

Integrating Character Education Elementary Mathematics: A Systematic Review of Values, Pedagogical Strategies and Moral Outcomes

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Abstract: While character education is widely promoted in elementary curricula, mathematics remains largely conceptualized as a value-neutral domain. Existing studies tend to focus on instructional tools rather than explaining how moral values are formed through mathematical learning processes. This conceptual systematic review synthesizes empirical studies indexed in Scopus and SINTA (2010–2025) to examine the underlying mechanisms through which character education is integrated into elementary mathematics. Using a PRISMA-guided selection and theory-informed synthesis, nine high-quality studies were analyzed. The review identifies recurring patterns of value representation, engagement, reflection, and internalization across narrative, cultural, and contextual pedagogies. Based on this synthesis, the study proposes the Mathematics–Character Integration Mechanism (MCIM) as a conceptual framework explaining how mathematics functions as a moral learning domain. This framework contributes to theoretical advancement by shifting the discourse from instructional techniques to mechanism-based character formation, with implications for curriculum design, teacher education, and future empirical research.

Keywords: Character Education; Mathematics Instruction; Elementary Education; Moral Development; Values Integration.

Abstrak: Meskipun pendidikan karakter banyak dipromosikan dalam kurikulum sekolah dasar, matematika masih umumnya dipandang sebagai bidang yang netral nilai. Studi-studi yang ada cenderung berfokus pada alat bantu pembelajaran daripada menjelaskan bagaimana nilai-nilai moral terbentuk melalui proses pembelajaran matematika. Tinjauan sistematis konseptual ini mensintesis studi-studi empiris yang terindeks di Scopus dan SINTA (2010–2025) untuk mengeksplorasi mekanisme mendasar di mana pendidikan karakter diintegrasikan ke dalam matematika dasar. Dengan menggunakan seleksi yang dipandu PRISMA dan sintesis yang didasarkan pada teori, sembilan studi berkualitas tinggi dianalisis. Tinjauan ini mengidentifikasi pola berulang dalam representasi nilai, keterlibatan, refleksi, dan internalisasi di berbagai pendekatan pedagogis naratif, budaya, dan kontekstual. Berdasarkan sintesis ini, studi ini mengusulkan Kerangka Kerja Integrasi Matematika-

Karakter (MCIM) sebagai kerangka konseptual yang menjelaskan bagaimana matematika berfungsi sebagai domain pembelajaran moral. Kerangka kerja ini berkontribusi pada kemajuan teoretis dengan memindahkan diskursus dari teknik instruksional ke pembentukan karakter berbasis mekanisme, dengan implikasi untuk desain kurikulum, pendidikan guru, dan penelitian empiris di masa depan.

Kata kunci: Pendidikan Karakter; Pengajaran Matematika; Pendidikan Dasar; Perkembangan Moral; Integrasi Nilai.

Introduction

Character education is increasingly recognized as a vital component of elementary education, fostering the development of moral and ethical values alongside academic skills. This approach, widely advocated in global education systems, plays a crucial role in developing students' emotional intelligence, interpersonal skills, and social responsibility. Character education is fundamental in shaping the behavior of children in their formative years, as it provides the ethical foundation upon which their future decisions are made. The need to foster character development within school curricula has gained significant traction, particularly in response to societal concerns about moral decline amid rapid technological advancements and globalization. As such, many educational systems, including Indonesia's, have incorporated character education into their national curricula to address these challenges and better prepare students for both academic success and responsible citizenship (Ciampa & Wolfe, 2021).

In Indonesia, the 2013 curriculum reform emphasizes character education as a pivotal aspect of teaching, ensuring that students receive a well-rounded education that not only enhances cognitive abilities but also nurtures values such as integrity, respect, and responsibility. The national curriculum framework, guided by the Pancasila Student Profile, integrates these values across all subjects, ensuring that students engage with both academic content and ethical instruction. By integrating character education into core academic subjects, Indonesia aims to produce well-rounded individuals who can make positive contributions to society. The inclusion of local cultural elements, such as wayang kancil, further personalizes the educational experience, making it more relatable and impactful for students (Prasetyo, 2020). Recent studies support this holistic approach, indicating that integrating moral and academic education fosters the development of students' cognitive and social skills, promoting well-rounded growth and preparing them for future challenges (Prawiyogi et al., 2025).

Despite these developments, the incorporation of character education in subjects like mathematics remains underexplored. Traditionally, mathematics is perceived as a value-neutral discipline, focusing primarily on logic, computation, and problem-solving skills. This perception creates a disconnect between mathematics and the broader goals of character development. Research indicates that such a disconnect can hinder students' moral growth, as well as their academic and social skills. Studies have shown that embedding character values within subjects like mathematics can enhance students' engagement, promote ethical decision-making, and foster skills like collaboration and responsibility (Asrial et al., 2024; Kim et al., 2019). Without addressing the character-building potential of mathematics, students may fail to connect the subject to their broader personal and ethical development, limiting the subject's full educational impact.

