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Exploring the Implementation and Challenges of Character Education in Junior High School Mathematics: A Mixed-Methods Study in Indonesia

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Abstract

Character education is one of the government's flagship programs today. As part of national education, character education is expected to instil character values at all levels of education, including in mathematics, and examine how character values are applied in mathematics learning in schools from the perspective of teachers and students. Using a qualitative descriptive approach, data were collected through structured and unstructured questions asked to students at one of the selected SMA Negeri 1 Palembang. Participants consisted of 88 students, namely 58 females and 30 males, and 1 teacher who was interviewed in the data collection stage to provide views from the educator's perspective. Participants were selected purposively to ensure contextual relevance. The results of the study showed that attitude was the most dominant factor influencing students in mathematics learning, while other factors that also influenced were the role of teachers, student activity in learning, and student inactivity. To assess the effectiveness of character education in mathematics learning, this study used an exploratory learning-based approach with in-depth assessment and strengthened collaboration, so that teachers were better able to instil character values directly and indirectly.

Keywords: Character education, mathematics learning, character values, junior high school, student values.

Introduction

Character is the widely recognized as a foundational element in building a resilient and prosperous nation. It functions not only as an individual trait but as a collective force shaping national integrity and social cohesion. In this context, education plays a pivotal role in shaping individual character, as it directly contributes to the quality of human resources that drive national development (Mailizar et al., 2020). Given this strategic position, the integration of character education within the formal education system requires active involvement and awareness from teachers and policymakers, particularly in aligning learning objectives with value formation. As Angraini et al. (2023) emphasize, is no longer optional, it is an essential process that must take place holistically at school, at home, and within the broader community. It is important to note that character education is not limited to children and adolescents, but is equally relevant for adults, as one's understanding and internalization of core values have significant implications for life quality, social adaptability, and readiness to face complex future challenges.

In mathematics learning, character values do not merely emerge as a byproduct but can be intentionally cultivated through well-structured instructional design. Research by Damianti & Afriansyah (2022) indicates a correlation between students' mathematical abilities and their character traits, suggesting that students who excel in mathematics tend to demonstrate strong

character values, and vice versa. This finding supports the view that mathematics is not solely concerned with theoretical concepts or numerical computations but also serves as a strategic medium for instilling discipline, honesty, and persistence. However, many existing studies remain normative in nature, often emphasizing the theoretical potential of character integration without empirical investigation into how these values manifest in the classroom. Moreover, few studies have conducted comparative analyses of different character values within mathematics learning, particularly across diverse student demographics or learning environments. Even fewer have employed mixed perspectives from both students and teachers, which are essential for a more holistic understanding of character development in practice.

Learning activities are based on a curriculum that is dynamic and continues to develop according to the times, although character education has become part of the curriculum, its implementation in mathematics learning still faces various challenges. character education requires students to have religious, honest, tolerant, creative, disciplined, independent, hard work, responsible, high curiosity, democratic, national spirit, love for the country, respect for achievement, friendly, peace-loving, fond of reading, and care for the environment and social (La'ia & Harefa, 2021).

Until now, the implementation of character education still faces challenges. One of them is that teachers often focus more on academic achievement than building student character (Harefa & Sarumaha, 2020). In fact, teachers have a significant responsibility in shaping students into individuals with strong character. Teachers who can effectively guide students throughout the learning process positively influence the development of students' learning behaviour, which in turn contributes to achieving optimal learning outcomes. Conversely, without good guidance, students can become lazy to learn, lack discipline, are not independent, less creative, irresponsible, less communicative, and lose curiosity (Harefa & Telaumbanua, 2020). Therefore, careful planning of learning activities is essential for teachers to ensure the integration of character education into the learning process (Ikram & Rosidah, 2020).

