

A quantitative investigation of mathematical identity and its components in prospective mathematics teachers

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Abstract

Mathematical identity has become a significant focus in mathematics education research because it influences how individuals perceive themselves as learners and practitioners of mathematics. Theoretical perspectives, including socio-cultural and discourse-based views, suggest that mathematical identity is constructed through personal experience, community recognition, and participation in mathematical practices. However, empirical research on the mathematical identity of prospective mathematics teachers remains limited, particularly studies that quantitatively examine the multiple components of identity before students enter the teaching profession. Addressing this gap, the present descriptive quantitative study investigates the mathematical identity of prospective mathematics teachers. A total of 88 participants completed the questionnaire on mathematical identity, which consisted of 18 items covering interest, recognition, competence, performance, and beliefs about mathematics. The responses were analyzed using descriptive statistical methods, including frequency distributions, mean scores, and categorical classifications. The results showed that 70.45% of prospective mathematics teacher students had a high mathematical identity. Component-level analysis revealed that 78.41% had high interest in mathematics, 55.68% had medium levels of recognition, 48.86% showed high competence beliefs, 92.04% scored high in performance beliefs, and 97.73% held strong positive beliefs about the nature of mathematics. This study contributes to the literature by providing a detailed quantitative profile of mathematical identity among prospective mathematics teachers. The findings suggest that teacher education programs should intentionally design learning environments that provide more opportunities for constructive feedback. Future research should examine the factors that shape and influence the development of mathematical identity, particularly through longitudinal or mixed-method approaches that can capture changes over time and provide deeper explanatory insights.

Keywords: Mathematical Identity, Prospective Teachers, Prospective Mathematics Teachers, Descriptive Quantitative

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INTRODUCTION

Mathematical identity plays a crucial role in the professional development of prospective mathematics teachers, as it shapes how they perceive themselves as learners and future practitioners of mathematics. Drawing on perspectives from Sfard, who frames identity through participation and reification, and Wenger, who views identity as a form of participation in a community of practice, mathematical identity reflects the beliefs, experiences, and ways individuals position themselves in relation to mathematics. This identity has a strong influence on future teachers' instructional decisions and, consequently, their students' learning outcomes. Mathematical identity also includes how an individual mathematics learner sees themselves in relation to mathematics. A positive mathematical identity possessed by a prospective mathematics teacher-student is related to the identity of a mathematics teacher in the teaching and learning process, so prospective mathematics teachers need to realize effective teaching (Kurniawati et al., 2022). In addition, a prospective mathematics teacher's mathematical identity can articulate their beliefs about mathematics and its teaching, which can influence their pedagogical choices and interactions with their students (Mandt, 2021). A teacher who views mathematics as a static body of knowledge can hinder the development of a positive mathematical identity that students should ideally have (Pagiling & Taufik, 2022). On the other hand, a teacher who views mathematics as something positive will be able to apply innovative, reflective teaching methods and develop a cheerful disposition towards mathematics (Mumcu & Aktaş, 2019). A person's view of mathematics, mainly that of a prospective mathematics teacher-student, is essential because it will significantly impact their involvement in learning and teaching mathematics (Llagas, 2021). Therefore, the mathematical identity of prospective mathematics teacher students is a multifaceted construct that can significantly influence the effectiveness of their learning and teaching experiences when they become professional mathematics teachers.

Understanding the mathematical identity of prospective mathematics teachers is essential for several reasons. One of the main reasons is that the mathematical identity of prospective mathematics teachers will shape how mathematics teaching and learning practices are carried out. A mathematics educator who views themselves positively towards mathematics will be more likely to perform well in mathematics, feel confident

in their teaching abilities, and be able to foster a positive mathematical identity for their students, which will ultimately be more beneficial in the mathematics learning process (Bates et al., 2011; Kurniawati et al., 2023). Previous research has also shown that teachers with positive mathematical identities are more likely to adopt innovative teaching methods that encourage student interaction and engagement, thereby improving student understanding and vice versa (Bobis et al., 2015; Lutovac & Kaasila, 2013; Miele et al., 2022). Moreover, building confidence and developing personal interest in mathematics can also be supported through meaningful learning choices such as the use of digital learning platforms, which reflect students' internal beliefs and learning identity (Ababil & Septianawati, 2021; Mandt et al., 2022; Sulistyawati & Radite, 2024). Therefore, recognizing and understanding the mathematical identity of prospective mathematics teacher students is essential to prepare them to become professional prospective mathematics teachers who can create a positive learning environment for their students.

