journal articles, conference papers with full text, original conceptual papers, design/development studies, empirical classroom/community studies.	Reviews, meta-analyses, editorials, non-original opinion pieces, abstracts without full text.
Topical relevance	Ethnomodelling, ethnomodeling, ethnomathematics with explicit modelling, culturally situated mathematical modelling, or cultural-to-curricular mathematical translation.	Cultural description without mathematical analysis or educational translation.
Mathematical component	Clear connection to formal or informal mathematics, mathematical representation, modelling, problem solving, measurement, geometry, arithmetic, statistics, functions, or computational thinking.	General cultural pedagogy without identifiable mathematical content.
Educational relevance	Studies relevant to learners, teachers, teacher candidates, curriculum, task design, assessment, or mathematics education theory.	Studies limited to architecture, anthropology, or cultural heritage without mathematics education implication.
Language	English, Indonesian, Portuguese, and Spanish records where title, abstract, or full text could be interpreted.	Records whose content was inaccessible or could not be sufficiently interpreted for eligibility.
Conceptual papers	Included when they offered original definitions, frameworks, or theoretical elaborations of ethnomodelling.	Secondary commentary not offering original conceptual contribution.

Screening, data extraction, and coding

Screening, data extraction, coding, and appraisal were conducted by Three reviewers. In the first stage, Reviewer 1 and Reviewer 2 independently screened titles and abstracts against the inclusion and exclusion criteria. In the second stage, the same reviewers assessed the full texts for eligibility. Any disagreement regarding inclusion, exclusion, corpus classification, mechanism coding, or appraisal category was discussed until consensus was reached. When consensus could not be reached, Reviewer 3 was consulted as an adjudicator. Before full coding, the reviewers piloted the extraction form on [isi jumlah artikel pilot] studies to refine the codebook and ensure consistent interpretation of key categories, including “ethnomodelling,” “culturally situated mathematical modelling,” “mathematical translation,” and “learning design.” The final coding was then completed through a two-cycle audit procedure. In the first cycle, eligible studies were coded using the extraction matrix. In the second cycle, all included studies and full-text exclusions were rechecked against the operational definition of ethnomodelling or culturally situated mathematical modelling. This consensus-based audit trail was used to strengthen reliability and transparency without reducing the heterogeneous conceptual and empirical corpus to a single agreement statistic.

Risk of bias and quality appraisal

Each included study was assigned an overall appraisal category: Low concern, Some concerns, or High concern. “Low concern” indicated that the study showed clear alignment among aims, design, evidence, and claims. “Some concerns” indicated that the study was relevant and usable for synthesis but had limitations such as restricted transferability, limited outcome evidence, small sample, incomplete statistical reporting, or insufficient detail on implementation. “High concern” indicated major limitations that substantially weakened confidence in the evidence, such as unclear methods, opaque data sources, or unsupported claims. Quality appraisal was not used to exclude studies automatically; rather, it was used to weight the interpretation of findings during synthesis. The revised appraisal categories for the included studies are presented in [Table 3](#).



Table 3. Quality appraisal criteria

Study	Study type	Appraisal category	Main appraisal note
Rosa & Orey (2010)	Conceptual/ pedagogical	Low concern	Clear foundational construct; empirical evidence was not expected for a conceptual paper.
Rosa & Orey (2011)	Conceptual/ theoretical	Low concern	Clear theoretical purpose and pedagogical examples.
Rosa & Orey (2012)	Theoretical framework	Low concern	Strong conceptual clarity on emic, etic, and dialectical approaches.
Rosa & Orey (2013)	Theoretical framework	Low concern	Coherent framework linking ethnomathematics and mathematical modelling.
Orey & Rosa (2013)	Case-based modelling	Some concerns	Strong modelling example, but transferability and classroom evidence are limited.
Rosa & Orey (2016)	Conceptual/ theoretical	Low concern	Coherent humanistic argument; not intended as intervention evidence.
Cortes & Orey (2020)	Mixed-methods classroom/ community study	Some concerns	Rich dialogical evidence, but causal claims are limited by design and context.
Orey & Rosa (2021)	Conceptual/ theoretical	Low concern	Clear glocalization argument and strong theoretical continuity.
Umbara et al. (2021)	Qualitative ethnomodelling	Some concerns	Clear cultural-mathematical mapping, but limited outcome evidence.
Yusran et al. (2021)	Qualitative cultural modeling	Some concerns	Relevant cultural modelling, but pedagogical validation requires stronger evidence.
Nursyahidah & Albab (2021)	Design research	Some concerns	Strong learning trajectory, but generalizability beyond the design context is limited.
Prahmana et al. (2021)	Qualitative ethnomathematics	Some concerns	Clear cultural-mathematical analysis, but intervention evidence is limited.
Tesfamicael et al. (2021)	Curriculum-oriented study	Some concerns	Useful curriculum implications, but empirical outcome reporting is limited.
Rodríguez-Nieto & Alsina (2022)	Qualitative theory-networking	Some concerns	Innovative theoretical networking, but the evidence base is context-specific.
Prahmana & D'Ambrosio (2022)	Conceptual/ empirical synthesis	Some concerns	Useful cultural perspective, but the boundary between review and conceptual synthesis requires caution.
Huencho & Chandia (2023)	Qualitative/ ethnographic	Low concern	Strong Indigenous argumentation focus and clear cultural grounding.
López Leiva et al. (2023)	Dialogical qualitative study	Low concern	Strong onto-epistemological argument and cultural-mathematical interpretation.
Robinson et al. (2023)	Narrative/ Indigenous methodology	Low concern	Important epistemic contribution; conventional outcome evidence was not applicable.
Meeran et al. (2024)	Reflective qualitative study	Some concerns	Relevant Indigenous game context, but classroom outcome evidence is limited.
Sudirman et al. (2024)	Ethnographic study	Low concern	Clear integration of ethnomathematics and ethnomodelling for school concepts.
Nursyahidah et al. (2025)	Design research/ learning trajectory	Some concerns	Strong technology and RME integration, but intervention generalizability is limited.
Hidayat et al. (2025)	Development/ field test	Some concerns	Promising quantitative results, but effect-size comparability and design controls require caution.
Marsigit et al. (2026)	Evaluation study	Some concerns	Useful teacher-quality evidence, but study context and reporting details require careful interpretation.
Larasati et al. (2025)	Intervention/evaluative study	Some concerns	Positive numeracy evidence, but instrument comparability and design controls are limited.
Madrugá (2025)	Conceptual/ theoretical	Low concern	Clear theoretical-methodological contribution to intercultural mathematics education.
Sastrawati et al. (2026)	Learning model development	Some concerns	Promising computational-thinking integration, but causal evidence remains preliminary.