Mathematics needs to be taught to students in order to develop their abilities to think logically, analytically, systematically, critically, and creatively, as well as to foster collaboration skills. To achieve this, continuous improvement is required in the strategies and methods used by teachers during the learning process. From a cognitive perspective, the construction of mathematical knowledge should be rooted in meaningful experiences for students as a foundation of mathematical thinking. Several studies have shown that learning activities involving manipulation using concrete or manipulative media, followed by graphical (visual) representation, and finally symbolic expression, are aligned with the stages of mathematical representation and enhance students' understanding. According to research Hatip & Setiawan (2021), the purpose of teaching mathematics is to foster values and enable students to master the structure of mathematical knowledge comprehensively. Mathematics teachers must actively create conditions in teaching, and guide students to discover and learn hands-on activities. Thinking and representation. From passive acquisition of knowledge to independent active discovery, so that students become the main object of learning mathematics.

Therefore, all parties must contribute to supporting mathematics learning that is able to develop character values. The main step in supporting this, it is necessary to analyse so far how the process and student attitudes on each type of character value in mathematics learning. Several previous studies have examined mathematics learning and its impact on student

attitudes and learning, but of the many studies that have been conducted, no one has examined the attitudes and processes of each character value while learning mathematics in students, especially junior high school students. Thus, this research is present to realize the existence of this phenomenon.

The role of teachers is crucial in shaping students' character. Teachers are expected to motivate students to be more disciplined, create opportunities that foster creativity through questioning, and encourage a sense of responsibility in completing assigned tasks. Moreover, teachers should instil the value of achievement by guiding students to complete their work independently, without relying on others. Building confidence in solving problems and expressing opinions is also an important part of character education (Purwitaningrum & Prahmana, 2021). This can be achieved by instilling strong character values early on.

Furthermore, effective character education requires teachers not only to act as instructors but also as role models who consistently demonstrate integrity, empathy, and resilience in the learning process (Khadijah et al., 2021). Teachers who build supportive and dialogic classroom environments are better able to foster values such as honesty, curiosity, and cooperation among students (Yolanda & Ain, 2023). According to Ariningsih and Amalia (2020), the strength of character education in mathematics lies in how well the teacher integrates ethical dimensions into instructional methods, materials, and classroom interactions.

Moreover, teacher awareness of developmental psychology is crucial in choosing appropriate scaffolding strategies that are aligned with students' moral and cognitive maturity. Vygotsky's concept of the Zone of Proximal Development (ZPD) provides a strong foundation for understanding how guided participation by teachers can gradually build independence and responsibility. Research by Aisyah (2024) also shows that exploration-based learning models, when led by teachers with strong character orientation, can stimulate creative and critical thinking skills in mathematical problem-solving.

Lastly, teacher collaboration with parents and the wider school community is essential in creating a consistent value system for students both in and out of the classroom. As highlighted by Emerentiana et al. (2020), such partnerships ensure that the values promoted in mathematics learning are reinforced at home and in daily life, contributing to the sustainable development of students' character

This research aims to examine the implementation process of character education in mathematics learning, as well as to identify the obstacles and challenges encountered in its application at the junior high school (SMP) level. In addition to describing the actual practices in classrooms, this study seeks to explore how character cultivation through mathematics has implications for the teacher's role as a facilitator in optimizing both cognitive and affective learning outcomes. Teachers are expected not only to deliver content but also to regulate student behaviour and attitudes, ensuring that character values such as honesty, discipline, creativity, and perseverance are properly internalized during the learning process.

This research is grounded in international education frameworks that increasingly call for the integration of character values into subject learning, including mathematics. The PISA 2021 Framework (OECD, 2021) emphasizes that numeracy skills must be developed alongside social and emotional competencies, as students are required to solve contextual problems with responsibility, fairness, and integrity highlighting the character dimension of mathematical thinking.

Similarly, the UNESCO Global Citizenship Education (GCED) and Education for Sustainable Development (ESD) frameworks position character education as an integral part of preparing learners to become responsible global citizens. These frameworks advocate for the embedding of values such as empathy, respect, and cooperation across all subjects, including STEM.

