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Culturally responsive mathematics learning through classical malay literature: Ethnomathematical perspectives on *Gurindam Dua Belas*

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Abstract

Ethnomathematical exploration of classical Malay literature, particularly Gurindam Dua Belas (Gurindam 12), has remained relatively limited despite its considerable potential to support culturally contextualized mathematics learning. This study aimed to examine the mathematical logic structures and set theory concepts embedded in Gurindam 12 by Raja Ali Haji through an ethnomathematical perspective. The study employed a qualitative interpretive design using a literary hermeneutic approach. Primary data were derived from Articles 5 and 6 of Gurindam 12, while secondary data consisted of scholarly publications on ethnomathematics and mathematics education published between 2014 and 2024. Data analysis was conducted through heuristic reading, thematic pattern identification, hermeneutic interpretation, and triangulation with formal mathematical theory. The findings revealed that Article 5 contained inferential structures analogous to mathematical implication logic ($p \rightarrow q$), represented through conditional moral relationships, whereas Article 6 reflected classificatory structures parallel to foundational concepts in set theory, including sets, subsets, and membership criteria. The integration of Gurindam 12 into mathematics education offers a culturally responsive ethnomathematical approach that may enhance conceptual understanding, cultural awareness, and positive mathematical dispositions. This study contributes to ethnomathematics literature by demonstrating that classical Malay literature constitutes a meaningful pedagogical resource for bridging indigenous knowledge systems with universal mathematical concepts.

Keywords: Ethnomathematics; *Gurindam 12;* Indigenous knowledge; Mathematical logic*;* Set heory

Introduction

Ethnomathematics has increasingly attracted scholarly attention in mathematics education because of its potential to connect mathematical learning with students' cultural experiences, social practices, and everyday realities (D'Ambrosio, 2016; Rosa & Orey, 2021). Existing studies have explored diverse cultural contexts, including traditional architecture, batik motifs, weaving patterns, and indigenous games, as sources of mathematical ideas and pedagogical activities (Risdiyanti & Prahmana, 2020; Utami et al., 2018). These studies demonstrated that cultural practices could facilitate contextualized and meaningful mathematics learning by enabling students to relate abstract mathematical concepts to familiar cultural environments (Chahine & Allexsaht-Snider, 2019). Within the Indonesian context, however, ethnomathematical research has predominantly emphasized tangible cultural artifacts, whereas classical literary works have received comparatively limited attention. One literary text that remains underexplored in ethnomathematics research is Gurindam Dua Belas (Gurindam 12), a classical Malay didactic poem written by Raja Ali Haji. Gurindam 12 consists of paired poetic verses containing moral teachings and advisory messages organized through consistent conditional and cause–effect structures (Liaw, 2013; Mahamod et al., 2015). Such structural regularities reflect forms of logical reasoning that may be interpreted in relation to implication structures in mathematical logic.

The relationship between literature and mathematics has been increasingly recognized within interdisciplinary educational research. Endraswara (2023), in a study of Javanese numerical poetry, demonstrated that traditional literary texts contain indigenous knowledge systems that may be interpreted through the perspective of literary ethnomathematics. A similar analytical perspective may be applied to Gurindam 12, as its poetic composition reflects systematic patterns of conditional reasoning, classification, and moral categorization that parallel forms of logical thinking in mathematics education. In ethnomathematical discourse, culture is not merely positioned as contextual ornamentation within instruction; rather, it is understood as an organized system of reasoning and knowledge production. According to Rosa and Orey (2016), ethnomathematics investigates mathematical ideas embedded within cultural practices, including linguistic and literary traditions that embody patterns of structure, logic, and relational thinking. In Gurindam 12, the recurring use of conditional expressions and categorical representations of human behavior provides a meaningful basis for interpreting literary reasoning through formal mathematical concepts such as implication logic, sets, subsets, and classification systems.