Synthesis strategy

The quality-appraisal categories were used during synthesis to avoid treating all evidence



as equally strong. Findings from studies categorized as Low concern were given greater interpretive weight when identifying stable conceptual and pedagogical patterns. Findings from studies categorized as Some concerns were retained but interpreted cautiously, especially when they involved preliminary outcome claims, limited comparison groups, or context-specific designs. This review has several methodological limitations. First, the review protocol was prepared before final screening and coding but was not formally registered in a public review-protocol registry. Second, although Google Scholar was useful for identifying multilingual and regionally published studies, its ranking system is unstable; therefore, the decision to screen the first 130 most relevant results may not be perfectly reproducible. Third, database visibility, language accessibility, and incomplete reporting in some included studies may have influenced the final corpus. These limitations were mitigated through transparent documentation of the search log, database-specific record counts, eligibility decisions, extraction matrix, and quality-appraisal categories.

RESULTS AND DISCUSSION

Results

As illustrated in Figure 1, the database search and supplementary citation-chaining process identified 130 records. After 85 duplicate records were removed, 45 records were screened based on their titles and abstracts. Ten records were excluded because they did not focus on mathematics education, did not address culture-to-mathematics translation, were not original works, or were outside the scope of the review. Subsequently, 35 reports were sought for full-text retrieval, of which nine were unavailable or did not provide sufficient information for appraisal. Finally, 26 full-text reports and original conceptual papers were included in the qualitative and conceptual synthesis.

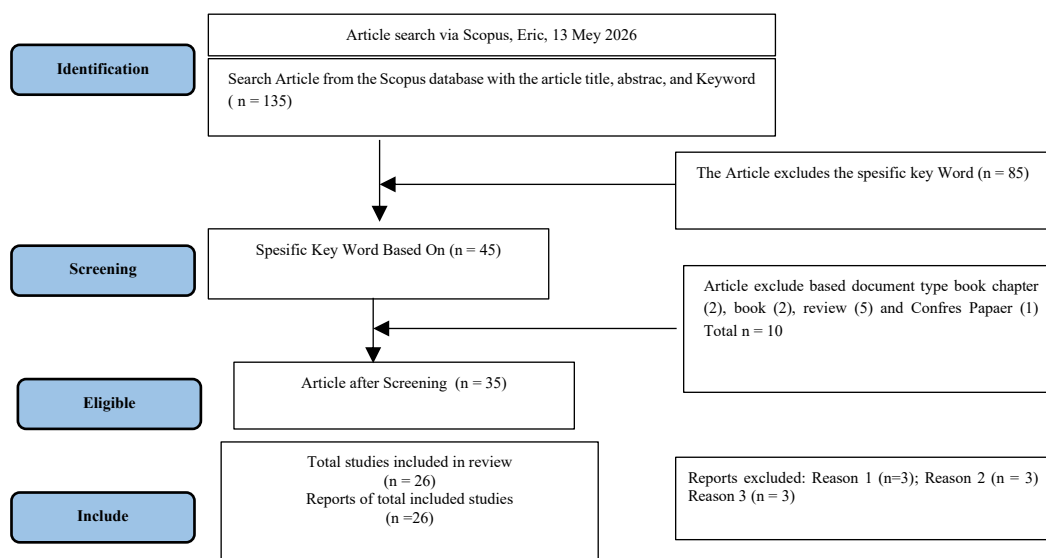


Figure 1. PRISMA 2020 flow diagram for updated systematic reviews

At the inclusion/eligibility stage, 35 articles that had passed the screening process were reassessed by three validators to ensure their conformity with the inclusion criteria established in this Systematic Literature Review (SLR). This assessment was conducted to identify articles that were genuinely relevant to the study's focus, provided sufficient data, and demonstrated adequate methodological quality. Based on the validation results, 9 articles were not recommended for inclusion in the final review stage. Consequently, 26 articles were deemed eligible for in-depth analysis.

The assessment conducted by Validator 1 indicated that several articles did not meet the inclusion criteria because they were not directly related to the review's main focus or research questions. In addition, some articles were available only in abstract form, without access to the full text, thereby limiting the availability of information required for comprehensive analysis.

Validator 1 also identified articles that were substantially similar to others that had already passed the selection process, raising the potential for data duplication during the synthesis stage.

Furthermore, Validator 2's assessment confirmed that some articles could not be included in the final review stage because they were not classified as empirical scientific studies. Several of these articles were opinion pieces, editorials, or conceptual papers that did not present a clearly defined research method. In addition, some articles involved subjects or research contexts that did not align with the predetermined inclusion criteria. Validator 2 also found that several articles were published outside the publication-year range specified in the SLR protocol, making them irrelevant to the scope of the present review.

The assessment by Validator 3 revealed that several articles did not clearly explain the variables, models, strategies, or approaches that constituted the SLR's focus. Moreover, these articles did not present research findings relevant to the indicators or outcomes analyzed in this study. From a methodological perspective, Validator 3 also noted that some articles failed to adequately describe the research instruments, data collection procedures, and data analysis techniques employed. As a result, the methodological quality of these articles was considered insufficient to support the synthesis of findings.