Moreover, the Realistic Mathematics Education (RME) approach developed by the Freudenthal Institute supports the use of real-world problem contexts to trigger not only mathematical reasoning but also character traits such as curiosity, honesty, and responsibility in problem-solving processes. Through RME-based tasks, students learn to justify their answers transparently and collaborate meaningfully.

In line with this, the 21st Century Skills Framework encourages the inclusion of soft skills and moral values including teamwork, ethical reasoning, and persistence as essential components of education, particularly in STEM disciplines. Mathematics, therefore, serves as a strategic medium not only to build students' logical competencies but also to shape their character through sustained, value-rich learning experiences.

By adopting these global and national perspectives, this study is expected to contribute to both theoretical understanding and practical solutions for enhancing the effectiveness and sustainability of character education in mathematics learning. It also provides recommendations for overcoming systemic and pedagogical barriers, thereby enabling mathematics teachers to better fulfil their dual role as instructors and character mentors.

Methods

This study employed a convergent mixed-methods approach, combining descriptive quantitative and qualitative methods to explore the implementation of character values in mathematics learning, as well as the obstacles encountered during the process. This approach allows for triangulation between numerical trends and in-depth perceptions from both students and teachers. The participants consisted of 88 Grade VII students and 3 mathematics teachers from a state junior high school in Palembang, Indonesia. The student sample was selected using purposive sampling based on academic ability (high, medium, low achievers) as recommended by classroom teachers. Although purposive, the sampling was stratified across student performance levels to enhance representativeness. Future studies may benefit from using power analysis or random stratification to improve generalizability.

Data in the study were collected through questionnaires and interviews with a research focus on nine character values, namely (1) discipline, (2) honesty, (3) hard work, (4) creativity, (5) curiosity, (6) independence, (7) conscientiousness, (8) democracy, and (9) responsibility. The questionnaire utilized a five-point Likert scale (Table 1) adapted from Miles and Hubermann (2014). Prior to implementation, the questionnaire was reviewed by two education experts and one character education specialist to establish content validity using Aiken's V formula, yielding a V index of 0.86 indicating strong agreement and acceptable validity. A pilot test with 30 students was conducted to assess reliability, resulting in a Cronbach's alpha of 0.82, which signifies high internal consistency.

Table 1
Rating Scale Miles and Hubermann (2014)

Categories	Score
Always	5
Often	4
Sometimes	3
Rarely	2
Never	1

A semi-structured interview was conducted with selected mathematics teachers to explore the perceived effectiveness, challenges, and strategies in integrating character values. The interviews were guided by a flexible protocol and carried out by one of the researchers. All interviews were transcribed verbatim for further analysis.

Data from the questionnaire were analysed quantitatively using descriptive statistics based on an interval scale as listed in Table 1. Furthermore, to determine the level of achievement of each student character value, categorization was carried out based on guidelines from Azwar (2012) which divided the score into five categories, namely very high, high, medium, low, and very low. The categorization results are then displayed in Table 2 to illustrate the average achievement of student character values in mathematics learning.

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Table 2
Categorization of Student Achieved Values (Azwar, 2012)

Criteria	Intervals
Very High	$x \geq \overline{X_t} + 1{,}5\ Sd_i$
High	$\overline{X_t} + 0{,}5\ Sd_i \leq x \leq \overline{X_t} + 1{,}5Sd_i$
Medium	$\overline{X_t} - 0{,}5\ Sd_i \leq x \leq \overline{X_t} + 0{,}5Sd_i$
Low	$\overline{X_t} - 1{,}5\ Sd_i \leq x \leq \overline{X_t} + 0{,}5Sd_i$
Very Low	$x \leq \overline{X_t} - 1{,}5Sd_i$

Results and Discussion

Student Character Values in Mathematics Learning Based on Student Questionnaire

Data on students' character values in mathematics learning obtained through questionnaires are presented in Table 3.