The central research question of this study is how mathematics education, a traditionally neutral academic subject, can be utilized as a tool for strengthening character in elementary school students. Addressing this question involves

examining how mathematics instruction can be restructured to integrate character education in alignment with national curricula. While character education is explicitly incorporated into subjects like religious studies and civic education, its application in mathematics is seldom considered. The core issue is the widely held belief that subjects like mathematics do not involve moral or ethical decision-making, which contributes to a lack of intentional character-building within these disciplines (Ciampa & Wolfe, 2021). This study challenges the prevailing view by exploring strategies to integrate character development into mathematics education, offering a potential solution to bridge the gap between cognitive learning and moral development in schools.

Several studies highlight the importance of incorporating affective learning into core subjects, particularly in the context of mathematics. By adopting a framework that integrates moral reasoning, such as the Pancasila Student Profile, mathematics can be transformed from a purely academic subject to one that contributes to the holistic development of students (Sutrisno et al., 2023). The integration of character education within mathematics can be achieved through strategies such as collaborative problem-solving, where students are encouraged to work together, communicate effectively, and take responsibility for their collective success (Kim et al., 2019). Other methods, including the use of moral dilemmas in problem-solving scenarios and the incorporation of cultural values, can help to contextualize mathematical learning within real-world ethical frameworks (Asrial et al., 2024). These approaches not only enhance students' mathematical skills but also instill essential character traits, such as integrity, perseverance, and empathy, crucial for their personal and academic success.

The literature on integrating character education into mathematics education suggests that it is not only feasible but also beneficial for fostering well-rounded students. However, a significant gap remains in the application of these strategies in elementary schools, where character education is often relegated to specific subjects. This research seeks to address this gap by exploring the potential for mathematics to serve as a vehicle for character development. By investigating how educators can embed ethical reasoning and character-building activities into mathematics lessons, this study contributes to the growing body of literature advocating an integrated approach to character education across all academic disciplines.

This study aims to investigate the integration of character education into elementary mathematics, focusing on values, pedagogical strategies, and the moral outcomes that result from this integration. It seeks to identify and propose effective pedagogical strategies that enable teachers to integrate character-building elements into their mathematics curricula. By reframing mathematics as a discipline that fosters ethical reflection and social responsibility, this research makes a novel contribution to the discourse on character education. The findings are expected to inform both educational practice and policy development, particularly in strengthening character-based learning in primary education.

Method

1. Research Design

This study employed a conceptual systematic literature review (SLR) to examine how character education is integrated into elementary mathematics and to identify the underlying mechanisms through which moral values are formed in mathematical learning contexts. Unlike descriptive reviews that primarily summarize study outcomes, this review adopts a theory-informed synthesis approach, aiming to generate conceptual insights and explanatory mechanisms across empirical studies.

This design allows the review to move beyond instructional techniques and focus on *how* mathematics functions as a moral learning domain. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, rigor, and replicability in the selection and synthesis of studies.

2. Data Sources and Search Strategy

The literature search was conducted using two primary databases: Scopus (Elsevier) and Google Scholar, selected to capture high-quality international and nationally indexed publications relevant to mathematics education and character education. The search strategy combined three thematic domains using Boolean operators:

- a. Character education domain: (“character education” OR “character development” OR “character building” OR “moral education” OR “value education”)
- b. Mathematics education domain: (“mathematics education” OR “mathematics learning” OR “mathematics instruction” OR “mathematics curriculum”)
- c. Educational level domain: (“elementary school” OR “primary school” OR “elementary students”)

These terms were combined using the AND operator to ensure relevance across all three domains. The search covered publications from 2010 to 2025, reflecting recent developments in curriculum reform and character education research.

3. Inclusion and Exclusion Criteria

Data were collected manually based on article type, year of publication, topic, title, and research results that discuss character building through learning or mathematics. Samples were found in 173 articles using the entered keywords. Then, the articles were screened based on title, abstract, and keywords, resulting in 62 relevant articles and 111 that were deemed inappropriate. Furthermore, it was manually reviewed for compliance with the inclusion criteria (IC) and exclusion criteria (EC) that guide the preparation of this systematic literature review, which is described in Table 1.

Table 1. Inclusion and exclusion criteria

No	Inclusion criteria	Exclusion criteria
1	Studies must explicitly focus on integrating character education into mathematics instruction	Studies that are not relevant to character education or mathematics
2	Studies published within the last 5-10 years (publication years limited to 2010-2025)	Unpublished studies in the period 2010-2025
3	The context of elementary school students	Studies that do not focus on primary education or primary school students
4	Articles published in Scopus journals (Q1, Q2, Q3, and Q4) and Sinta 1	Articles not published in indexed journals (Scopus and SINTA 1)

4. Study Selection Process

The initial database search yielded 173 articles. The selection process was conducted in several stages:

- a. Title, abstract, and keyword screening resulted in 62 potentially relevant articles.