Based on the overall assessment of the three validators, the articles excluded at the inclusion/eligibility stage demonstrated several major limitations, including limited relevance to the focus of the study, restricted access to full-text documents, potential data duplication, incompatibility with the required research type and context, publication outside the specified time frame, and insufficient clarity in terms of research substance and methodology. Therefore, of the 35 articles that passed the screening stage, 9 articles were excluded, leaving 26 articles that met the criteria for comprehensive review.

Descriptive characteristics of the corpus

Table 4 summarizes the descriptive characteristics and distribution of the studies included in this review. The corpus shows growth after 2020, especially in Indonesian studies on ethnomathematics-based learning trajectories, digital worksheets, numeracy, computational thinking, and culturally contextualized mathematical literacy (Hidayat et al., 2025; Larasati et al., 2025; Nursyahidah et al., 2025; Prahmana & D'Ambrosio, 2022; Sastrawati et al., 2026; Sudirman et al., 2024; Umbara et al., 2021). Brazil remains foundational for ethnomodelling theory and dialogical classroom-community studies, while Chile, Guatemala, South Africa, Ethiopia, and other contexts broaden the epistemological and intercultural scope of the field (Cortes & Orey, 2020; Huencho & Chandía, 2023; López Leiva et al., 2023; Meeran et al., 2024; Orey & Rosa, 2021; Robinson et al., 2023; Rosa & Orey, 2012, 2013; Tesfamicael et al., 2021). The trend is interpreted cautiously because database coverage, language accessibility, and regional publication patterns may influence which studies become visible in the corpus.

Table 4. Descriptive distribution of included studies

Dimension	Dominant pattern	Interpretive note
Publication period	Foundational conceptual work before 2020; stronger empirical and design-oriented growth after 2020.	The field is shifting from conceptual articulation to classroom, digital, and curriculum implementation.
Regional distribution	Brazil and Indonesia are most visible; Chile, Guatemala, Canada, Ethiopia, South Africa, and other contexts broaden the corpus.	Regional visibility may reflect search-language accessibility and open-access availability.
Study type	Conceptual papers, qualitative ethnographic studies, design research, development studies, mixed methods, and quasi-experimental classroom studies.	Heterogeneity supports conceptual synthesis but limits meta-analysis.
Mathematical domain	Geometry, measurement, arithmetic, modular reasoning, statistics, functions, sets, mathematical literacy, numeracy, and computational thinking.	Cultural objects often generate multiple mathematical domains simultaneously.
Educational level	Primary, lower-secondary, secondary, teacher education, and community-based studies.	Teacher education remains underdeveloped relative to learner-focused designs.
Outcome focus	Cultural recognition, conceptual understanding, mathematical literacy, critical thinking, numeracy, computational thinking, and task quality.	Outcome claims are promising but often not supported by comparable quantitative evidence.



Summary of included studies

Table 5 provides a compact extraction matrix for the 26 included studies and original conceptual papers. Core ethnomodelling studies explicitly used ethnomodelling or ethnomodeling as a theoretical or methodological construct. Adjacent studies were retained when they translated cultural practices into mathematical models, representations, tasks, trajectories, or curriculum resources even if they did not consistently use the term ethnomodelling. Table 6 adds quality-appraisal judgements for the same corpus.

Table 5. Compact extraction matrix of included studies

Authors/year	Cultural context	Mathematical domain	Method/design	Main contribution or finding
Rosa & Orey (2010)	Ethnomathematics program; cultural practices as modelling situations	General modelling; culturally situated problem solving	Conceptual pedagogical paper	Positioned ethnomodelling as a pedagogical tool for connecting cultural practices with academic modelling.
Rosa & Orey (2011)	Multiple cultural practices	Mathematical modelling	Conceptual/theoretical paper	Framed ethnomodeling as a pedagogical action for uncovering ethnomathematical practices.
Rosa & Orey (2012)	Ethnomodelling epistemology	Emic, etic, and dialectical modelling	Theoretical framework paper	Clarified emic, etic, and dialectical approaches as analytic lenses for ethnomodelling.
Rosa & Orey (2013)	Daily-life systems of cultural groups	Mathematical modelling; ethnomathematics	Theoretical framework paper	Defined ethnomodelling as a research framework linking cultural systems and school mathematics.
Orey & Rosa (2013)	Architectural wall pattern in Ouro Preto	Functions; curves; coordinate systems	Case-based mathematical modelling	Showed how a local architectural artifact can be mathematized through function models.
Rosa & Orey (2016)	Humanistic mathematics and cultural practices	Culturally situated modelling	Conceptual paper	Argued that ethnomodelling humanizes mathematics by validating cultural mathematical knowledge.
Cortes & Orey (2020)	Farmers' market in Belo Horizonte	Functions; relations; modelling of selling practices	Mixed-methods classroom/community study	Supported re-signification of function concepts through dialogical interaction with a labour practice.
Orey & Rosa (2021)	Local-global mathematical practices	Glocal modelling	Theoretical paper	Framed ethnomodelling as a glocalization process connecting local practices and formal mathematics.
Umbara et al. (2021)	Cigugur Indigenous good-day calculation	Number, sets, relations, congruence, modulo	Qualitative ethnomodelling study	Mapped Indigenous calculation practices into integer operations, relations, congruence, and modulo.
Yusran et al. (2021)	Atag construction and vernacular architecture	Geometry, measurement, spatial reasoning	Qualitative cultural modelling	Identified mathematical structures in local construction with potential for culturally situated learning.
Nursyahidah & Albab (2021)	Traditional cookie-maker context	Cylinder surface area and volume	Design research with GeoGebra	Designed a learning trajectory linking food practices, measurement, and solid geometry.
Prahmana et al. (2021)	Pranamatangsa system and birth-death ceremonial	Calendar calculation; arithmetic relations	Qualitative ethnomathematics	Showed how cultural calendrical systems can generate mathematical formulas and classroom meaning.
Tesfamichael et al. (2021)	Ethiopian cultural and curriculum context	Curriculum and mathematics learning	Curriculum-oriented ethnomathematics study	Discussed curriculum implications of using ethnomathematics to support student learning.
Rodríguez-Nieto & Alsina (2022)	Daily practices and STEAM contexts	Mathematical connections; modelling	Qualitative networking of theories	Networked ethnomathematics, STEAM education, and globalized analysis of daily practices.
Prahmana & D'Ambrosio (2022)	Cultural perspective on mathematics learning	Geometry, values, and cultural perspective	Conceptual/empirical synthesis	Positioned ethnomathematics as a cultural perspective for learning mathematics.
Huencho	Mapuche Indigenous	Quantitative and	Qualitative/eth	Demonstrated Indigenous cultural