Previous studies on the integration of literature into mathematics education have reported positive contributions to students' conceptual understanding, mathematical communication, and learning engagement (Capraro & Capraro, 2018; Schiro, 2020). Furthermore, Growney (2020) argued that poetry and mathematics share fundamental similarities in terms of structure, rhythm, pattern, and aesthetic organization, thereby allowing both disciplines to mutually enrich the learning process. Similarly, Aharoni (2014) and Presmeg (2006) emphasized that poetry and mathematics exhibit comparable forms of logical structure and symbolic patterning. Nevertheless, studies specifically examining the relationship between classical Malay literature

and mathematical concepts remain scarce. Consequently, significant opportunities remain for investigating how traditional literary texts may function as culturally grounded pedagogical resources within mathematics education

Based on the research gap identified above, this study aimed to analyze the mathematical logic structures embedded in Article 5 of Gurindam 12, examine the set theory concepts reflected in Article 6, explore the ethnomathematical pedagogical values of the text for mathematics education, and develop a conceptual framework for integrating Gurindam 12 into the teaching of mathematical logic and set theory. This study is expected to contribute to the development of ethnomathematics scholarship in Indonesia while offering an alternative approach to contextual, culturally responsive, and meaningful mathematics learning.

Methods

This study employed a qualitative interpretive design using a literary hermeneutic approach to examine the mathematical structures embedded in Gurindam 12 by Raja Ali Haji. The qualitative interpretive framework was selected because the study aimed to explore symbolic meanings, patterns of reasoning, and conceptual structures embedded within literary texts rather than to measure observable variables quantitatively. In line with hermeneutic inquiry, interpretation was directed toward understanding how linguistic expressions and cultural representations in classical Malay literature may reflect implicit forms of mathematical reasoning (Ricoeur, 2016; Valdes, 1987). The primary data consisted of texts from Articles 5 and 6 of Gurindam 12, selected because these sections exhibit strong conditional, classificatory, and relational structures relevant to mathematical logic and set theory. Secondary data comprised national and international scholarly publications on ethnomathematics, mathematical logic, set theory, literary studies, and culturally responsive mathematics education published between 2014 and 2024. These sources were used to support conceptual interpretation, theoretical triangulation, and interdisciplinary analysis.

Data analysis was conducted through four systematic and iterative stages. The first stage involved heuristic reading, in which each verse of Gurindam 12 was repeatedly examined to identify textual structures, diction patterns, semantic regularities, and cause–effect expressions. At this stage, analytical attention focused on recurring linguistic forms indicating logical relations, classification patterns, and moral categorization. The second stage involved the identification and coding of logical and classificatory structures within the text. Textual units containing conditional statements, relational patterns, and grouping structures were categorized and associated with formal mathematical concepts, including implication logic, sets, subsets, and membership relations. For example, conditional expressions structured through moral consequences were interpreted as forms of implication logic represented by the symbolic relation ($p \rightarrow q$). Similarly, classificatory representations of human behavior and ethical categories were analyzed through the perspective of set theory and relational structures.

The third stage consisted of hermeneutic interpretation through an ethnomathematical perspective. At this stage, the identified patterns were interpreted within the socio-cultural,

philosophical, and literary context of classical Malay tradition. The interpretation referred to the four perspectives of literary ethnomathematics proposed by Endraswara (2023), namely analogical ethnomathematics, anthropological ethnomathematics, pedagogical ethnomathematics, and literary memory ethnomathematics. These perspectives enabled the analysis to move beyond surface linguistic forms toward a broader understanding of how literary structures may embody systems of indigenous reasoning and knowledge construction. In this study, Gurindam 12 was therefore interpreted not merely as a literary artifact, but also as a cultural text containing organized logical structures that may be pedagogically reconstructed within mathematics education.