- b. Full-text screening was conducted to assess alignment with the inclusion criteria, resulting in the exclusion of 53 articles that did not meet subject relevance, educational context, or indexing standards.
- c. A final sample of nine high-quality studies was retained for in-depth analysis.

Among these studies, seven were indexed in Scopus and two in SINTA 1, providing a balanced representation of international and national scholarly perspectives. The selection process is summarized using a PRISMA flow diagram.

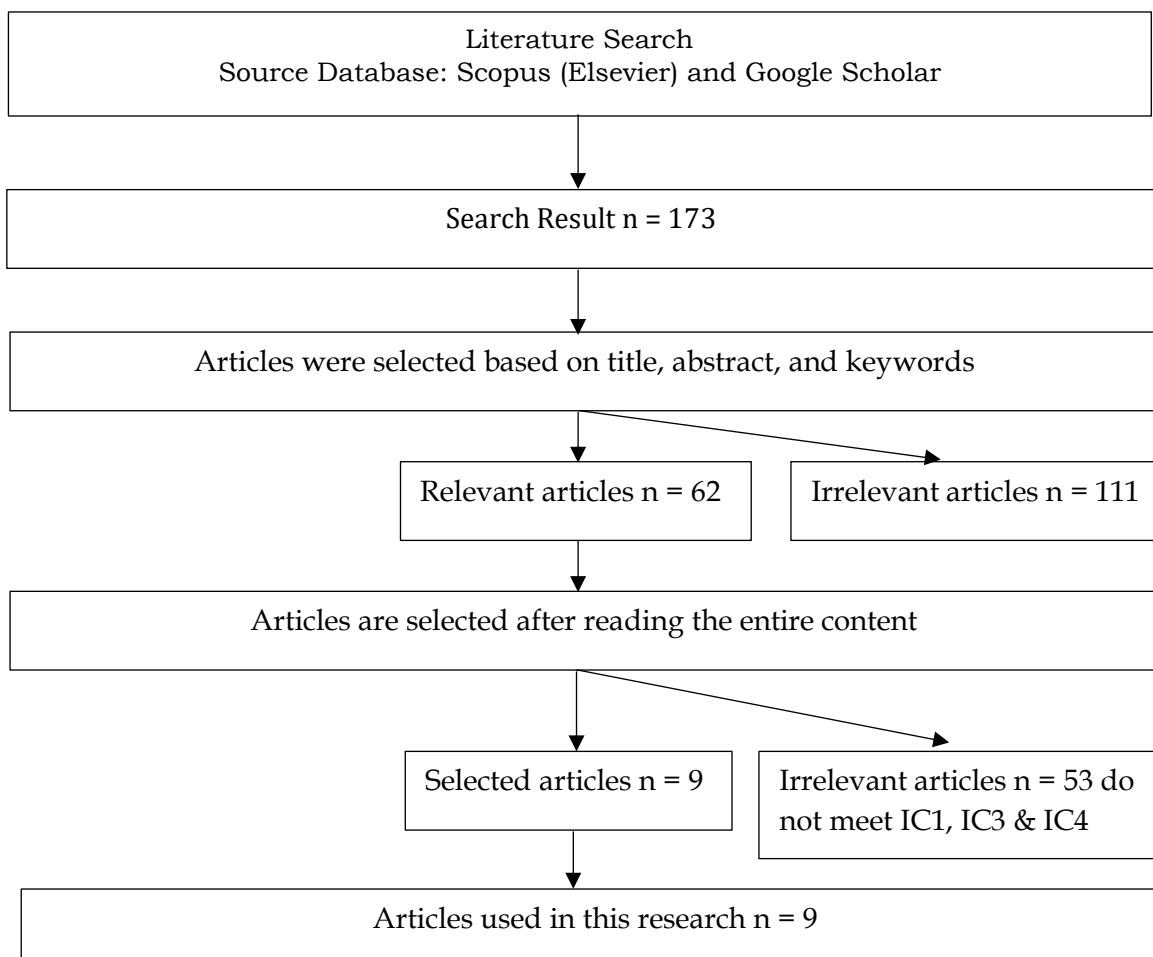


Figure 1. Stages in determining systematic literature review (Adoption of PRISMA)

Table 2. List and Synthesis of Articles

No	Author and Year	Indexing	Research focus	Key findings
1	Baek et al. (2022)	Scopus Q2	Developing a climate change program integrated with STEAM and character education.	Students significantly improved in character and STEAM competencies, especially morality, emotion, and convergence.
2	Agusdianita et al. (2021)	Scopus Q4	Exploring elementary geometry concepts based on the Bengkulu Tabot culture to enhance student understanding and character development.	Tabot culture helps strengthen character traits such as logic, critical thinking, curiosity, and confidence while teaching geometry.