Table 3
Character Value in Mathematics Learning

Value	Statements	Percentage (%)					Avarage Category
		Always	Often	Sometimes	Rarely	Never	
Discipline	When I have math assignments, I always do them.	54.5	18.18	20.45	6.82	0	High $\bar{x} = 12.97$
	I always submit my assignments on time.	47.7	17.05	20.45	12.50	2.27	
	I never skip class during math class.	89.77	4.55	3.41	1.14	1.14	
Honesty	When given a math problem, I try to do it myself.	22.73	29.55	34.09	11.36	2.27	Medium $\bar{x} = 10.33$
	I ask the teacher if there is math material that I don't understand.	20.45	10.23	30.68	29.55	9.09	
	When there is a math test, I study beforehand so that I don't cheat.	36.36	25	20.45	15.91	2.27	
Hard work	I try to solve math problems even if they are difficult or take a long time.	35.23	34.09	19.32	9.09	2.27	Medium $\bar{x} = 10.7$
	I don't give up easily and keep trying when I encounter difficulties in understanding math material.	32.95	30.68	23.86	7.95	4.55	
	I take the time to study math regularly so that I can understand the concepts taught.	17,05	21,59	25	29,55	6,82	
Creativity	I like to try different strategies when doing math problems.	20,45	32,95	25	12,5	9,09	Medium $\bar{x} = 9,75$
	I can explain math answers in my own way, not just following examples from the teacher or book.	19,32	19,32	27,27	19,32	14,77	

	I usually find more than one way to solve math problems.	17,05	22,73	32,95	22,73	4,55	
Curiosity	I feel interested in learning more about new math concepts that my teacher has not taught me.	18,18	18,18	29,55	23,86	10,23	Medium $\bar{x} = 10{,}45$
	I often look for additional sources (books, internet, videos) to understand math materials.	30,68	29,55	26,14	12,5	1,14	
	I feel curious to know different ways of solving math problems.	29,55	35,23	17,05	14,77	3,41	
Independence	I always try to find my own solutions before asking for help.	27,27	39,77	18,18	11,36	3,41	Medium $\bar{x} = 10.41$
	I am able to complete math tasks without relying on the help of others	14,77	25	40,91	18,18	1,14	
	I can manage my time and responsibilities for learning math well without having to be reminded	18,18	28,41	27,27	17,05	9,09	
Conscientiousness	I always pay attention to every detail in doing math assignments to avoid mistakes.	40,91	21,59	25	10,23	2,27	High $\bar{x} = 10.98$
	I check my math work before submitting it to make sure there are no mistakes.	34,09	20,45	25	15,91	4,55	
	I try to understand well every instruction or information in a math problem before determining the solution steps.	28,41	30,68	20,45	13,64	6,82	
Democracy	I am open to criticism and suggestions from friends about how I solve math problems.	21,59	29,55	29,55	18,18	1,14	Medium $\bar{x} = 10.82$
	I do not feel superior or inferior to my friends in learning math.	30,68	25	14,77	13,64	15,91	
	I avoid belittling or laughing at my friends' incorrect answers to math problems.	26,14	23,86	17,05	21,59	11,36	

Responsibility	I always do my math assignments seriously even though the assignments are difficult.	44,32	22,73	20,45	10,23	2,27	Medium $\bar{x} = 10.82$
	I am always focused and never joke with friends when the teacher explains math material in class.	22,73	31,82	21,59	20,45	3,41	
	I do not hesitate to ask questions and always take responsibility for the opinions I express during math lessons.	19,32	31,82	22,73	20,45	5,68	

Based on the results of the student questionnaire presented in Table 3, the character value of discipline appears most prominently, categorized as high. This is reflected in the percentage of students who consistently complete math assignments (54.55%) and never skip class during mathematics learning (89.77%). According to research by Costa-Mendes et al. (2021), discipline in mathematics learning contributes significantly to students' conceptual understanding and accuracy in solving problems. These disciplined behaviours are essential in shaping a positive learning attitude and enhancing academic achievement.