The fourth stage involved theoretical triangulation and conceptual validation. The interpretation results were systematically compared with formal mathematical theory and recent ethnomathematics literature to ensure analytical consistency and conceptual coherence. Interpretive validity was established through iterative interpretation and theoretical corroboration rather than through conventional data-source triangulation. Three practical validation criteria were applied throughout the analysis process. First, textual consistency was maintained by ensuring that interpretations remained grounded in the original linguistic structure and semantic context of the verses. Second, conceptual correspondence was examined by aligning the identified logical and classificatory patterns with established mathematical concepts such as logical implication, sets, relations, and subsets. Third, theoretical corroboration was conducted by comparing the findings with previous ethnomathematics studies and relevant interdisciplinary scholarship. These procedures were implemented continuously throughout the interpretive process to minimize subjective bias and strengthen analytical reliability. Furthermore, the study adopted a transdisciplinary perspective integrating literary studies, mathematics education, pedagogy, and cultural anthropology in order to construct a more comprehensive analytical framework for interpreting the ethnomathematical dimensions of Gurindam 12 (Jablonka, 2016; Shirley & Palhares, 2020).

Results and Discusion

Ethnomathematical Dimensions of Mathematical Logic in Article 5 of Gurindam 12

Table 1 presents the ethnomathematical analysis of mathematical logic embedded in Article 5 of Gurindam 12 by Raja Ali Haji. The findings indicate that the verses consistently employ conditional linguistic structures characterized by repetitive “if–then” patterns, which conceptually parallel forms of reasoning in formal mathematical logic. In addition to conditional relations, the verses also demonstrate processes of classification, inference, behavioral categorization, and observational verification that may be associated with concepts in set theory, propositional logic, and deductive reasoning. These patterns suggest that Gurindam 12 functions not only as a literary and moral text, but also as a cultural representation of systematic reasoning embedded within the Malay intellectual tradition.

Table 1. Ethnomathematical Analysis of Mathematical Logic in Article 5 of *Gurindam 12*

Original Malay Text (*Gurindam 12*, Article 5)	English Translation	Logical Pattern	Mathematical Concept	Ethnomathematical Interpretation
Jika hendak mengenal orang berbangsa, lihat kepada budi dan bahasa.	If one wishes to recognize a person of noble character, observe their manners and speech.	Conditional ("if–then") relation	Logical implication $p \rightarrow q$	Moral identity is inferred through observable indicators, reflecting a culturally grounded pattern of conditional reasoning.
Jika hendak mengenal orang yang berbahagia, sangat memeliharakan yang sia-sia.	If one wishes to recognize a happy person, they carefully avoid useless matters.	Cause–effect relation	Propositional logic	Happiness is conceptually associated with the ability to avoid futile actions, demonstrating contextual logical association.
Jika hendak mengenal orang mulia, lihatlah kepada kelakuan dia.	If one wishes to recognize an honorable person, observe their behavior.	Attribute-based classification	Set classification	Human characteristics are categorized according to behavioral criteria, analogous to membership within a set.
Jika hendak mengenal orang yang berilmu, bertanya dan belajar tiadalah jemu.	If one wishes to recognize a knowledgeable person, they never tire of asking questions and learning.	Logical inference	Deductive reasoning	Persistent learning behavior functions as evidence of knowledge acquisition and intellectual development.
Jika hendak mengenal orang yang berakal, di dalam dunia mengambil bekal.	If one wishes to recognize a wise person, they prepare provisions for life in this world.	Premise–conclusion relation	Logical reasoning	Wisdom is inferred from preparedness, foresight, and thoughtful action within social life.

Original Malay Text (*Gurindam 12*, Article 5)	English Translation	Logical Pattern	Mathematical Concept	Ethnomathematical Interpretation
Jika hendak mengenal orang yang baik perangai, lihat pada ketika bercampur dengan orang ramai.	If one wishes to recognize a person of good character, observe them when interacting with many people.	Observational verification	Empirical logic	Good character is validated through social interaction and contextual behavioral observation.