Authors/year	Cultural context	Mathematical domain	Method/design	Main contribution or finding
& Chandia (2023)	cultural practices	arithmetic argumentation	nographic educational study	practices as sources of mathematical argumentation and humanization.
López Leiva et al. (2023)	Mesoamerican numbers in Ixil	Number systems; onto-epistemological dialogue	Dialogical qualitative study	Reconnected Indigenous number practices with mathematical language, identity, and epistemology.
Robinson et al. (2023)	Aki Chike Win and Indigenous STEM stories	Mathematics and STEM as place-based knowledge	Narrative/Indigenous methodology	Showed mathematics as relational, spiritual, and land-connected in Indigenous teaching and learning.
Meeran et al. (2024)	Morabaraba game	Indigenous mathematical knowledge; strategy	Reflective qualitative study	Illustrated traditional games as sources of Indigenous mathematical reasoning.
Sudirman et al. (2024)	Fishermen community and fish auction activities	Sets, statistics, social arithmetic, operations	Ethnographic study	Connected fishermen activities with ethnomathematics and ethnomodelling for school concept institutionalization.
Nursyahidah et al. (2025)	Pranata mangsa in statistics learning	Statistics; data interpretation	Design research; TE-RME learning trajectory	Integrated technology, ethnomathematics, and RME for statistics learning.
Hidayat et al. (2025)	Ethno-modelling and 3N digital worksheet	Critical thinking; culturally contextual tasks	Development/field test	Reported promising effects of EM3N digital worksheets on mathematical critical thinking.
Marsigit et al. (2026)	Ethnomathematics learning practices	Pedagogical quality; task design	Evaluation study	Identified strengths and limitations in teacher implementation of ethnomathematics learning practices.
Larasati et al. (2025)	Elementary ethnomathematics-based learning	Numeracy; minimum competency assessment	Intervention/evaluative study	Suggested that ethnomathematics-based learning can support elementary numeracy outcomes.
de Freitas Madruga (2025)	Intercultural mathematical education	Ethnomodelling as theoretical-methodological proposal	Conceptual/theoretical paper	Proposed ethnomodelling as a theoretical-methodological orientation for intercultural mathematics education.
Sastrawati et al. (2026)	Ethnomathematics and computational thinking	Problem solving; computational thinking	Learning model development	Linked ethnomathematics with computational thinking for mathematical problem solving.

Table 6. Quality-appraisal summary of included studies

Study type	Main appraisal note
Conceptual/theoretical	Clear foundational construct; empirical evidence not expected for conceptual paper.
Conceptual/theoretical	Clear theoretical purpose and pedagogical examples.
Conceptual/theoretical	Strong conceptual clarity on emic, etic, and dialectical lenses.
Conceptual/theoretical	Coherent theoretical framework linking ethnomathematics and modelling.
Case-based modeling	Strong modelling example; limited transferability and classroom evidence.
Conceptual/theoretical	Coherent humanistic argument; not intended as intervention evidence.
Mixed-methods classroom/community	Rich dialogical evidence; causal claims limited by design and context.
Conceptual/theoretical	Clear glocalization argument and strong theoretical continuity.
Qualitative ethnomodelling	Clear cultural-mathematical mapping; limited outcome evidence.
Qualitative cultural modelling	Relevant cultural modelling; pedagogical implications need stronger validation.
Design research	Strong learning trajectory; limited generalizability beyond design context.
Qualitative ethnomathematics	Clear cultural-mathematical analysis; limited intervention evidence.
Curriculum-oriented study	Useful curriculum implications; limited empirical outcome reporting.
Qualitative theory-networking	Innovative theoretical networking; evidence base is context-specific.
Conceptual/empirical synthesis	Useful cultural perspective; boundary with review/conceptual synthesis needs caution.
Qualitative/ethnographic	Strong Indigenous argumentation focus and clear cultural grounding.
Dialogical qualitative	Strong onto-epistemological argument and cultural-mathematical



	interpretation.
Narrative/Indigenous methodology	Important epistemic contribution; conventional outcome evidence not applicable.
Reflective qualitative	Relevant Indigenous game context; limited classroom outcome evidence.
Ethnographic study	Clear integration of ethnomathematics and ethnomodelling for school concepts.
Design research/learning trajectory	Strong technology and RME integration; intervention generalizability limited.
Development/field test	Promising quantitative results; effect-size comparability and controls require caution.
Evaluation study	Useful teacher-quality evidence; publication details and study context require verification.
Intervention/evaluative	Positive numeracy evidence; instrument comparability and design controls limited.
Conceptual/theoretical	Clear theoretical-methodological contribution to intercultural mathematics education.
Learning model development	Promising computational-thinking integration; causal evidence remains preliminary.

Conceptual network and coding-to-theme trail

Across the corpus, ethnomodelling operates through a repeated mechanism (Table 7). Local or Indigenous practices are first recognized as emic knowledge; ethnomathematics identifies embedded mathematical relations; mathematical modelling provides etic representational tools; and a dialogical translation process produces models, tasks, worksheets, learning trajectories, trails, or curriculum resources. This mechanism leads to both cognitive outcomes and cultural-recognition outcomes when the cultural practice is not detached from its local meaning.