Despite its importance, understanding the mathematical identity of prospective mathematics teachers remains challenging. Mathematical identity is shaped not only by individual beliefs and past experiences but also by broader socio-cultural and discourse-based influences. From socio-cultural perspectives, identity develops through participation in mathematical communities, interactions with teachers and peers, and exposure to dominant narratives about what it means to be "good at mathematics." Discourse-based views further highlight how learners position themselves and are positioned by others through language, classroom norms, and institutional expectations. These intertwined factors can lead prospective teachers to develop either empowering or limiting identities. For instance, many learners internalize negative societal discourses that portray mathematics as difficult or exclusive, which can lead to feelings of incompetence or anxiety. Such experiences, particularly those involving repeated failure or discouraging classroom interactions, can persist into teacher preparation programs and shape how prospective teachers view their own mathematical capabilities. Failures experienced when learning mathematics in the past at school, for example, can cause complexity in a mathematics learner's perception, resulting in a decrease in confidence in their mathematical abilities (Gresham, 2017; Kurniawati, 2021). Less meaningful learning experiences conducted by teachers in the past also contributed to the formation

of the mathematical identity of mathematics learners, making it challenging for prospective teachers to develop a positive attitude towards mathematics (Pagiling & Taufik, 2022; Shodiqin et al., 2020). Similar findings regarding cognitive errors and conceptual misunderstandings during mathematical proofs have also been reported, indicating how mathematical identity is formed and sometimes disrupted in early academic stages (Akhyar & Khiyarusoleh, 2022; Yazidah & Sulistyowati, 2022). In short, although a positive mathematical identity is essential for prospective mathematics teacher students to possess, understanding the kind of mathematical identity prospective mathematics teachers have while they are still students is crucial for gaining insight to carry out follow-up actions that develop a positive mathematical identity.

Several mathematics education scholars have examined mathematical identity from various perspectives. Studies on in-service mathematics teachers have shown that mathematical identity continues to develop over time through sustained and meaningful learning experiences. Other research has highlighted that strengthening teachers' mathematical identities can be supported through participation in professional communities that promote deeper mathematical understanding and collaborative engagement (Coskun et al., 2023; Grootenboer, 2020; Kitchen et al., 2021). However, much of this work has focused on practicing teachers rather than those still in preparation programs. Empirical studies investigating the mathematical identity of prospective mathematics teachers—particularly using quantitative approaches—remain limited. Consequently, there is a need to understand better how mathematical identity manifests among prospective teachers before they enter the profession, providing insights that may inform teacher education programs. Therefore, this study aims to identify and understand the mathematical identity of student mathematics teachers. Understanding the mathematical identity of student mathematics teachers is essential for developing more effective professional teacher education programs that support the formation and development of prospective mathematics educators with positive mathematical identities.

METHODS

This descriptive quantitative study aims to examine the mathematical identity of prospective mathematics teachers. The population consisted of all mathematics education students at a state university in Ponorogo. The participants were selected

using a census sampling technique, in which all mathematics education students enrolled in the second and fourth semesters at the selected institution were invited to participate. Participation in the study was entirely voluntary, and students were informed that they could withdraw at any time without consequence. Prior to data collection, the researcher explained the study's purpose, procedures, and the confidential treatment of all responses. No identifying information was collected, and all data were analyzed anonymously to ensure the privacy and protection of participants. Data were collected using a mathematical identity questionnaire comprising 18 items measured on a Likert scale. The instrument was adapted from previously established frameworks (Cribbs et al., 2015; Solomon, 2009) and further refined based on components used by Kurniawati et al. (2023) and Kurniawati et al. (2022). It covers five components of mathematical identity: interest, recognition, competence, performance, and beliefs about the nature of mathematics. Prior to data collection, the questionnaire underwent expert validation and a pilot reliability test, yielding satisfactory internal consistency coefficients. In addition, the instrument meets the criteria for content validity, with a range of 0.79-1.00, and demonstrates construct validity. The overall reliability value is 0.91 (Kurniawati et al., 2022). Descriptive statistical analysis was employed to examine the data. The analysis included calculating means, categorical classifications, and percentage distributions for each component. The results were presented in tables and diagrams to support a clear interpretation of the findings.