Table 1 presents an interpretive mapping between the verses in Article 5 of Gurindam 12 and selected concepts in formal mathematical logic. The analysis does not assume a direct or absolute equivalence between literary expressions and formal mathematical structures; rather, it identifies conceptual correspondences in the reasoning patterns embedded within the text. The repetitive conditional expressions beginning with "jika hendak mengenal …" ("if one wishes to recognize …") were initially identified as linguistic indicators of conditional relations. These expressions were subsequently analyzed through several systematic stages, including identifying the conditional structure of each verse, determining the implied relationship between premise and conclusion, classifying the reasoning pattern, and relating the identified structure to relevant mathematical concepts such as logical implication, deductive inference, and classification within set theory. Through this stepwise interpretive process, the analysis sought to minimize subjectivity and establish a more transparent analytical framework for understanding how Malay literary traditions may reflect systematic forms of reasoning associated with ethnomathematical perspectives.

In formal mathematical logic, implication structures are commonly represented by the symbolic relation $(p \rightarrow q)$ in which a premise (p) leads to a corresponding conclusion (q) with specific truth conditions (Enderton, 2015). The findings indicate that Gurindam 12 consistently demonstrates analogous implication patterns in which conditions are followed by logically related moral or behavioral consequences. Unlike abstract symbolic logic, however, the logical structures presented in Gurindam 12 are contextual and grounded in observable human experience. The implications expressed within the verses are derived from empirical observations of behavior, ethics, and social interaction, thereby enabling learners to connect formal logical concepts with familiar cultural realities. In this sense, the text offers a contextualized form of logical reasoning that may support students' conceptual understanding of mathematical logic through culturally meaningful examples (Meaney et al., 2016).

Beyond implication structures, the analysis also identified linguistic patterns that conceptually resemble additional logical operators. These expressions were not interpreted as strict symbolic operators in the formal mathematical sense; rather, they were understood heuristically as linguistic forms reflecting analogous reasoning processes. For example, the

phrase "budi dan bahasa" ("character and speech") may be interpreted as representing a conjunctive relationship because both elements function simultaneously as complementary indicators of noble character. Conceptually, this relationship resembles the logical conjunction form $(p \wedge q)$ in which two conditions operate together within a single relational structure. Similarly, the phrase "tiadalah jemu" ("without weariness") may be interpreted as reflecting semantic negation because it expresses the absence of reluctance or fatigue within the learning process. This pattern conceptually resembles the negation operator $\bar{p}$ although it remains grounded in contextual language rather than symbolic formalization.

These interpretations should therefore be understood as heuristic and contextual rather than as literal symbolic translations of literary language into mathematical notation. The analysis focuses on identifying analogous reasoning structures embedded within the text instead of claiming exact equivalence between natural language and formal logical systems. This perspective is consistent with the arguments of Lakoff and Núñez (2000), who proposed that mathematical ideas are constructed through embodied cognition, metaphorical reasoning, and linguistic structures. It also aligns with ethnomathematical perspectives advanced by D'Ambrosio (2001) and Rosa and Orey (2016), which emphasize that mathematical reasoning may be embedded within cultural narratives, symbolic systems, and literary traditions without requiring strict formal correspondence to academic mathematics.

Ethnomathematical Dimensions of Set Theory in Article 6 of *Gurindam 12*

Table 2 presents the ethnomathematical analysis of set theory concepts identified in Article 6 of *Gurindam 12* by Raja Ali Haji. The analysis focuses on how repetitive expressions of selection, categorization, and social grouping within the verses reflect systematic classificatory patterns that conceptually parallel foundational ideas in set theory. Rather than interpreting the literary text as a direct mathematical formulation, the analysis examines how social classifications embedded in the Malay literary tradition resemble mathematical concepts such as set membership, subsets, intersections, and selective grouping. Through this interpretive approach, Article 6 demonstrates culturally grounded forms of classificatory reasoning that are relevant to ethnomathematics and mathematics education.

Table 2. Ethnomathematical Analysis of Set Theory in Article 6 of *Gurindam 12*

Original Malay Text	English Translation	Classification Pattern	Set Theory Concept	Ethnomathematical Interpretation
Cahari oleh mu akan sahabat, yang boleh dijadikan obat.	Seek for yourself a companion, one who may serve as a remedy.	Selection based on criteria	Set membership	A "good companion" is categorized as a member of the set of supportive individuals who provide emotional and moral benefit.