This finding is further supported by Nurlita et al. (2022) who emphasize the importance of accuracy and thoroughness in mathematics. The ability to pay close attention to details and re-check one's work is not only a manifestation of discipline but also a strategy to reduce errors and deepen conceptual comprehension.

On the other hand, several character values fall into the medium category, such as honesty and creativity. For instance, only 22.73% of students reported always attempting to solve problems independently without copying from peers. According to Darmayanti et al. (2022), highlight that academic dishonesty remains a challenge in mathematics, where students often prioritize obtaining correct answers over understanding the logical reasoning process. This underscores the importance of integrating learning approaches that foster integrity, such as character-based assessments.

Regarding hard work and independence 35.23% of students reported always trying to solve difficult problems, and 27.27% consistently sought their own solutions before seeking help. These behaviours align with Vygotsky's theory (1978) ZPD, which suggests that students benefit from challenges slightly above their current ability level, especially when supported through appropriate scaffolding. In this context Bosica et al. (2021) advocate for Problem-Based Learning (PBL) as an effective strategy to enhance student independence and perseverance in mathematics learning.

Table 4
Character Value in Mathematics Learning

Value	Statements	Percentage					Avarage Category
		Always	Often	Sometimes	Rarely	Never	

Discipline	Math teachers enter the class on time.	26,14%	30,68%	29,55%	11,36%	2,27%	High
	Math teachers reprimand students who violate class rules (such as eating in class, talking, disturbing friends, loitering, etc.) during math learning.	59,09	31,82%	6,82%	1,14%	1,14%	
	Math teachers check students' attendance during math learning.	63,64%	21,59%	11,36%	2,27%	1,14%	
Honesty	Math teachers warns/reprimands students who try to look at their friends' answers during the math test.	45,45%	40,91%	9,09%	3,41%	1,14%	Medium
	Math teachers invite students to reflect by giving opinions related to math learning.	22,73%	39,77%	29,55%	6,82%	1,14%	
	Math teachers prohibit students from bringing gadgets during math lessons and exams.	56,82%	26,14%	9,09%	5,68%	2,27%	
	Math teachers inform students of assessment results after math tests/exercises.	27,27%	22,73%	29,55	13,64%	6,82%	
Hard work	Math teachers make it a habit for all students to complete all math assignments given well within the allotted time.	48,86%	32,95%	12,5%	3,41%	2,27%	Medium
	Math teachers encourage students to study mathematics more actively.	57,95%	28,41%	11,36%	2,27%	0%	
	Math teachers provide opportunities for students to seek information, about	40,91%	28,41%	20,45%	5,68%	4,55%	

	math subject matter to friends, teachers or other parties.						
	Math teachers get students used to expressing their opinions during class discussions.	28,41%	35,23%	20,45%	10,23%	5,68%	
Creativity	Math teachers ask a variety of questions related to a mathematical subject to provoke students' ideas.	37,5%	34,09%	12,5%	14,77%	1,14%	Medium
	Math teachers provide tasks that challenge creative thinking.	31,82%	37,50	21,59	5,68%	3,41%	
	Math teachers apply a variety of different learning methods.	35,23%	39,77	18,18%	4,55%	2,27%	
	Math teachers use a variety of assessment tools, such as description/essay questions, multiple choice questions, oral exams.	23,86%	42,05%	22,73%	9,09%	2,27%	
Curiosity	Math teacher asks questions related to the math material.	46,59%	26,14%	19,32%	5,68%	2,27%	Medium
	Math teachers create a classroom atmosphere that invites curiosity.	22,73%	34,09%	25%	12,5%	5,68%	
	Math teachers invite students to seek information from various sources such as from different books, from youtube, from google.	32,95%	28,41%	22,73%	11,36%	4,55%	
	Math teachers familiarize students to do the exercise questions given.	48,86%	35,23%	6,82%	7,95%	1,14%	
Independence	Math teachers create a classroom	19,32%	39,77%	26,14%	12,5%	2,27%	Medium