The mathematical identity studied in this research combines several previous expert opinions, resulting in a self-portrait of a person related to mathematics. This identity encompasses a person's interests, abilities, perceptions, and beliefs about the nature of mathematics, as well as their personal characteristics. The mathematical identity components used in this study refer to previously used mathematical identity components (Kurniawati et al., 2023; Kurniawati et al., 2022). The mathematical identity components are modifications of the mathematical identity components that have been used previously by Cribbs et al. (2015), namely four components, and one component was added by Solomon (2009). The components of mathematical identity used in this study encompass five aspects: interest, recognition, competence, performance, and beliefs about the meaning or nature of mathematics (Kurniawati et al., 2023; Kurniawati et al., 2022).

Table 1. Components of Mathematical Identity

Components and Component Definitions	
Mathematical identity	Interest Interest is a person's desire, curiosity, and pleasure in learning and teaching mathematics.
	Recognition Recognition is a person's perception of others' views (parents, teachers/lecturers, friends) towards them and their own self-perception regarding mathematics.
	Competence Competence is a person's ability and belief about their ability to understand and persist in mathematics.
	Performance Performance is the result of a person's work and belief in their achievements or accomplishments in mathematics.
	Belief in the Nature of Mathematics Beliefs about the nature of mathematics encompass a person's understanding of the meaning and usefulness of mathematics in everyday life.

[Table 1](#) presents the components of mathematical identity along with their operational definitions. These components include interest, recognition, competence, performance, and beliefs about the nature of mathematics. Interest refers to students' desire, curiosity, and enjoyment in learning or engaging with mathematics. Recognition refers to students' perceptions of how others (such as teachers, parents, or peers) perceive their mathematical ability, as well as their own self-perception. Competence reflects students' perceived ability and confidence in understanding and persisting in mathematical tasks. Performance relates to students' mathematical achievements and their beliefs about those achievements. Finally, beliefs about the nature of mathematics encompass students' views on the meaning, structure, and applicability of mathematics in everyday life. As summarized in [Table 1](#), these five components collectively illustrate how students see themselves in relation to mathematics, both personally and socially. Understanding each component helps clarify how mathematical identity is constructed and how it may influence students' engagement, motivation, and learning outcomes.

RESULT AND DISCUSSION

Demographic Description of the Mathematical Identity of Prospective Mathematics Teacher Students

Respondent Characteristics Based on Gender

The study included 88 students as respondents. The characteristics of the

respondents, based on gender, were 81% female (71 students) and 19% male (17 students). The visualization of the percentage of respondents based on gender is presented in [Figure 1](#).

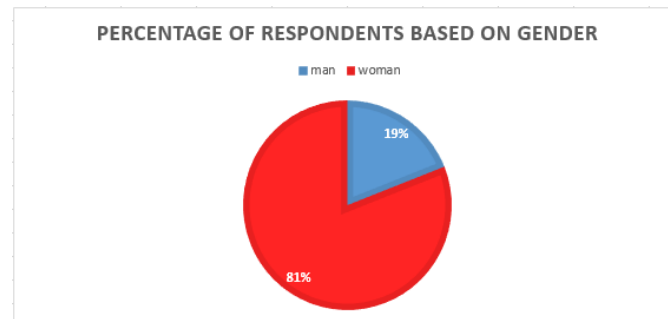


Figure 1. Percentage of Respondents Based on Gender

As shown in [Figure 1](#), the majority of respondents were female (81%), while only 19% were male. This gender distribution reflects a common trend in mathematics education programs in Indonesia, where female students tend to enroll in teacher education programs in higher proportions. Such a pattern is important to consider when interpreting the findings, as prior studies have shown that gender may influence aspects of mathematical identity, including confidence, recognition, and beliefs about mathematics.

Respondent Characteristics Based on Study Level

The study included 88 students as respondents. The characteristics of respondents, based on study level, were as follows: 49% were 2nd-semester students (43 students), and 51% were male (45 students). The visualization of the percentage of respondents based on study level is presented in [Figure 2](#).

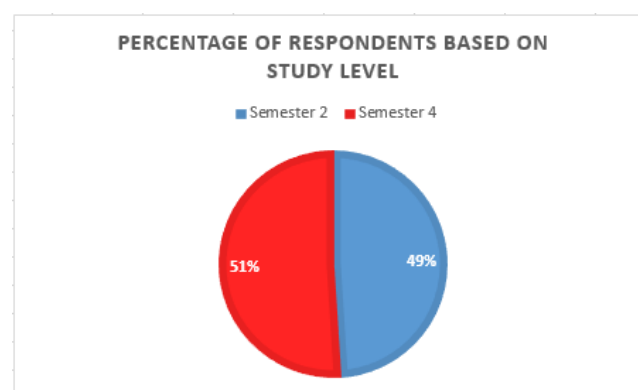


Figure 2. Percentage of Respondents Based on Study Level

As shown in [Figure 2](#), the distribution of respondents based on study level is

relatively balanced, with 49% in the second semester and 51% in the fourth semester. This balance allows for a meaningful comparison between early-and mid-program students. The pattern suggests that students at different stages of the program may have varying levels of exposure to mathematics education courses, teaching-related experiences, and academic expectations, which can influence the development of their mathematical identity.