Original Malay Text	English Translation	Classification Pattern	Set Theory Concept	Ethnomathematical Interpretation
Cahari oleh mu akan guru, yang boleh tahukan tiap seteru.	Seek for yourself a teacher, one who could discern every adversary.	Categorization through attributes	Subset classification	Teachers are classified according to wisdom and the ability to distinguish harmful influences.
Cahari oleh mu akan isteri, yang boleh dimenyerahkan diri.	Seek for yourself a wife, one to whom one could surrender oneself.	Grouping based on trustworthiness	Intersection of characteristics	The ideal spouse is represented through the intersection of loyalty, trust, and responsibility.
Cahari oleh mu akan kawan, pilih segala orang yang setiawan.	Seek for yourself a friend, choose from among all those who are faithful.	Filtering and selection	Universal set and subset	From the universal set of people, only faithful individuals are selected as members of the desired subset.
Cahari oleh mu akan abdi, yang ada baik sedikit budi.	Seek for yourself a servant, one who possesses at least some virtue.	Minimal qualification criteria	Set inclusion	Individuals possessing moral virtue are included within the acceptable membership category.

The findings indicate that Article 6 exhibits systematic patterns of classification and selection that may be interpreted as conceptually analogous to set theory rather than as direct formal mathematical structures. The repeated phrase “cahari oleh mu” (“seek for yourself”) functions as a linguistic marker of selective grouping within social categories. In this interpretation, the analysis does not claim that the verses explicitly constitute mathematical sets; instead, it identifies conceptual parallels between the classificatory reasoning embedded within the text and the organizational principles underlying set theory. Each couplet contains three interconnected interpretive components: a broader social category functioning as a potential universal set, a more specific social role operating as a subset (such as companion, teacher, spouse, friend, or servant), and particular moral or behavioral criteria determining inclusion within that subset.

The transformation from literary text to mathematical interpretation was conducted through several analytical stages. First, recurring classification patterns within the linguistic structure were identified. Second, the criteria used to distinguish social groups were examined. Third, relational patterns among the identified categories were interpreted. Finally, these

patterns were compared with established concepts in set theory, including membership, subsets, filtering, and selection. Consequently, the interpretation remains heuristic and contextual rather than formally symbolic. Alternative literary, moral, or sociocultural interpretations remain possible; however, the ethnomathematical perspective specifically emphasizes how cultural texts may embody systematic forms of categorization and relational reasoning. This perspective aligns with Devlin's (2014) argument that mathematics fundamentally concerns patterns and structures in human reasoning, as well as with Lipschutz and Lipson's (2017) explanation that set theory centers on classification, grouping, and membership relations. It is also consistent with ethnomathematical perspectives proposed by D'Ambrosio (2001) and Rosa and Orey (2016), which recognize that mathematical reasoning may emerge through culturally embedded systems of organization and interpretation.

The mathematical relationships identified in the analysis may be represented through symbolic set notation. For example, the set of supportive companions may be represented as

$$S = \{x | x \text{ is a companion who provides remedy or solace}\},$$

while the set of wise teachers may be expressed as

$$G = \{x | x \text{ is a teacher who distinguishes good from bad}\}.$$

Similarly, trusted spouses, faithful friends, and virtuous servants may be represented as

$$I = \{x | x \text{ is a wife who can be fully trusted}\},$$

$$K = \{x | x \text{ is a friend characterized by faithfulness}\}, \text{ and}$$

$$A = \{x | x \text{ is a servant possessing moral virtue}\},$$

respectively. In these representations, membership within each set is determined by explicitly defined moral or social attributes derived from the verses of *Gurindam 12*. These defining characteristics function as membership criteria distinguishing members from non-members, reflecting a foundational principle of set theory (Rosen, 2018).