	atmosphere that provides opportunities for students to work alone.						
	Math teachers ask students to work on their own individual assignments.	40,91%	32,95%	12,5%	12,5%	1,14%	
	Math teachers monitor students' independent work during tests/exercises.	40,91%	34,09%	17,05%	4,55%	3,41%	
	Math teachers appoint students to work on problems directly on the blackboard.	43,18%	28,41%	17,05%	9,09%	2,27%	
	Math teachers provide opportunities for students to ask teachers or friends about math materials.	39,77%	31,82%	21,59%	6,82%	0%	
Conscientiousness	When starting the lesson, the math teacher wrote the learning objectives/KDs and the title of the material to be learned.	32,95%	35,23%	13,64%	11,36%	6,82%	High
	Math teachers ask students to be careful and not rush in doing math problems.	47,73%	29,55%	18,18%	4,55%	0%	
	Math teachers ask students to check their answer sheets before collecting them.	48,86%	30,68%	13,64%	5,68%	1,14%	
	Math teachers knows the students' level of understanding of the material being taught, if the students do not understand, they are given motivation or questions related to the material	37,5%	31,82%	25%	5,68%	0%	
Democracy	Math teachers require students to work	46,59%	26,14%	12,5%	11,36%	3,41%	Medium

	together in groups without distinguishing ethnicity, race, class, religion and social status.						
	Math teachers give equal treatment to all students.	39,77%	26,14%	18,18%	11,36%	4,55%	
	Math teachers provide opportunities for students to express their opinions in math learning.	45,45%	23,86%	25%	5,68%	0%	
Responsibility	Math teachers get students used to taking responsibility for their opinions.	32,95%	40,91%	18,18%	3,41%	4,55%	Medium
	Math teachers give warnings if there are students who do not do math assignments.	46,59%	34,09%	11,36%	6,82%	1,14%	
Average		40,16%	31,62%	17,99%	7,73%	2,50%	

From Table 4, it can be seen that mathematics teachers have implemented various educational principles quite well. The questionnaire results show that 40.16% of teachers always apply character values in mathematics learning, while the other 31.62% often apply them. Thus, about 71.78% of teachers consistently apply the principles of character education such as honesty, democracy, discipline, conscientiousness, hard work, creativity, independence, curiosity, and responsibility in the learning process.

The application of character values in mathematics learning aligns with the findings Bosica et al's research (2021), who emphasize that the success of character education in mathematics is highly dependent on the teacher's consistency in integrating these values into everyday instructional practices. The teacher's role significantly shapes students' processes and attitudes toward various character values developed through mathematics learning. Ariningsih and Amalia (2020) revealed that mathematics has three main strengths in shaping student character, namely: (a) the strength of the material or concepts taught, (b) the strength of the learning methods applied by the teacher, and (c) the strength of the character of the mathematics teacher himself. This is also supported by Yolanda & Ain (2023), which found that the teacher's attitude in teaching mathematics has a significant effect on learning motivation and the development of student character values.

In terms of the strongest aspects, the values of discipline, hard work and honesty occupy a high percentage in the "always" and "often" categories. Discipline, for example, is a key element in learning mathematics because it requires regularity in understanding concepts and following problem-solving procedures (Costa-Mendes et al., 2021). The discipline instilled by

teachers applies not only in classroom management but also in encouraging students to complete tasks on time, follow the steps of solving correctly, and pay attention to details in calculations. In addition, the value of hard work also receives major attention in mathematics learning. According to research by Badawi et al. (2023), hard work plays an important role in helping students develop academic resilience in facing mathematical challenges. Students who are accustomed to working hard in solving problems will be better able to deal with complex problems and improve critical thinking skills.