Respondent Characteristics Based on Reasons for Choosing a Study Program

Respondent characteristics based on the reasons for choosing a study program are from 88 mathematics education students: 76% of students chose a mathematics education study program according to their wishes (67 students), and 24% of students chose a mathematics education study program because of other people's requests (21 students). Visualization of the percentage of respondents based on the reasons for selecting a study program is presented in [Figure 3](#).

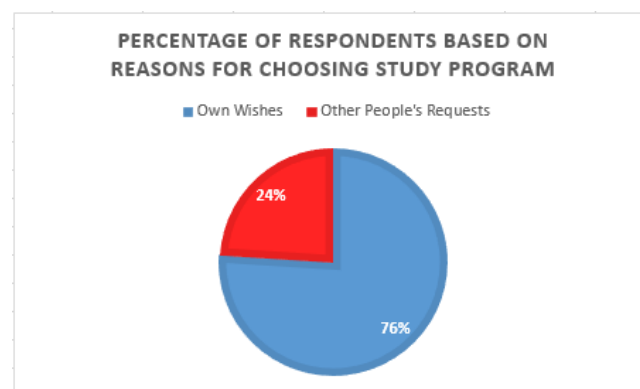


Figure 3. Percentage of Respondents Based on Reasons for Choosing the Study Program

Following the visualization of these percentages presented in Figure 3, the high proportion of students who selected the program based on their own interest suggests that many respondents entered mathematics education with intrinsic motivation. This may positively influence components of mathematical identity, such as interest and persistence. Conversely, students who chose the program due to external pressure may require additional academic and emotional support to develop a strong and positive mathematical identity.

Respondent Characteristics Based on School Origin

Respondent characteristics based on the reason for choosing the school of origin are from 88 students of mathematics education, 69% of students come from Madrasah

Aliyah (MA) (61 students), 25% of students come from Senior High Schools (SMA) (22 students), and 6% of students come from Vocational High Schools (SMK) (5 students). The visualization of the percentage of respondents based on their school of origin is presented in [Figure 4](#).

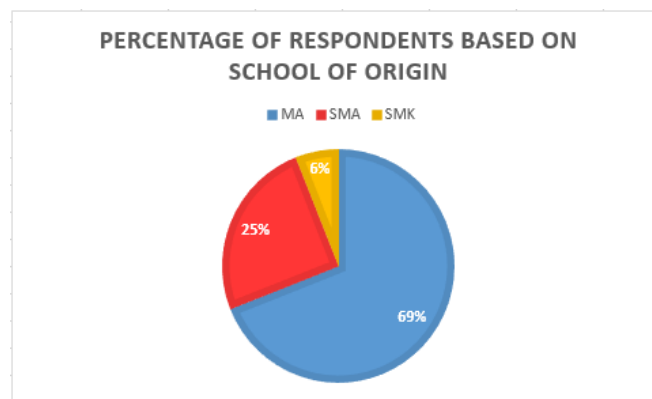


Figure 4. Percentage of Respondents Based on School of Origin

This distribution suggests that the majority of participants come from MA, which typically places stronger emphasis on mathematics and science in the curriculum. Such academic backgrounds may contribute to students' higher interest and confidence in mathematics, as reflected in their mathematical identity scores. Meanwhile, the smaller proportion of SMA and SMK graduates may experience differing levels of preparedness due to variations in curriculum focus, highlighting the importance of tailored support during the early stages of the teacher education program.

Respondent Characteristics Based on Job Aspirations

Respondent characteristics based on job aspirations are from 88 mathematics education students: 65% of students aspire to be mathematics teachers or educators (48 students), 22% aspire to be entrepreneurs in the field of mathematics education (19 students), 17% aspire to have jobs unrelated to mathematics (15 students), 3% aspire to be content creators of mathematics education (3 students), and 3% aspire to be developers of mathematics teaching media (3 students). Visualization of the percentage of respondents based on job aspirations is presented in [Figure 5](#).