The findings further indicate that the concepts embedded in Article 6 may be represented visually through Venn diagrams to illustrate relationships among sets, including intersection, union, difference, complement, and disjoint relationships. Such visual representations provide pedagogical support for explaining how individuals may belong simultaneously to multiple categories or be excluded from particular groups. For example, the intersection between companions and teachers may be represented as S∩G indicating individuals who function both as supportive companions and as wise teachers. Similarly, the complement of set S may be represented as S' representing individuals who do not satisfy the criteria for membership within the set of supportive companions. These contextual representations may support students' conceptual understanding of set operations through culturally meaningful situations (Utami et al., 2018; Arisetyawan et al., 2014).

Figure 1 illustrates how the moral and social classifications presented in Article 6 of Gurindam 12 may be interpreted through set relationships and operations. The visual representation clarifies the membership criteria associated with each social category while

demonstrating how contextual cultural meanings may support students' understanding of foundational set theory concepts within culturally responsive mathematics learning approaches, including Pendidikan Matematika Realistik Indonesia (PMRI). Furthermore, the use of the word "segala" ("all") in the fourth couplet provides a contextual basis for introducing generalized relationships in mathematics. Although not functioning as formal symbolic logic, the expression conceptually reflects the idea that members of a particular category share common defining characteristics. This contextual interpretation may help students recognize how classification, grouping, and shared attributes are connected to broader mathematical reasoning processes. As argued by Fouze and Amit (2017), connecting abstract mathematical concepts with meaningful real-life situations can support students' conceptual understanding and engagement in mathematics learning.