No	Author and Year	Indexing	Research focus	Key findings
3	Tarusu et al. (2022)	Scopus Q3	Investigating character development in elementary students through online mathematics learning during the pandemic.	Online learning during the pandemic helped instill character traits like honesty, discipline, and responsibility in students.
4	Lestari et al. (2021)	Scopus Q3	Using comics integrated with Pancasila values to teach mathematics and improve students' critical thinking and character.	Comics with Pancasila values effectively improved critical thinking and character traits like discipline and hard work.
5	Purwoko et al. (2019)	Scopus Q4	Designing a mathematics learning model using Batik Nusantara to integrate cultural values and character education.	The Batik-based learning model produced positive responses from students and was effective in improving math learning outcomes.
6	Ahmadi et al. (2021)	Sinta 1	Developing a mathematics comic as a teaching material that integrates the moral value of discipline and hard work for elementary school students	The results indicate the effectiveness of mathematics comics in instilling Pancasila moral values in elementary mathematics teaching in Indonesia.
7	Suyitno et al. (2019)	Scopus Q2	The purpose of this research was to get input on how elementary school teachers in Japan integrate character values in learning, especially in math lessons.	The study identified that teachers integrated key character values such as nationalism, independence, cooperation, and integrity into mathematics lessons. The research also found that the integration of character education had a positive effect on students' social relationships and the overall school environment.
8	Putri et al. (2022)	Scopus Q1	The purpose of this study was to investigate teachers' perceptions of the integration of Islamic values into mathematics learning through comics.	The result of the study also showed that the mathematics comics in Islamic values were limited. Therefore, it is necessary to develop mathematics comics in Islamic values contexts.
9	Suzana et al. (2021)	Scopus Q3/ Sinta 1	The study's primary objective was to create teaching materials that incorporate local wisdom, particularly from the Acehnese culture, alongside the promotion of character values within mathematics learning.	the study concluded that integrating character education into mathematics learning, through the development of culturally relevant teaching materials, enhances both academic understanding and the cultivation of positive character traits.

5. Quality Appraisal

To ensure methodological rigor, all selected studies were evaluated using the Critical Appraisal Skills Programme (CASP) checklist. The appraisal focused on research

design clarity, methodological coherence, data credibility, and the validity of conclusions. Only studies demonstrating sufficient methodological quality and conceptual relevance were included in the final synthesis.

6. Data Extraction and Synthesis

Data were extracted manually from each selected study, focusing on:

- a. Research objectives and design
- b. Pedagogical strategies for character integration
- c. Types of character values emphasized
- d. Reported moral and educational outcomes

Rather than aggregating findings statistically, this review employed a conceptual synthesis approach, identifying recurring patterns and explanatory structures across studies. Through iterative comparison, four interrelated stages of character integration in mathematics learning emerged: value representation, value engagement, value reflection, and character internalization.

7. Methodological Contribution

By combining PRISMA-guided systematic procedures with theory-informed conceptual synthesis, this methodology strengthens the analytical depth of the review. It enables the study to contribute not only empirical insights but also a theoretical framework that advances understanding of character education within mathematics education. This approach aligns with contemporary standards for conceptual systematic reviews in high-impact educational research journals.

Result and Discussion

Results

The nine reviewed studies demonstrated that mathematics education can function as a character-building tool when moral values are explicitly integrated through learning media, cultural context, and pedagogical design. Four thematic clusters were identified:

1. Character development in mathematics learning,
2. Instructional approaches and media for value integration,
3. Teacher and student perceptions, and
4. The effectiveness of integrative approaches.

Overall, the study results suggest that mathematics is not merely a cognitive domain but can also serve as an arena for moral education when intentionally designed. However, its effectiveness depends heavily on the quality of the learning design and the teacher's capacity.

1. Character Development in Mathematics learning

All studies indicate that mathematics can foster character traits such as discipline, responsibility, perseverance, honesty, curiosity, cooperation, and what is referred to as 'moral awareness' (the recognition and consideration of ethical issues). In this context, character refers to the positive personal qualities that influence behavior, decision-making, and interactions. These findings suggest that mathematics, often regarded as a value-neutral discipline, can serve as a conduit for the internalization of moral values when these values are integrated into mathematical activities.

Several teaching approaches have been identified, such as the use of narrative media (comics) and ethnomathematics practices, which illustrate how these methods can influence character formation. For instance, [Ahmadi et al. \(2021\)](#) and [Lestari et al. \(2021\)](#) demonstrate that comics are effective in cultivating discipline and

responsibility, as the moral stories within the comics encourage character identification and development. Ethnomathematics practices ([Agusdianita et al., 2021](#); [Purwoko et al., 2019](#)) focus on enhancing curiosity, cultural identity, and self-confidence, thereby enriching mathematical learning with relevant cultural contexts.

Furthermore, collaborative approaches, such as those implemented in Japan ([Suyitno et al., 2020](#)) and in the STEAM-SSIBL program ([Baek et al., 2022](#)), demonstrate how group interactions strengthen social values, including cooperation, perseverance, and shared responsibility. Together, these observations enable a comparison of the different types of character that emerge from the approaches employed: narrative methods foster personal morality (individual ethics), while collaborative approaches cultivate social morality (ethics within groups). Cultural approaches build collective identity (a shared sense of responsibility within cultural groups).