As shown in [Figure 5](#), the data indicate that the majority of respondents still envision their future within the teaching profession, aligning with the primary goals of mathematics teacher education programs. However, the presence of alternative aspirations such as entrepreneurship, content creation, and media development reflects

a growing diversification of career interests among prospective teachers. This trend suggests the need for teacher education curricula to integrate broader professional skills, including digital literacy, instructional design, and educational entrepreneurship, to support students' varied career pathways better.

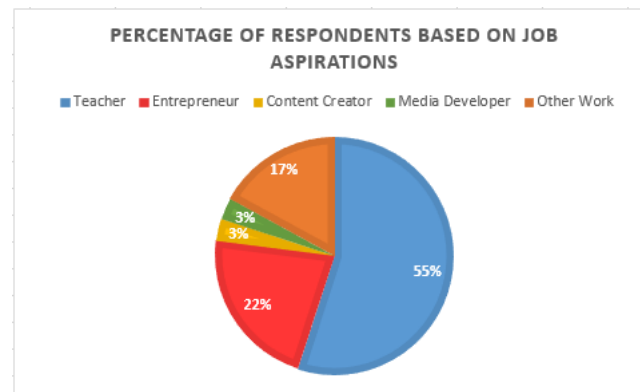


Figure 5. Percentage of Respondents Based on Job Aspirations

Instead of repeating the descriptive values shown in the figures, this discussion focuses on interpreting the demographic patterns and their potential influence on students' mathematical identity. Overall, the sample consisted predominantly of female students, which reflects the gender composition commonly found in mathematics education programs across Indonesia. This distribution is important because prior studies (Kurniawati et al, 2023; Santosa et al., 2025) consistently show that female prospective teachers tend to display higher affective engagement, such as interest and beliefs about the value of mathematics, while male students often report stronger confidence and perceived competence. The present study shows a similar pattern: female students demonstrated strong beliefs about the nature and usefulness of mathematics, whereas male students showed slightly higher levels of competence and performance. Sociocultural expectations may shape these differences; Indonesian academic culture often encourages female students to be diligent and compliant, yet modest in expressing confidence, which may contribute to lower recognition scores among them.

A comparison between study levels further strengthens this interpretation. Students in the fourth semester tended to show higher competence and performance than those in the second semester, reflecting their increased exposure to coursework and teaching-related experiences. However, the recognition component remained relatively low across both groups. This finding suggests that recognition is not primarily

determined by academic progress but by social interactions, peer dynamics, and lecturer feedback factors that may not change substantially between semesters. Previous studies (Santosa et al., 2020) similarly report that Indonesian students often rely heavily on external validation but also hesitate to claim recognition due to cultural norms that emphasize humility.

Another notable trend is the high level of belief in the nature of mathematics across respondents. This may stem from long-standing exposure to mathematics as a structured and rule-governed discipline throughout schooling. Beliefs tend to be more stable and less influenced by immediate classroom interactions, which explains why this component consistently appears highest relative to others. Studies also highlight that strong foundational beliefs are common among students who enter teacher education programs by choice, a pattern reflected here as most respondents selected the mathematics education program based on personal interest rather than external pressure (Justicia-Galiano et al, 2024; Lauren et al, 2023; Pikk et al, 2025).

The diversity of school backgrounds and career aspirations also provides insights into the formation of mathematical identity. Students from Madrasah Aliyah (MA) frequently exhibit strong discipline and perseverance attributes, which may contribute to higher belief and competence scores. Meanwhile, students who aspire to become teachers tend to show high recognition of the social importance of mathematics, but also experience anxiety regarding performance and validation, consistent with findings from Aprinastuti & Kovács (2022).

These demographic and psychological patterns have practical implications for teacher education programs. First, institutions should design learning environments that foster constructive feedback and recognition, especially for early-semester students and female students who may experience lower confidence despite strong motivation. Second, structured mentoring systems can support students transitioning from theory-focused coursework to practice-oriented experiences, helping to reduce gaps in competence between semesters. Third, curriculum developers should integrate reflective activities, peer collaboration, and culturally responsive pedagogies to help students articulate their mathematical thinking confidently. Finally, policies that strengthen career preparation. For example, seminars on professional identity and teaching practice simulations can help students align their aspirations with their developing mathematical

identity.