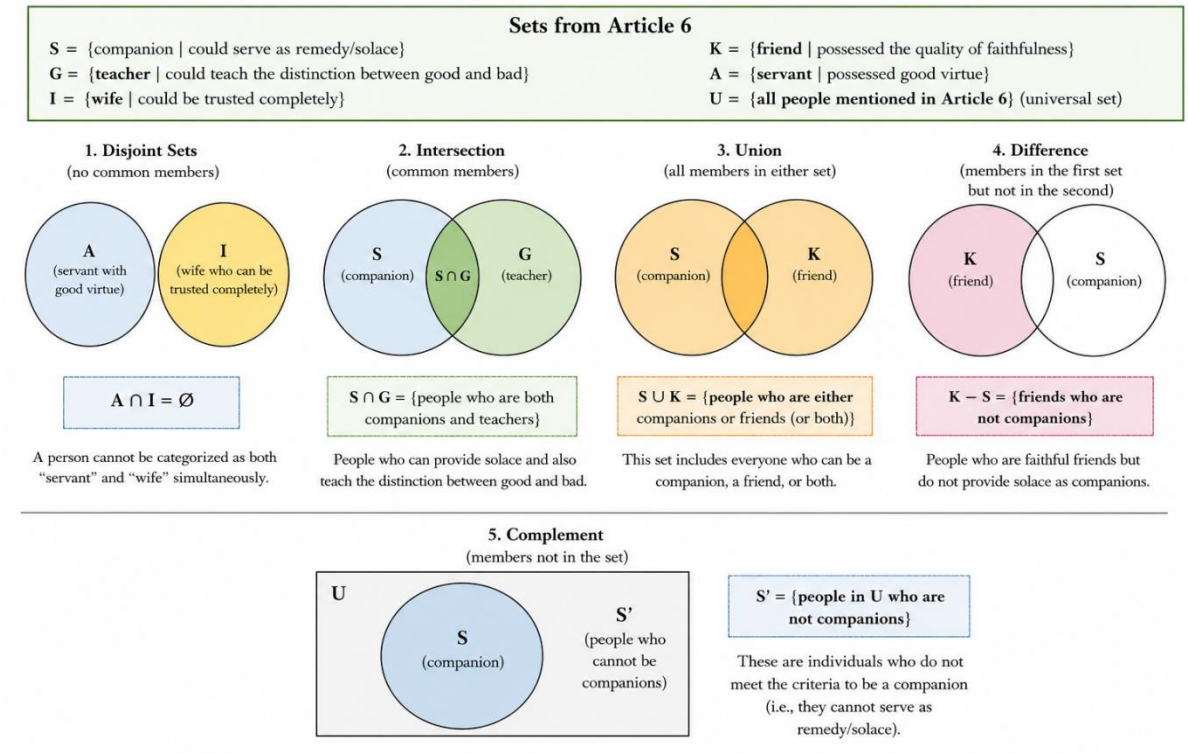


Figure 1. Visual Representation of Set Concepts in Article 6 using Venn Diagrams

Pedagogical Values and Implementation Framework

The integration of Gurindam 12 into mathematics education is grounded in ethnomathematical pedagogical principles that emphasize meaningful, contextual, and culturally responsive learning (D'Ambrosio, 2020; Rosa & Orey, 2016). Within this framework, ethnomathematics is understood not merely as the inclusion of cultural artifacts in classroom activities, but as an educational approach that situates mathematical learning within systems of cultural meaning, identity formation, and social experience. Ethnomathematical learning therefore involves cultural contextualization, reinforcement of students' cultural identities, holistic learning experiences, and opportunities for multicultural dialogue and reflection (Shirley & Palhares,

2020; Meaney et al., 2016). In this context, Gurindam 12 by Raja Ali Haji provides a relevant Malay cultural framework through which mathematical ideas may be introduced while simultaneously fostering cultural awareness and ethical reflection. Accordingly, the use of Gurindam 12 in this study is positioned as a pedagogical medium for connecting mathematical concepts with cultural meaning rather than as an empirically measured instructional intervention.

The findings suggest that the literary structure of Gurindam 12 may support mathematics learning through a sequence of ethnomathematical instructional stages adapted from the frameworks proposed by Tan and Ang (2016) and Arisetyawan et al. (2014). The first stage involves literary appreciation, in which students read, interpret, and appreciate Gurindam 12 as a classical literary work embedded within Malay cultural traditions. This stage is intended to establish cultural familiarity and contextual engagement prior to formal mathematical instruction. The second stage involves identifying mathematical patterns within the text, particularly conditional structures, classification systems, and relational patterns embedded in the verses. Students may recognize repetitive "if–then" expressions as forms conceptually analogous to implication logic $p \rightarrow q$ and identify grouping structures associated with set theory concepts. The third stage involves mathematical formalization, during which teachers introduce formal symbolic representations such as implication notation and set-builder notation $A = \{x|P(x)\}$ to connect contextual reasoning with formal mathematical language.

The fourth stage involves application and generalization, in which students construct analogous examples derived from their own social and cultural experiences. Through this process, learners are encouraged to transfer abstract mathematical concepts into meaningful real-life situations, thereby strengthening conceptual understanding and relational thinking. The final stage involves values reflection, where students discuss the ethical meanings embedded within the verses and examine the relationship between logical reasoning, decision-making, and moral behavior. This reflective dimension is particularly important within ethnomathematical pedagogy because it positions mathematics not only as a technical discipline, but also as a human activity connected to cultural values and social responsibility.

The findings further indicate that Gurindam 12 possesses several pedagogical advantages as a culturally embedded learning medium. The poetic structure of the text, characterized by rhythm, repetition, and consistent rhyme patterns, may support students' engagement, comprehension, and memory retention during mathematics instruction (Capraro & Capraro, 2018; Schiro, 2020). The paired verse structure and recurring linguistic forms can function as cognitive cues that assist learners in organizing and recalling newly introduced mathematical ideas. In this study, Gurindam 12 is therefore positioned as a cognitive anchor connecting formal mathematical concepts with students' prior cultural knowledge and local wisdom. This interpretation aligns with theories of meaningful learning, which emphasize that conceptual understanding becomes more effective when new information is meaningfully connected to existing cognitive structures and lived experiences.

Previous studies have demonstrated that culturally contextualized mathematics learning may contribute positively to students' conceptual understanding, motivation, and identity

formation. Fouze and Amit (2017) and Chahine and Allexsaht-Snider (2019), for example, reported that students who learned mathematics through culturally relevant contexts exhibited stronger conceptual retention, improved knowledge transfer, higher intrinsic motivation, and greater reinforcement of cultural identity. In relation to ethnomathematical pedagogy, Rosa and Orey (2016) proposed that learning outcomes may be evaluated through several dimensions, including conceptual understanding, procedural competence, cultural connectedness, and mathematical disposition. Within this framework, the integration of Gurindam 12 potentially supports not only mathematical cognition, but also the development of positive attitudes toward mathematics and appreciation of cultural heritage.