Table 7. Coding-to-theme trail for the synthesized mechanism

Synthesized process	Coding indicators	Illustrative studies	Analytic interpretation
Recognition	Cultural practice treated as legitimate mathematical knowledge; insider meanings preserved.	Rosa & Orey (2012, 2013, 2016); Huencho & Chandía (2023); López Leiva et al. (2023); Robinson et al. (2023).	Ethnomodelling begins by resisting deficit views of local or Indigenous knowledge.
Translation	Cultural procedures represented through diagrams, language, symbols, quantities, or modelling situations.	Umbara et al. (2021); Orey & Rosa (2013); Sudirman et al. (2024); Prahmana et al. (2021).	Translation mediates between emic practice and etic mathematical representation.
Mathematization	Measurement, abstraction, function building, modular reasoning, statistics, or modelling cycles.	Orey & Rosa (2013); Nursyahidah & Albab (2021); Hidayat et al. (2025); Nursyahidah et al. (2025).	Mathematical structure becomes explicit without erasing cultural meaning.
Recontextualization	Cultural model becomes task, worksheet, learning trajectory, assessment, or curriculum resource.	Cortes & Orey (2020); Hidayat et al. (2025); Nursyahidah et al. (2025); Marsigit et al. (2026).	Educational value depends on converting models into learnable and assessable classroom designs.

Qualitative Synthesis

Trend 1: From cultural identification to dialogical translation

The first trend is a movement from identifying mathematics in culture toward translating cultural practice into mathematical models. Foundational ethnomodelling papers emphasize that emic knowledge should not be replaced by school mathematics but placed in dialogue with etic tools (Rosa & Orey, 2012, 2013). Stronger empirical examples show this movement when market practices are translated into function concepts, architectural curves into mathematical models, local calendrical calculations into modular and relational structures, and fishermen's activities into institutionalized school mathematics concepts (Cortes & Orey, 2020; Orey & Rosa, 2013; Sudirman et al., 2024; Umbara et al., 2021).

By contrast, weaker forms of ethnomathematics-based learning tend to stop at identification. They may show that a cultural object has geometric patterns or numerical features but do not explain how learners are guided to model, justify, generalize, or evaluate those



structures. The review therefore distinguishes ethnomathematical recognition from ethnomodelling translation: recognition identifies mathematics in cultural practices, while translation turns those practices into negotiable, representational, and pedagogically usable models (Prahmana & D'Ambrosio, 2022; Rosa & Orey, 2016).

Trend 2: Cultural artifacts as model-generating objects

The second trend is the use of cultural artifacts and practices as model-generating objects. Architecture and construction practices frequently generate geometry, measurement, spatial reasoning, and function modelling, as seen in studies on architectural wall curves and atag construction (Orey & Rosa, 2013; Yusran et al., 2021). Calendrical and ceremonial systems generate number patterns, relational structures, and modular reasoning (Prahmana et al., 2021; Umbara et al., 2021). Batik patterns, Indigenous number systems, Morabaraba games, food-making practices, and daily STEAM activities generate geometry, arithmetic argumentation, strategy, measurement, and mathematical connections (López Leiva et al., 2023; Meeran et al., 2024; Nursyahidah & Albab, 2021; Prahmana & D'Ambrosio, 2022; Rodríguez-Nieto & Alsina, 2022). These examples show that cultural artifacts can become sources of modelling, not merely illustrations used to motivate students.

Trend 3: Classroom design and digital ethnomodelling

The third trend is the increasing movement from cultural documentation to classroom and digital design. Design research using GeoGebra has shown how food-related cylinder contexts can support students' understanding of surface area and volume (Nursyahidah & Albab, 2021). Technology-enhanced realistic mathematics education has been used to develop learning trajectories in statistics, while digital worksheets and computational-thinking-oriented models extend ethnomathematics into more future-oriented learning environments (Hidayat et al., 2025; Nursyahidah et al., 2025; Sastrawati et al., 2026). These studies suggest that digital tools can support ethnomodelling when they enable learners to visualize, manipulate, compare, test, and revise mathematical representations derived from cultural situations.

However, technology does not automatically produce ethnomodelling. A digital worksheet, animation, map trail, or GeoGebra file becomes an ethnomodelling environment only when students are asked to collect or interpret cultural data, represent relationships, test assumptions, build or revise models, and reflect on how the model relates to both local meaning and academic mathematics. Without these modelling actions, technology risks becoming only a delivery medium for culturally themed tasks.

Trend 4: Equity, humanization, and epistemic justice

The fourth trend concerns equity and epistemic justice. Indigenous and intercultural studies show that ethnomodelling is not only a cognitive approach but also an ethical and epistemological one. When local and Indigenous knowledge is treated as a legitimate source of mathematical reasoning, learners encounter mathematics as a human, historical, and cultural activity rather than a detached universal code (Huencho & Chandía, 2023; López Leiva et al., 2023; Robinson et al., 2023; Rosa & Orey, 2016). This can strengthen learner identity, cultural recognition, and participation, particularly in rural, Indigenous, multilingual, and minoritized communities (Meeran et al., 2024; Tesfamicael et al., 2021).

At the same time, the ethical dimension requires caution. Cultural knowledge should not be extracted from communities merely to decorate school tasks or academic publications. Future ethnomodelling research needs clearer protocols for community consent, representation, cultural ownership, benefit-sharing, and the protection of sacred or restricted knowledge. The strongest studies are those that preserve the dignity and meaning of cultural practices while making their mathematical structure available for learning, especially in Indigenous and intercultural settings (de Freitas Madruga, 2025; Huencho & Chandía, 2023; López Leiva et al., 2023; Robinson et al., 2023).

Descriptive Quantitative Evidence and Outcome Patterns

A formal meta-analysis was not conducted because the corpus was methodologically and statistically heterogeneous. The included records consist of conceptual papers, qualitative



ethnographic studies, design research, mixed-methods studies, one-group pretest-posttest designs, development studies, and evaluative studies. Outcomes also differ widely, including mathematical literacy, numeracy, critical thinking, computational thinking, function understanding, pedagogical quality, and cultural recognition. Only a small number of intervention-oriented studies reported extractable quantitative statistics, and these were not comparable enough for a pooled estimate.