General Description of the Mathematical Identity of Prospective Mathematics Teacher Students

Before presenting the overall distribution of mathematical identity levels, it is important to summarize how the collected data were categorized into high, medium, and low levels based on predetermined scoring criteria. This categorization provides an overview of how strongly prospective mathematics teacher students perceive their interest, recognition, competence, performance, and beliefs about mathematics. The distribution of these categories is illustrated in [Figure 6](#).

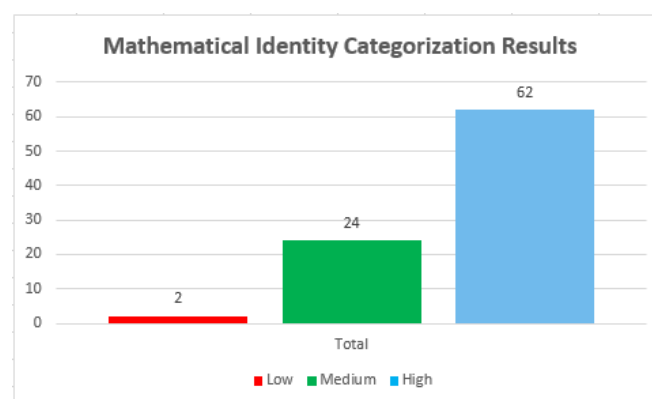


Figure 6. Categorization of Mathematical Identities

The results of the study show that, in general, as seen in [Figure 6](#), the mathematical identity of prospective mathematics teacher students is that 62 students are in the high category (70.45%), 24 mathematical identities of students are in the medium category (27.27%), and two mathematical identities of students are in the low category (0.02%).

Interest of Prospective Mathematics Teacher Students

Before examining the distribution of students' interest levels, it is important to highlight that the interest component reflects students' desire, curiosity, and pleasure in learning and teaching mathematics. Understanding this component helps reveal how strongly students are personally drawn to mathematics as future mathematics teachers. The categorization of interest levels is presented in [Figure 7](#).

In the interest component, [Figure 7](#) shows that there are 69 students in the high-interest category (78.41%), 18 students in the moderate-interest category (20.45%), and one student in the low-interest category (1.14%).

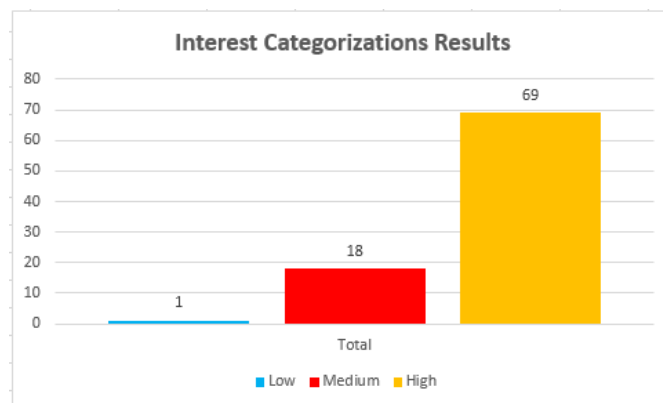


Figure 7. Categorization of Interest Components

Table 2. Distribution of Respondents' Answers on Interest Components

No	Question Items	Answer					Average
		STS	TS	N	S	SS	
1	I have a desire to learn mathematics	1	1	17	29	40	4.205
2	I want to teach mathematics to others	0	0	20	20	38	4.205
3	When studying mathematics, I want to know the material more deeply	1	1	17	34	35	4.148
4	I want to know how to teach math to others	1	1	13	23	50	4.364
5	I feel happy when I study mathematics	2	4	27	32	23	3.795
6	When I teach mathematics to others, I feel happy	0	0	16	31	41	4.284

[Table 2](#) and [Figure 8](#) show that of the six question items in the interest component, students' desire to know how to teach mathematics has the highest average score, namely 4.364. At the same time, the pleasure felt when learning mathematics has the lowest average score, namely 3.795.