Building on these comparisons, the findings address the research question: "How can mathematics education be used as a tool for strengthening character?" Mathematics becomes a tool for character development when mathematical activities are intentionally designed to encourage ethical behavior, not just cognitive abilities. Values are formed not from the mathematical content itself, but from how students experience it through stories, culture, collaboration, and meaningful moral contexts.

In summary, these findings underscore the importance of curriculum design that integrates character development into mathematics instruction. Character traits frequently emphasized in various educational contexts, such as responsibility, discipline, and honesty, develop both explicitly through curriculum design and implicitly through pedagogical interactions, classroom culture, and teaching tools.

2. Instructional Approaches and Media for Value Integration

The reviewed literature suggests that effective teaching media and pedagogical strategies are essential for integrating character education into mathematics instruction. Three main approaches have proven to be effective: (1) value-based educational media (comics), (2) culturally responsive pedagogy (ethnomathematics), and (3) contextual problem-solving activities. Each of these approaches contributes to the dual objective of developing both mathematical and moral skills in students.

The first practical approach is the use of value-based media, such as comics. Comics that incorporate Pancasila or Islamic values have proven highly effective in enhancing student motivation and internalizing moral values. [Ahmadi et al. \(2021\)](#) and [Putri et al. \(2022\)](#) demonstrate how comics can present mathematical problems through narrative scenarios that involve ethical decision-making, fostering both cognitive and affective connections among students. This media not only stimulates cognitive engagement but also serves as a moral stimulus, helping students internalize values such as discipline, honesty, and responsibility.

The second approach, ethnomathematics, plays a key role in linking mathematical concepts with students' local cultures, thereby increasing the relevance and meaning of learning. For example, [Agusdianita et al. \(2021\)](#) demonstrate that incorporating the Tabot culture into geometry teaching not only enriches mathematical understanding but also fosters students' curiosity, critical thinking, and self-confidence. Other cultural approaches, such as the Batik Nusantara-based learning model ([Purwoko et al., 2019](#)), demonstrate that culturally responsive teaching can enhance cultural appreciation, foster social responsibility, and promote character development in students.

The third approach is contextual learning, which integrates real-world issues into mathematics instruction. Contextual problem-solving activities related to social issues, such as climate change or community challenges, support students' moral development. [Baek et al. \(2022\)](#) found that contextual teaching strategies in STEAM programs help students develop empathy, ecological awareness, and collaborative skills as they confront the ethical consequences of the mathematical solutions they devise. Similarly, [Suyitno et al. \(2019\)](#) highlight the effectiveness of integrating real-life scenarios into mathematics lessons through community-based projects and group work.

Overall, the integration of character education into mathematics instruction is supported by a multimodal approach that combines narrative, cultural context, and real-world applications. Educational comics, ethnomathematics approaches, and contextual problem-solving tasks provide complementary avenues for embedding character values into mathematics lessons. With a thoughtful instructional design framework, these approaches create a rich learning environment that fosters both academic excellence and balanced character growth.

These findings also emphasize the importance of teaching media in enhancing both cognitive and character development in students. For instance, the Batik Nusantara-based learning model not only improves mathematics learning outcomes but also deepens students' appreciation for their cultural heritage and the associated character values. Media rooted in familiar socio-cultural contexts help bridge the gap between abstract mathematical content and students' lived experiences, confirming the pedagogical strength of visual and narrative strategies in character education.

3. Teacher and Student Perceptions on Character Integration

Teachers play a crucial role in integrating character education into mathematics instruction, particularly at the elementary level. Teachers' perceptions, values, and pedagogical strategies significantly influence how moral values are conveyed through academic content. As explained by [Putri et al. \(2022\)](#), teachers generally recognize their responsibility in shaping students' character, with many indicating that their religious and cultural beliefs influence their teaching practices. The alignment between these beliefs and pedagogical approaches supports the integration of character values in mathematics lessons as part of a holistic education framework. [Suyitno et al. \(2019\)](#) further demonstrate the decisive influence of teachers by showing how Japanese educators intentionally incorporate values such as discipline, honesty, and cooperation into their mathematics lessons. Their choices of culturally relevant strategies highlight teachers' autonomy and intention in constructing value-rich learning environments.

However, significant challenges remain. [Ahmadi et al. \(2021\)](#) highlight that teachers often struggle to balance the demands of the mathematics curriculum with efforts to integrate character education. Time constraints in delivering academic material limit opportunities for discussions on values. Furthermore, many teachers lack adequate training in character education methodologies, which reduces their confidence in implementing these strategies. These challenges highlight the need for enhanced institutional support and targeted professional development initiatives.