To understand how character values are applied in mathematics learning, an in-depth interview was conducted with one of the mathematics teachers at the school. The teacher stated that conceptually, all nine national character values namely discipline, honesty, hard work, creativity, curiosity, independence, conscientiousness, democracy, and responsibility had been consciously integrated into the teaching and learning process. However, in practice, hard work emerged as the most prominent character trait observed during mathematics instruction. According to the teacher, students who consistently practice hard work tend to show better understanding of mathematical concepts, higher problem-solving abilities, and greater persistence when faced with complex or unfamiliar tasks.

The teacher emphasized that hard work functions as a foundation for other character values. Without a strong work ethic, students are less likely to develop perseverance, responsibility, or academic honesty. This observation aligns with studies, which found that students who demonstrate sustained effort in mathematics are more resilient in the face of failure and more capable of independent learning. The teacher also noted that students who lack the willingness to try often depend heavily on peers or online answers, which may hinder deep understanding and character growth.

Moreover, hard work in mathematics does not only relate to completing assignments or solving problems; it also involves mental endurance, a willingness to engage with abstract reasoning, and the humility to learn from mistakes. The teacher stated that instilling this attitude requires consistent reinforcement through feedback, encouragement, and meaningful tasks. By embedding hard work into everyday routines such as regular practice, goal setting, and reflective discussions students begin to internalize this value as part of their learning identity.

From a developmental perspective, the emphasis on hard work reflects the constructivist approach to character formation, where learners actively construct meaning through effortful engagement. This is in line with Piaget's view that students build understanding through assimilation and accommodation, and with Vygotsky's (1978) concept of the ZPD, where the teacher's role in scaffolding challenges is crucial in fostering independence and perseverance. The teacher also reported using peer tutoring and collaborative problem-solving to motivate students who tend to give up easily, indicating the importance of balancing individual effort with social interaction.

In conclusion, the interview highlights that while all character values are important, hard work emerges as the gateway value that enables students to access and develop other traits. As such, mathematics teachers play a strategic role not only in delivering content, but also in building students' moral resilience and academic integrity through consistent emphasis on effort, reflection, and responsibility.

Besides hard work, the value of independence is also one of the dominant characters in mathematics learning. This is in line with constructivism learning theory, where students build

their own understanding through experience and reflection, thus encouraging them to be more independent in learning (Piaget, 1972; Vygotsky, 1978). However, this does not mean that collaboration between students is ignored. Teachers still want to instill the awareness that each student must first try to solve the problem on their own. After students are able to solve the problems well, then collaboration is developed through peer tutors, where students who understand better help their friends who are having difficulty. This is reinforced by the research of Park and Kwon (2024),which states that the combination of independent learning and group cooperation in mathematics can improve students' problem solving skills and critical thinking ability. Thus, learning mathematics not only emphasizes independence, but also strengthens cooperation and mutual assistance between students in understanding the concepts taught.

Teachers in this study have also emphasized the importance of perseverance in solving problems and understanding concepts independently before discussing with peers, in accordance with the constructivism approach to learning (Piaget, 1952; Vygotsky, 1978). Honesty as an important aspect in mathematics also appears as one of the character values that are often applied in learning. Based on the results of research by Darmayanti et al. (2022), honesty in mathematics can be seen from students' habits in doing problems without cheating, reporting the results of their work honestly, and admitting mistakes in calculations or concepts that are understood. Teachers in this study have tried to instill honesty by providing opportunities for students to present their answers openly and discuss them with peers.

Based on the results of researcher interviews, the teacher stated that many students in mathematics learning lack awareness of the importance of character values, particularly curiosity and honesty. This lack of awareness stems from learning approaches that emphasize solving problems rather than exploring concepts in depth. As a result, students tend to focus on obtaining the final answer without fully understanding the underlying process. In addition, learning methods that do not stimulate active involvement make students unaccustomed to developing deeper understanding (Suzana et al., 2021). In the aspect of honesty, many students choose instant methods such as cheating or relying on technology without understanding the concepts taught. The academic pressure they feel exacerbates this condition, where students prioritize the end result over an honest and meaningful learning process (Mokotjo & Mokhele, 2021). This suggests that without an awareness of the value of honesty, they tend to prioritize efficiency in obtaining answers over conceptual understanding of the material.