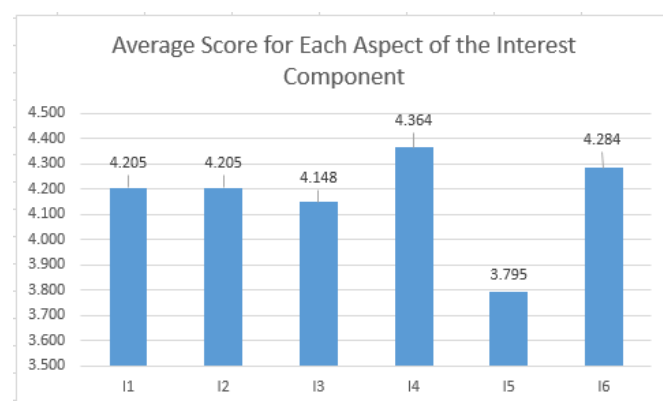


Figure 8. Average Score for Each Aspect of the Interest Component

Recognition of Prospective Mathematics Teacher Students

Before presenting the distribution of recognition levels, it is important to clarify

that the recognition component refers to how students perceive others' views of their mathematical abilities, as well as their own self-perception in relation to mathematics. This component provides insight into the social and relational aspects of students' mathematical identity. The categorization of recognition levels is presented in [Figure 9](#).

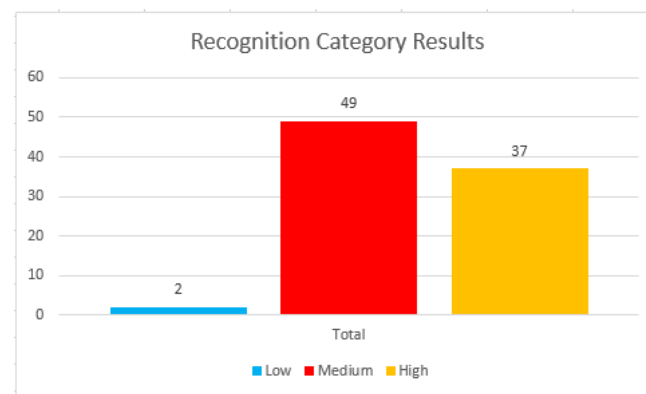


Figure 9. Categorization of Recognition Components

In the recognition component, [Figure 9](#) shows that there are 37 students in the high recognition category (42.45%), 49 students in the medium recognition category (55.68%), and two students in the low recognition category (2.27%).

Table 3. Distribution of Respondents' Answers on the Recognition Component

No	Question Items	Answer					Average
		STS	TS	N	S	SS	
1	I feel that my parents see that I have good mathematical abilities	1	1	27	37	22	3.886
2	I feel that the lecturer sees that I have good mathematical abilities	5	6	42	26	3	3.318
3	I feel that my friends see that I have good mathematical abilities	3	2	45	24	14	3.500
4	I see myself as having good abilities in mathematics	3	10	39	24	12	3.364

[Table 3](#) and [Figure 10](#) show that of the four question items contained in the recognition component, students' perception that their parents consider them to have good mathematics abilities has the highest average score, namely 3.886. In contrast, students' perception that lecturers see them as having good mathematics abilities has the lowest average score, namely 3.318.

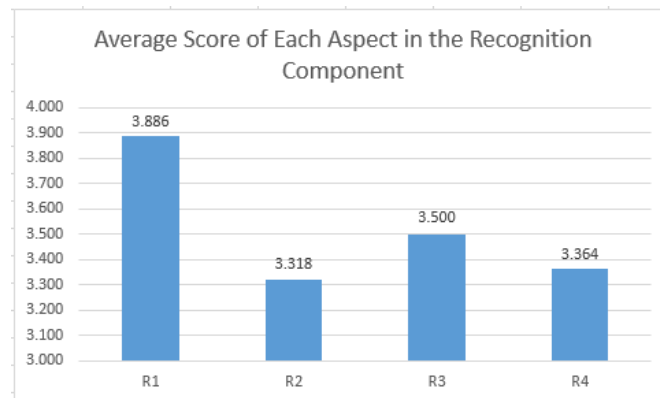


Figure 10. Average Score of Each Aspect in the Recognition Component

Competency Belief of Prospective Mathematics Teacher Students

Before presenting the distribution of competency beliefs, it is important to clarify that the competency belief component reflects students' perceptions of their beliefs about their ability to understand and persist in mathematics. This component provides insight into students' confidence in their mathematical capabilities. The categorization of competency belief levels is presented in [Figure 11](#).