From students' perspectives, mathematics instruction integrated with values is generally received enthusiastically. [Ahmadi et al. \(2021\)](#) reported that students responded positively to mathematics comics that incorporate Pancasila values. The visually engaging and narrative-based format not only enhanced students' understanding of mathematical concepts but also encouraged reflection on values such as responsibility and honesty. Similarly, [Purwoko et al. \(2019\)](#) found that

students were highly interested and motivated when learning through the Batik Nusantara-based learning model. This culturally enriched instruction facilitated a deeper connection between academic content and the ethical learning objectives.

Students also actively reflected on the moral dimensions of their learning experiences. [Baek et al. \(2022\)](#) highlighted how contextual mathematics instruction, linked to social and scientific issues, encouraged students to engage with real-world problems, fostering a sense of moral responsibility and social awareness. This aligns with the findings of [Suyitno et al. \(2019\)](#), who observed that students exposed to character-integrated mathematics lessons exhibited increased awareness of ethical behavior, respect for others, and collaborative attitudes.

Overall, the integration of character education into elementary mathematics is significantly influenced by both teachers' perceptions and practices, as well as students' attitudes and reflections. While there is enthusiasm and recognition of its importance, practical barriers such as time constraints and insufficient teacher training remain. The consistent positive responses from students reaffirm the value of this integration, underscoring its potential to shape well-rounded, ethical learners through a subject traditionally considered neutral and purely cognitive.

4. Effectiveness and Outcomes of Value-Integrated Mathematics Instruction

Assessing the effectiveness of character education in mathematics instruction requires a comprehensive, multifaceted evaluation approach. Various instruments have been employed in studies to measure both cognitive and affective learning outcomes. For instance, [Baek et al. \(2022\)](#) employed two instruments to assess students' character development and STEAM competencies, utilizing a combination of both qualitative and quantitative methodologies. Their evaluation model includes student learning outcomes, field notes, and standardized tests, providing a deeper understanding of how students' academic and moral progress is achieved in an integrated curriculum.

Several studies have consistently demonstrated the impact of character education on student engagement and mathematics achievement. [Ahmadi et al. \(2021\)](#) demonstrated that integrating character values, such as discipline and hard work, into mathematics instruction through comic media not only improved students' academic performance but also enhanced their engagement and intrinsic motivation. Comics that embody Pancasila values created an interactive, morally rich learning environment that supported both content mastery and character development. Similarly, [Purwoko et al. \(2019\)](#) reported improvements in learning outcomes and student enthusiasm for mathematics when a Batik Nusantara-based model was applied. This contextualized learning approach increased students' sense of relevance to the material and the values being taught, enhancing their academic and ethical engagement.

While longitudinal research on the long-term impact of character-integrated mathematics instruction remains limited, early findings indicate enduring benefits. [Baek et al. \(2022\)](#) tracked changes in students' character and STEAM competencies over a program that integrated social issues and moral values into classroom activities. Their study reported significant improvements in emotional awareness, ethical thinking, and social responsibility, suggesting that sustained exposure to character education within academic instruction can foster long-term development.

The comparative analysis between traditional teaching models and those integrated with character education consistently demonstrates advantages for the latter. [Ahmadi et al. \(2021\)](#) found that students exposed to comic-based teaching with

Pancasila themes showed higher levels of engagement and character awareness compared to those taught using conventional methods. Similarly, [Purwoko et al. \(2019\)](#) observed that students participating in the Batik Nusantara learning model exhibited better academic outcomes and stronger moral sensitivity than their peers in traditional settings. These comparative results highlight the added value of integrating character education within the mathematics curriculum, particularly when culturally relevant or narrative-based teaching methods are employed.

Overall, current empirical evidence strongly supports the conclusion that integrating character education into elementary mathematics instruction enhances academic achievement and fosters moral and emotional development in students. The use of innovative assessment tools and contextually relevant pedagogical models further strengthens these findings. Although long-term studies remain limited, existing research suggests that this integrative approach offers a promising pathway for fostering holistic educational development, combining cognitive rigor with ethical and social learning.

Despite promising outcomes, several barriers hinder the widespread adoption of character-integrated mathematics instruction. One major challenge is the inconsistency in implementation practices across schools and regions, often exacerbated by a lack of training and support for teachers. [Ahmadi et al. \(2021\)](#) acknowledge that teachers face time constraints and curriculum pressures, which can reduce opportunities for value-based learning. Additionally, while educators may be committed to character education, they often lack formal training in pedagogical strategies for integrating values. These gaps highlight the need for more targeted professional development initiatives and more straightforward guidelines for incorporating character values into daily teaching practices.

Discussion

The findings of this study regarding the integration of character education into elementary mathematics instruction not only align with existing research but also extend our understanding of integrating moral education within academic subjects. Previous studies have shown that character education enhances student engagement, moral reasoning, and academic achievement across various disciplines, particularly in the social sciences and humanities ([Ciampa & Wolfe, 2021](#); [Kim et al., 2019](#); [KomalaSari & Saripudin, 2018](#); [Suyitno et al., 2019](#)). However, this study focuses on integrating character education into mathematics, a subject traditionally considered logic-based. It suggests that even subjects deemed morally neutral can support both academic and moral growth in students ([Suzana et al., 2021](#)).