This study also suggests broader implications for mathematics education in Indonesia. Indonesia possesses extensive literary traditions across diverse ethnic communities, including Javanese, Sundanese, Malay, and Buginese cultures, all of which may serve as valuable contextual resources for ethnomathematics-based learning (Risdiyanti & Prahmana, 2020). The integration of Gurindam 12 illustrates a possible approach for bridging disciplinary boundaries among mathematics, language education, literature, and civics education, thereby supporting interdisciplinary and integrative thinking aligned with the demands of 21st-century education (Jablonka, 2016). Nevertheless, the implementation of such approaches also presents practical challenges. Effective integration requires teachers who possess not only strong mathematical understanding, but also sufficient knowledge of local cultural traditions and the pedagogical competence necessary to integrate cultural and mathematical content meaningfully. Furthermore, curriculum constraints, instructional time limitations, and variations in teacher readiness may influence the feasibility of classroom implementation. Consequently, although the ethnomathematical integration of Gurindam 12 demonstrates substantial pedagogical potential, its successful application depends on supportive educational conditions, including curriculum flexibility, institutional support, and sustained teacher professional development (Meaney et al., 2016; Shirley & Palhares, 2020).

Conclusion

This study examined Gurindam 12, particularly Articles 5 and 6, through an ethnomathematical perspective and identified literary structures that conceptually correspond to foundational ideas in mathematical logic and set theory. The analysis demonstrated that the repetitive conditional expressions in Article 5 reflect reasoning patterns analogous to logical implication, conceptually represented by the form $p \rightarrow q$ and associated with broader logical relationships such as conjunction and negation. Likewise, the classificatory patterns found in Article 6 reveal systematic forms of social grouping that parallel concepts in set theory, including membership, subsets, selection criteria, intersection, union, difference, and complement. These findings indicate that classical Malay literary traditions may embody organized structures of reasoning that can be interpreted through mathematical perspectives without assuming direct equivalence between literary language and formal symbolic systems.

From an ethnomathematical standpoint, the integration of Gurindam 12 into mathematics education may serve as a culturally responsive pedagogical approach that connects mathematical concepts with literary and cultural meaning. Rather than positioning the text as a substitute for formal mathematics instruction, this study proposes that cultural texts such as Gurindam 12 can function as contextual learning resources through which abstract mathematical ideas become more meaningful and accessible to students. Within this framework, the use of Gurindam 12 potentially supports students' conceptual understanding of logic and set theory, strengthens cultural awareness, and fosters positive mathematical dispositions. The pedagogical potential of this approach is further supported by the rhythmic and structured poetic form of the text, which may facilitate engagement, recall, and conceptual association between local wisdom and formal mathematical knowledge. Nevertheless, these implications should be understood as theoretical and interpretive possibilities rather than empirically validated instructional outcomes.

This study contributes to the development of ethnomathematics scholarship in Indonesia by demonstrating that classical Malay literature possesses substantial potential as a source of culturally grounded mathematics learning. In particular, the study expands existing ethnomathematical research beyond tangible cultural artifacts toward literary and linguistic traditions as forms of indigenous mathematical reasoning. However, several limitations should be acknowledged. First, the analysis focused exclusively on Articles 5 and 6 of Gurindam 12, thereby limiting the scope of interpretation across the broader text. Second, the study remained theoretical and interpretive in nature without empirical classroom implementation or experimental validation. Consequently, further research is needed to explore ethnomathematical dimensions within other classical Nusantara literary traditions, develop instructional modules based on literary ethnomathematics, conduct empirical studies examining pedagogical effectiveness, and design teacher professional development frameworks that support the integration of literary and cultural contexts into mathematics education.

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Conflicts of Interest

The authors declare that no conflict of interest regarding the publication of this manuscript.

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