Table 8 outlines the outcome-oriented evidence and limitations. The descriptive outcome evidence is therefore interpreted cautiously. Digital or classroom intervention studies report promising patterns, especially for critical thinking, numeracy, mathematical literacy, and computational thinking (Hidayat et al., 2025; Larasati et al., 2025; Nursyahidah et al., 2025; Sastrawati et al., 2026). However, several studies used small samples, limited randomization, insufficient comparison groups, or incomplete effect-size reporting. Thus, the evidence is best described as promising but preliminary rather than conclusive.

Table 8. Outcome-oriented evidence and limitations

Study cluster	Outcome focus	Reported pattern	Key limitation	Implication
Ethno-modelling digital worksheets	Mathematical critical thinking	Promising gains or large reported effect in field testing.	Effect size comparability and design controls need verification.	Future studies should use controlled designs and report full statistics.
Ethnomathematics-based numeracy	Numeracy and minimum competency-related outcomes	Positive descriptive improvement reported.	Limited comparability of instruments and contexts.	Use validated numeracy instruments and longer follow-up.
Technology + ethnomathematics + RME	Statistics understanding and learning trajectory quality	Learning trajectory supports contextual statistical reasoning.	Design research emphasizes process more than causal effect.	Combine design research with outcome validation.
Computational thinking integration	Problem solving and CT skills	Suggests potential alignment between cultural modelling and algorithmic reasoning.	Emerging evidence; few replications.	Develop clearer CT indicators and modelling rubrics.
Teacher/pedagogical quality studies	Task quality, assessment, facilitation	Teachers can identify cultural artifacts but may struggle with authentic assessment and modelling facilitation.	Competency measures are still underdeveloped.	Teacher education should include ethnographic, modelling, and assessment competencies.

Discussion

Ethnomodelling as culturally situated mathematical modeling

The synthesis suggests that ethnomodelling should be conceptualized as culturally situated mathematical modelling rather than as a subcategory of cultural contextualization. Cultural contextualization often inserts cultural objects into pre-existing school mathematics tasks. Ethnomodelling, by contrast, begins with the mathematical logic of a cultural practice and constructs a dialogical pathway toward academic mathematics. This distinction extends Rosa and Orey's foundational definition by showing how the emic-etic-dialogical framework has been operationalized across design studies, digital learning environments, Indigenous knowledge contexts, intercultural education, and curriculum-oriented research (de Freitas Madruga, 2025; Orey & Rosa, 2021; Rosa & Orey, 2012, 2013; Sudirman et al., 2024).

A synthesized mechanism: recognition, translation, mathematization, and recontextualization

The review's main conceptual contribution is the four-process mechanism of ethnomodelling. Recognition validates cultural practices as mathematical and epistemically legitimate, as emphasized in humanistic and indigenous mathematics education (Huencho & Chandía, 2023; Robinson et al., 2023; Rosa & Orey, 2016). Translation converts local procedures,



language, and meanings into representations without detaching them from cultural context, as illustrated by studies of market practices, Mesoamerican numbers, and Indigenous calendrical calculations (Cortes & Orey, 2020; López Leiva et al., 2023; Umbara et al., 2021). Mathematization develops formal relations, quantities, symbols, diagrams, functions, models, or algorithms, as seen in architecture, construction, food-making, and fishermen community activities (Nursyahidah & Albab, 2021; Orey & Rosa, 2013; Sudirman et al., 2024; Yusran et al., 2021). Recontextualization transforms these models into classroom tasks, learning trajectories, digital resources, or assessment situations (Hidayat et al., 2025; Marsigit et al., 2026; Nursyahidah et al., 2025). When recognition is missing, the approach risks cultural extraction. When translation is missing, cultural knowledge remains disconnected from formal mathematics. When mathematization is weak, tasks become decorative. When recontextualization is absent, the model does not become pedagogically usable.

Teacher education implications

The review also indicates that teacher education is a critical condition for high-quality ethnomodelling. Teachers and teacher candidates may be able to identify cultural artifacts but still struggle to design modelling tasks, contextual apperception, student-centered facilitation, authentic assessment, and ethical collaboration with cultural communities (Marsigit et al., 2026). Professional development should therefore cultivate five competencies: ethnographic sensitivity, modelling-cycle design, cultural task design, assessment literacy, and ethical partnership with communities. These competencies can help prevent superficial cultural insertion and support rigorous culturally situated mathematical reasoning, especially when ethnomathematics is used for curriculum development and intercultural mathematical education (de Freitas Madruga, 2025; Sudirman et al., 2024; Tesfamicael et al., 2021). In this sense, high-quality ethnomodelling is not merely a matter of bringing cultural objects into mathematics classrooms. It requires teachers who are able to listen to culture with respect, translate local meanings into meaningful mathematical investigations, and guide students toward deeper reasoning without reducing culture to a decorative context. When teacher education develops these capacities, ethnomathematics can become a more powerful pedagogical pathway: one that honors community knowledge, strengthens students' mathematical thinking, and builds a more humane and culturally responsive mathematics education

Ethical implications for research and curriculum design

Ethnomodelling research should be ethically accountable to the communities whose knowledge is transformed into academic tasks. Researchers should clarify how community knowledge was accessed, how cultural meanings were represented, whether community members consented to the use of their knowledge, and how the community benefits from the research. This is particularly important when the knowledge is Indigenous, sacred, collectively owned, or linked to cultural identity, as shown by studies involving Indigenous argumentation, Mesoamerican number systems, Aki Chike Win, and Indigenous games (Huencho & Chandía, 2023; López Leiva et al., 2023; Meeran et al., 2024; Robinson et al., 2023). Ethical ethnomodelling should be dialogical not only mathematically but also socially and culturally.