The integration of character education in mathematics has a profound impact on students' academic success and moral development. As noted by [Putri et al. \(2022\)](#), incorporating ethical dilemmas and real-life situations into mathematics lessons not only increases student engagement but also deepens their understanding of mathematical concepts. By introducing scenarios that require students to consider fairness, responsibility, and other moral issues, mathematics education can evolve from merely teaching technical skills to becoming a medium for cultivating important character traits such as accountability, empathy, and perseverance. These traits, in turn, create a classroom environment that values collaboration, respect, and ethical decision-making ([Asrial et al., 2024](#); [Ciampa & Wolfe, 2021](#); [Suyitno et al., 2019](#)). This study emphasizes that such integration not only enriches students' mathematical abilities but also prepares them to become active, responsible citizens by cultivating social awareness and responsibility.

The literature suggests that elementary mathematics education provides a fertile ground for cultivating character traits. These traits are shaped by both intentional curriculum design and pedagogical interactions, as well as classroom culture. For instance, [Ahmadi et al. \(2021\)](#) show that the use of narrative-based learning tools, such as comics infused with Pancasila values, significantly enhances students' sense of responsibility and discipline. These comics serve not only as academic tools but also as moral compasses, helping students internalize ethical behavior through relevant, engaging stories. This finding is supported by [Suyitno et al. \(2019\)](#), who found in their study in Japan that value-based teaching strategies, particularly those focused on developing traits such as honesty, perseverance, and cooperation, can be systematically applied in mathematics lessons. This approach suggests that character development in mathematics can be a clearly defined pedagogical goal, rather than an incidental outcome.

Moreover, [Baek et al. \(2022\)](#) emphasize the importance of an interdisciplinary approach, integrating character education into STEM subjects (Science, Technology, Engineering, and Mathematics), including mathematics, resulting in significant improvements not only in students' academic skills but also in their emotional and moral competencies. Their research shows that participation in such integrated programs enhances students' ability to regulate their emotions, demonstrate empathy, and apply moral reasoning. These emotional and social competencies are crucial in preparing students to face both academic and personal challenges. This study underscores the psychological and social dimensions of learning, suggesting that integrating moral values and academic achievement should not be viewed as two separate entities but rather as complementary components of a comprehensive education.

The importance of culture in mathematics education also contributes to the development of students' character. Research by [Agusdianita et al. \(2021\)](#) demonstrates that utilizing local cultural contexts, such as the Tabot culture from Bengkulu, in teaching mathematical concepts, such as geometry, can enrich students' understanding of mathematical concepts while simultaneously fostering a sense of identity, personal responsibility, and a deeper appreciation for their cultural heritage. A similar approach was found by [Purwoko et al. \(2019\)](#), who showed the effectiveness of integrating Batik Nusantara principles into mathematics education. The incorporation of culture enhances students' connection to the subject matter while promoting values such as respect, creativity, and discipline.

The findings from these studies support the notion that character traits such as responsibility and discipline align well with mathematics, given the subject's structured, rule-based nature. As suggested by [Ahmadi et al. \(2021\)](#) and [Suyitno et al. \(2019\)](#), classrooms that actively emphasize these values show higher levels of student engagement, perseverance in problem-solving, and a greater sense of ownership over their learning process. These traits not only contribute to academic success but also to students' development as individuals who can apply these values across various aspects of their lives.

Furthermore, the use of educational media and pedagogical strategies that support character education in mathematics is further reinforced by valuable learning tools, such as comics. Comics infused with Pancasila values, as demonstrated by [Ahmadi et al. \(2021\)](#), have been shown to improve students' understanding of mathematics while promoting values such as honesty and responsibility. This is also supported by [Putri et al. \(2022\)](#), who noted that teachers perceive comics as a valuable tool for embedding Islamic values in mathematics instruction. The visual and contextual

representations offered by comics make learning more engaging and accessible, supporting the internalization of moral lessons alongside academic content.

Culturally responsive teaching, particularly through ethnomathematics, also emerges as a powerful tool for character education in mathematics. Ethnomathematics links mathematical concepts with students' cultural backgrounds, making them more meaningful and relevant. [Agusdianita et al. \(2021\)](#) explore how integrating the Bengkulu Tabot culture into mathematics lessons not only enhances conceptual understanding but also fosters character traits such as critical thinking, curiosity, and self-confidence. Similarly, [Purwoko et al. \(2019\)](#) demonstrate that the Batik Nusantara-based learning model in mathematics received positive responses from students, reinforcing cultural values and supporting both academic and moral development.

[Baek et al. \(2022\)](#) also highlight the effectiveness of contextual problem-solving activities in promoting character development. Their study reveals that integrating real-world issues, such as climate change, into mathematics education enhances students' moral reasoning, empathy, and collaborative skills. These findings align with the research by [Suyitno et al. \(2019\)](#), which describes how Japanese educators use real-life scenarios to teach mathematics. Through group work and community-based projects, students not only develop mathematical reasoning but also engage in moral decision-making, thus strongly supporting the objectives of holistic education.