The lack of reinforcement of curiosity and honesty has resulted in the weak value of hard work among students. They prefer shortcuts, such as simply memorizing formulas without understanding the underlying concepts, copying answers without trying to work it out themselves, or even giving up before trying. According to Mujahid (2021), this tendency arises because mathematics is often considered a difficult and boring subject, so students are reluctant to think deeper and look for solutions independently. In fact, hard work in mathematics is not just about solving problems, but also building courage in facing challenges, accepting the risk of mistakes, and continuing to try even if you don't immediately get the right answer.

To improve character values in mathematics learning, a comprehensive and sustainable strategy is needed. One approach that can be applied is PBL. According to Darmayanti et al. (2022), the use of PBL-based Learner Worksheets is proven to increase student independence and hard work. This method provides challenges that hone their critical thinking skills, so that students are more encouraged to find solutions independently and understand math concepts

better. In the research results Aisyah (2024) also stated that PBL provides an opportunity for students to bring up creative values in mathematics learning.

Another effective strategy is character-based assessment. (Khadijah et al., 2021) emphasized that character assessments that include aspects of hard work, honesty, and independence can improve students' understanding of mathematical concepts more deeply. With an assessment that emphasizes these values, students are not only assessed based on the final result, but also on the process they go through in solving mathematical problems. In line with Emerentiana et al. (2020), if teachers consistently apply assessments that emphasize character values in the learning process, students will be trained to get used to behaving well in various situations. This habit, in the long run, will foster positive character internally, so that students are not only cognitively capable, but also have integrity in action.

Conclusion

Based on the research findings, mathematics learning contributes significantly to the formation of student character, especially in the domains of discipline and conscientiousness, which emerged as the most dominant values. However, the relatively low emergence of creativity and honesty highlights areas that require further pedagogical attention. These findings indicate that character values in mathematics learning are not only influenced by instructional design but also by students' intrinsic motivation, learning habits, and teacher consistency in integrating values into daily practice.

From a theoretical perspective, this study enriches the discourse on character education in subject-specific contexts, especially in mathematics, which is often perceived as value-neutral. The findings support Vygotsky's concept of scaffolding and the ZPD, as well as Bruner's Spiral Curriculum, in which repeated contextual exposure helps reinforce character traits. Moreover, the research aligns with global frameworks such as UNESCO's GCED/ESD and the PISA 2021 framework, by demonstrating the intersection of cognitive skills and socio-emotional development in numeracy education.

Practically, this study emphasizes the importance of applying exploration-based learning models such as PBL and Project-Based Learning (PjBL) to foster students' independence, curiosity, and integrity in solving mathematical problems. In addition, character-based assessment systems which evaluate students not only on cognitive performance but also on values like honesty and responsibility can enhance learning outcomes more holistically. Strengthening collaboration between teachers and parents is also crucial to ensure consistency in character formation across school and home environments.

From a policy standpoint, the results suggest the need for educational stakeholders to institutionalize character integration within mathematics curriculum and teacher training programs. Structured teacher guidelines and support for value-oriented pedagogy can enhance character education implementation beyond declarative policy.

However, this study has several limitations. The research was conducted in a single junior high school in Palembang, which may limit the generalizability of the findings to other regions or school contexts. The use of self-reported questionnaires also raises the possibility of social desirability bias in students' and teachers' responses. Therefore, future studies are recommended to involve a larger and more diverse sample across different geographic regions,

integrate classroom observation, and explore longitudinal impacts of character-based learning strategies on academic and behavioural outcomes.

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