Limitations

First, the corpus combines core ethnomodelling studies and adjacent culturally situated modelling studies. This decision was necessary because explicit ethnomodelling empirical literature remains relatively small, but it also broadens the interpretive scope of the review. Second, multilingual searching reduces but does not eliminate language and database bias. Portuguese, Indonesian, Spanish, and Indigenous-language-related studies may still be underrepresented when metadata or full texts are not easily accessible.

Third, the review includes heterogeneous study designs. This strengthens conceptual synthesis but limits causal inference and prevents statistically meaningful meta-analysis. Fourth, several intervention-oriented studies have small samples, limited comparison groups, one-group designs, or incomplete statistical reporting. Claims about learning outcomes must therefore be interpreted as promising but preliminary. Fifth, the quality appraisal was necessarily adapted to



heterogeneous evidence. Although this made it possible to compare conceptual, qualitative, design-based, mixed-methods, and intervention-oriented studies within one corpus, future reviews with narrower inclusion criteria may apply design-specific tools such as MMAT, CASP, JBI, or ROBINS-I separately by study type (Hong et al., 2018).

Future Research Directions

Future research should be organized around four agendas derived from the evidence gaps identified in this review.

Methodological agenda

Future studies should use stronger designs where appropriate, including controlled intervention studies, design-based implementation research, longitudinal studies, and mixed-methods research linking process data with outcome evidence. Quantitative studies should report sample sizes, pre/post means, standard deviations, reliability, fidelity checks, effect sizes, and complete statistical tests.

Pedagogical agenda

Research should examine how teachers learn to design emic-etic-dialogical tasks, facilitate modelling discussions, scaffold mathematical representation, and assess culturally situated modelling competence. Teacher education studies should include concrete indicators of ethnographic sensitivity, modelling-cycle competence, task design quality, assessment literacy, and ethical collaboration with cultural communities (Marsigit et al., 2026; Sudirman et al., 2024; Tesfamicael et al., 2021).

Technological agenda

Digital ethnomodelling should move beyond delivery media toward modelling environments where learners collect cultural data, build models, test assumptions, compare representations, revise explanations, and reflect on local-global knowledge relations. GeoGebra, GIS, Mat City Map, animation, digital worksheets, and computational thinking tools should be evaluated for their modelling affordances rather than only their novelty (Hidayat et al., 2025; Nursyahidah & Albab, 2021; Nursyahidah et al., 2025; Sastrawati et al., 2026).

Ethical and intercultural agenda

Future research should develop explicit ethical protocols for community consent, cultural ownership, representation, and benefit-sharing. More studies are also needed in underrepresented Indigenous, island, rural, multilingual, and minoritized communities so that the field does not remain concentrated in a few national or linguistic contexts (Huencho & Chandía, 2023; López Leiva et al., 2023; Meeran et al., 2024; Robinson et al., 2023; Tesfamicael et al., 2021).

CONCLUSIONS AND SUGGESTIONS

This systematic review and conceptual synthesis shows that ethnomodelling is a promising but still methodologically developing field in mathematics education. Its most distinctive contribution lies in transforming ethnomathematics from cultural identification into culturally situated mathematical modelling. The evidence indicates that ethnomodelling can support mathematical understanding and cultural recognition when it is designed as a dialogical process between local knowledge and academic mathematics. At the same time, claims about learning outcomes remain preliminary because the empirical corpus is methodologically heterogeneous. The review contributes a synthesized mechanism of recognition, translation, mathematization, and recontextualization, positioning ethnomodelling as a dialogical bridge among local knowledge, mathematical modelling, curriculum design, and learner identity.

ACKNOWLEDGEMENTS

The authors would like to thank all scholars whose works contributed to the development of this systematic review and conceptual synthesis. The authors also acknowledge the use of generative AI and AI-assisted tools, including ChatGPT and Grammarly, to support language refinement, clarity, grammar checking, and manuscript editing. These tools were used only to improve the readability and presentation of the manuscript. All intellectual content, conceptual



analysis, interpretation of findings, conclusions, and final revisions remain the full responsibility of the authors

REFERENCES

- Cortes, D. P. O., & Orey, D. C. (2020). Connecting ethnomathematics and modelling: A mixed methods study to understand the dialogic approach of ethnomodelling. *Revemop*, 2, e202011. <https://doi.org/10.33532/revemop.e202011>
- Hidayat, W., Aripin, U., & Widodo, S. A. (2025). Integration of ethno-modelling and 3N: An innovative digital worksheet framework to enhance students' mathematical critical thinking skills. *Infinity Journal*, 14(4), 1019–1042. <https://doi.org/10.22460/infinity.v14i4.p1019-1042>
- Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M. P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M. C., Vedel, I., & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for Information*, 34(4), 285–291. <https://doi.org/10.3233/EFI-180221>
- Huencho, A., & Chandía, E. (2023). Humanizing mathematics education: Quantitative and arithmetic argumentation of Indigenous cultural practices. *ZDM–Mathematics Education*, 55(6), 1085–1099. <https://doi.org/10.1007/s11858-023-01490-7>
- Larasati, I., Pramasdyahsari, A. S., & Harun, L. (2025). Enhancing elementary student's numeracy skills through ethnomathematics-based learning: An analysis of minimum competency assessment results. *Journal of Honai Math*, 8(1), 71–88. <https://doi.org/10.30862/jhm.v8i1.861>
- López Leiva, C. A., de la Cruz Gómez, D., & Castro Cutz, J. (2023). Reconnecting with the mathematical thought of the Mesoamerican numbers in Ixil: An onto-epistemological dialogue. *ZDM–Mathematics Education*, 55(6), 1067–1083. <https://doi.org/10.1007/s11858-023-01523-1>
- Marsigit, Irfan, M., & Sukoco, H. (2026). Evaluation of pedagogical quality in ethnomathematics learning practices. *Discover Education*, 5, Article 25. <https://doi.org/10.1007/s44217-025-01026-z>
- Madrugá, Z. E. F. (2025). Intercultural mathematical education: Ethnomodelling as a theoretical-methodological proposal for basic education. *International Journal of Studies in Education and Science*, 6(3), 325–338. <https://doi.org/10.46328/ijses.2213>
- Meeran, S., Mamanyena, K. S., Merriam, M. M., Noor, D. M., & Makokotlela, M. V. (2024). Ethnomathematics in intermediate phase: Reflections on the Morabaraba game as Indigenous mathematical knowledge. *African Journal of Research in Mathematics, Science and Technology Education*, 28(2), 171–184. <https://doi.org/10.1080/18117295.2024.2340095>
- Nursyahidah, F., & Albab, I. U. (2021). Learning design on surface area and volume of cylinder using Indonesian ethno-mathematics of traditional cookie maker assisted by GeoGebra. *Mathematics Teaching Research Journal*, 13(4), 79–98. <https://files.eric.ed.gov/fulltext/EJ1332350.pdf>
- Nursyahidah, F., Wardono, Mariani, S., & Wijayanti, K. (2025). Integrating technology, ethnomathematics, and realistic mathematics education in learning statistics: A learning trajectory. *Infinity Journal*, 14(3), 633–654. <https://doi.org/10.22460/infinity.v14i3.p633-654>
- Orey, D. C., & Rosa, M. (2013). The mathematics of the curves on the wall of the Colégio Arquidiocesano and its mathematical models: A case for ethnomodeling. *Journal of Mathematical Modelling and Application*, 1(8), 42–62. <https://www.researchgate.net/profile/Milton-Rosa/publication/300644848>
- Orey, D. C., & Rosa, M. (2021). Ethnomodelling as a glocalization process of mathematical practices through cultural dynamism. *The Mathematics Enthusiast*, 18(3), 439–468. <https://doi.org/10.54870/1551-3440.1533>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S.,



- ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Prahmana, R. C. I., & D'Ambrosio, U. (2022). Learning mathematics through ethnomathematics: A cultural perspective. *Mathematics Education Research Journal*, 34(4), 789–804. <https://doi.org/10.1007/s13394-021-00389-4>
- Prahmana, R. C. I., Yudianto, W., Rosa, M., & Orey, D. C. (2021). Ethnomathematics: Pranatamangsa system and the birth-death ceremonial in Yogyakarta. *Journal on Mathematics Education*, 12(1), 93–112. <https://doi.org/10.22342/jme.12.1.11745.93-112>
- Robinson, L., West, K., Daoust, M., Sylliboy, S., Lafferty, A., Wiseman, D., Lunney Borden, L., Ghostkeeper, E., Glanfield, F., Ribbonleg, M., & Bernard, K. (2023). When mathematics has spirit: Aki Chike Win. *ZDM—Mathematics Education*, 55(6), 1053–1065. <https://doi.org/10.1007/s11858-023-01482-7>
- Rodríguez-Nieto, C. A., & Alsina, Á. (2022). Networking between ethnomathematics, STEAM education, and the globalized approach to analyze mathematical connections in daily practices. *Eurasia Journal of Mathematics, Science and Technology Education*, 18(3), em2085. <https://doi.org/10.29333/ejmste/11710>
- Rosa, M., & Orey, D. C. (2010). Ethnomodeling as a pedagogical tool for the ethnomathematics program. *Revista Latinoamericana de Etnomatemática*, 3(2), 14–23. <https://www.revista.etnomatematica.org/index.php/RevLatEm/article/view/25>
- Rosa, M., & Orey, D. C. (2011). Ethnomodeling: A pedagogical action for uncovering ethnomathematical practices. *Journal of Mathematical Modelling and Application*, 1(3), 58–67. https://scholar.google.com/scholar?cluster=5911569017214109262&hl=id&as_sdt=0,5
- Rosa, M., & Orey, D. C. (2012). The field of research in ethnomodeling: Emic, ethic and dialectical approaches. *Educação e Pesquisa*, 38(4), 865–879. <https://doi.org/10.1590/S1517-97022012000400006>
- Rosa, M., & Orey, D. C. (2013). Ethnomodeling as a research theoretical framework on ethnomathematics and mathematical modeling. *Journal of Urban Mathematics Education*, 6(2), 62–80. <https://doi.org/10.21423/jume-v6i2a195>
- Rosa, M., & Orey, D. C. (2016). Humanizing mathematics through ethnomodelling. *Journal of Humanistic Mathematics*, 6(2), 3–22. <https://doi.org/10.5642/jhummath.201602.03>
- Sastrawati, E. S., Putri, A. G. E., Hidayat, A. F., Yantoro, & Zahyuni, V. (2026). Ethnomathematics meets computational thinking: Developing a learning model for mathematical problem-solving. *AL-ISHLAH: Jurnal Pendidikan*, 18(1), 1031–1040. <https://doi.org/10.35445/alishlah.v18i1.9354>
- Sudirman, Rodríguez-Nieto, C. A., & Bonyah, E. (2024). Integrating ethnomathematics and ethnomodeling in institutionalization of school mathematics concepts: A study of fishermen community activities. *Journal on Mathematics Education*, 15(3), 835–858. <https://doi.org/10.22342/jme.v15i3.pp835-858>
- Tesfamicael, S. A., Nakken, A. H., Tumebo, T., & Gray, P. (2021). Curriculum implications of using ethnomathematics to promote student learning in Ethiopia. *Journal of Mathematics and Culture*, 15(3), 85–123. <https://www.researchgate.net/publication/352312090>
- Umbara, U., Wahyudin, W., & Prabawanto, S. (2021). Exploring ethnomathematics with ethnomodeling methodological approach: How does Cigugur Indigenous people use calculations to determine good day to build houses? *Eurasia Journal of Mathematics, Science and Technology Education*, 17(2), em1939. <https://doi.org/10.29333/ejmste/9673>
- Yusran, Y. A., Utami, S., Surjono, & Muhammad, A. Y. (2021). Ethnomodelling on atag construction in Ajung Village, Jember Regency. *ARTEKS: Jurnal Teknik Arsitektur*, 6(1), 129–138. <https://doi.org/10.30822/arteks.v6i1.644>