Three main pedagogical approaches emerge from the literature: value-based media, ethnomathematics, and contextual learning. Each approach facilitates character development in different ways:

1. Value-based media (comics) facilitate moral identification by enabling students to connect with characters who model values such as responsibility and honesty.
2. Cultural approaches, such as Batik Nusantara and the Tabot tradition, strengthen character development by embedding moral values within students' social and cultural contexts, thereby enhancing personal responsibility and identity.
3. Contextual learning, through issues like climate change, encourages ethical reasoning as students explore the moral implications of their mathematical decisions.

This comparison demonstrates that while each approach focuses on different dimensions of character, individual, social, and collective, they all rely on the same process: 1) value representation, 2) value engagement, and 3) value reflection and 4) character internalization

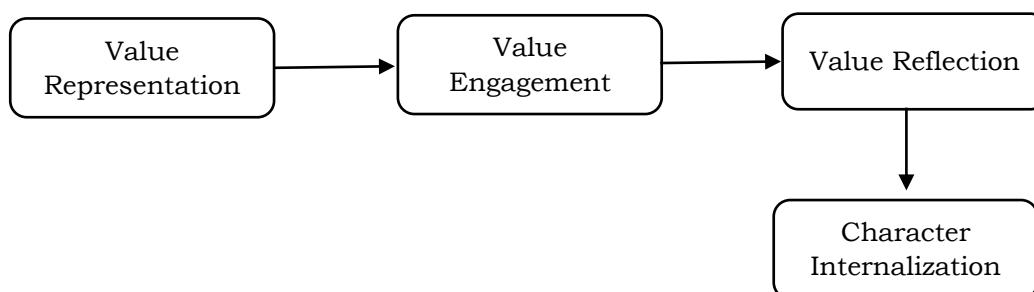


Figure 2. Mathematics-character Integration Mechanism (MCIM)

The conceptual model of the Mathematics–Character Integration Mechanism (MCIM) is illustrated in Figure 2, outlining the key stages:

1. Value Representation: Moral values are conveyed through various media, such as narrative, visual, cultural, and social, helping students identify and connect with specific values.
2. Value Engagement: Students engage in mathematical activities that require them to demonstrate moral behaviors, such as honesty in calculations, cooperation with others, perseverance in problem-solving, and taking responsibility for their actions.
3. Value Reflection: Through reflection, students evaluate their decisions and the ethical implications of their mathematical strategies or solutions.
4. Character Internalization: Through repeated experiences of value representation, engagement, and reflection, students internalize moral values, making them an integral part of their character.

These stages align with [Lickona \(2015\)](#) character education theory, which emphasizes three components: knowing the good, desiring the good, and doing the good. Value Representation corresponds to the recognition of moral values (knowing the good). At the same time, Value Engagement and Value Reflection are linked to desiring the good, where students engage both emotionally and intellectually with moral values ([Lickona, 2004](#)). Finally, Character Internalization involves doing good, with internalized values manifested in real-life actions.

In conclusion, integrating character education into elementary mathematics instruction is not only feasible but also essential for fostering well-rounded students with a strong moral foundation. Approaches such as narrative-based media, cultural relevance, and real-life contexts enrich both academic and moral development. Despite challenges such as time constraints and inadequate teacher training, evidence suggests that when effectively implemented, value-integrated mathematics education can lead to significant improvements in both cognitive and character development, preparing students to become not only competent mathematicians but also responsible and ethical citizens.

Conclusion

The study examines the integration of character education into elementary mathematics, investigating its potential to develop not only academic skills but also moral and ethical values in students. The findings highlight that mathematics, traditionally viewed as a neutral academic subject, can serve as a powerful tool for character development when explicitly designed to promote values such as discipline, responsibility, and cooperation. By incorporating values into mathematical instruction through approaches such as narrative-based media, ethnomathematics, and real-world problem-solving, students engage in both cognitive and moral development.

The research contributes to existing knowledge by demonstrating the feasibility and benefits of value-integrated mathematics education. It emphasizes the importance of culturally relevant teaching tools, such as comics, and contextual learning, which enhance both mathematical understanding and character traits. The study reveals that when teachers intentionally embed character education into mathematics lessons, students exhibit improved engagement, ethical behavior, and academic performance. The novelty of this study lies in its focus on mathematics, a subject often regarded as neutral in character development. It offers new insights into how mathematics can be harnessed as a medium for moral education. This approach

challenges the traditional divide between cognitive learning and moral development, advocating for a more holistic educational framework.

However, the study also identifies barriers to widespread implementation, including time constraints and a lack of teacher training in character education methodologies. The research suggests that future studies should focus on developing teacher-training programs and on creating more straightforward guidelines for integrating character education across subjects, including mathematics. Additionally, further research could explore the long-term effects of value-integrated mathematics education on students' character and academic achievements.

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