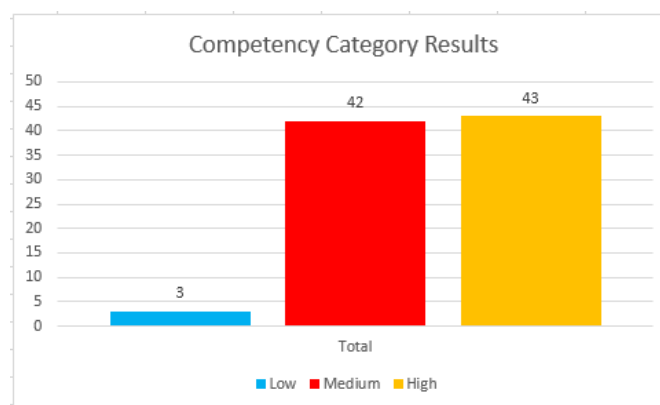


Figure 11. Categorization of Competency Component

In the competency belief component, [Figure 11](#) shows that there are 43 students with a high competency belief category (48.86%), 42 students with a moderate competency belief category (47.73%), and three students with a low competency belief category (3.41%).

Table 4. Distribution of Respondents' Answers on Competency Components

No	Question Items	Answer					Average
		STS	TS	N	S	SS	
1	I am confident that I understand the mathematics material given by the lecturer.	2	6	46	24	10	3.386
2	I believe I understand how to teach	1	8	40	29	10	3.443

	mathematics to others						
3	When I encounter problems, I keep trying hard to study mathematics	2	4	30	39	13	3.648
4	When teaching/explaining mathematical material, I try hard to teach/explain the material well, even though I encounter problems	1	2	31	37	17	3.761

[Table 4](#) and [Figure 12](#) show that of the four question items in the competency belief component, students' beliefs about their persistence in teaching/explaining the material well despite encountering problems had the highest average score, 3.761. In contrast, their belief that they understood the lecture's material had the lowest average score, namely 3.386.

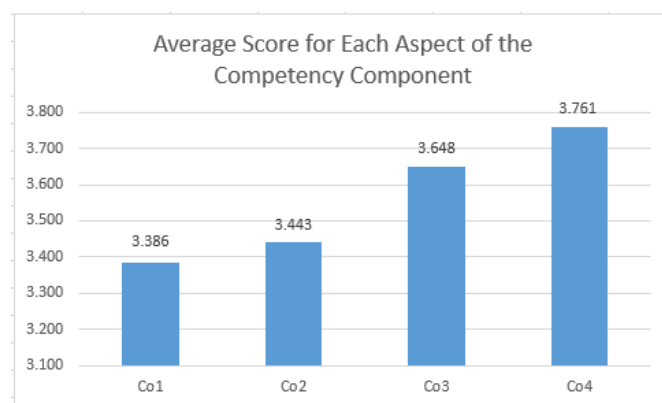


Figure 12. Average Score for Each Aspect of the Competency Component

Performance Beliefs of Prospective Mathematics Teacher Students

Before presenting the distribution of performance beliefs, it is essential to explain that the performance belief component reflects students' confidence in their actual achievements and accomplishments in mathematics. This component provides an overview of how students evaluate their own mathematical performance based on past learning experiences. The categorization of performance belief levels is displayed in [Figure 13](#).

In the performance belief component, [Figure 13](#) shows that there are 81 students in the high-performance belief category (92.04%), six students in the medium-performance belief category (6.82%), and one student in the low-performance belief category (1.14%).

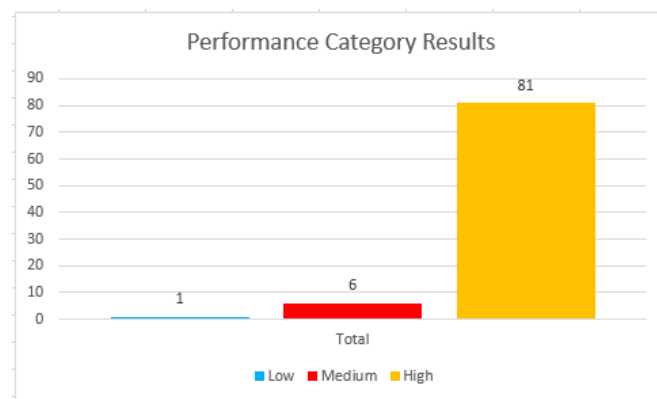


Figure 13. Categorization of Performance Components

Table 5. Distribution of Respondents' Answers on Performance Components

No	Question Items	Answer					Average
		STS	TS	N	S	SS	
1	I completed my math assignment well	2	3	32	40	11	3.625
2	My math work/grades are satisfactory	2	7	42	30	7	3.375

[Table 5](#) and [Figure 14](#) show that of the two question items contained in the performance belief component, students' belief that they completed their mathematics assignments well had the highest average score, namely 3.625. In contrast, the belief that their mathematics work/grades were satisfactory had the lowest average score, 3.375.

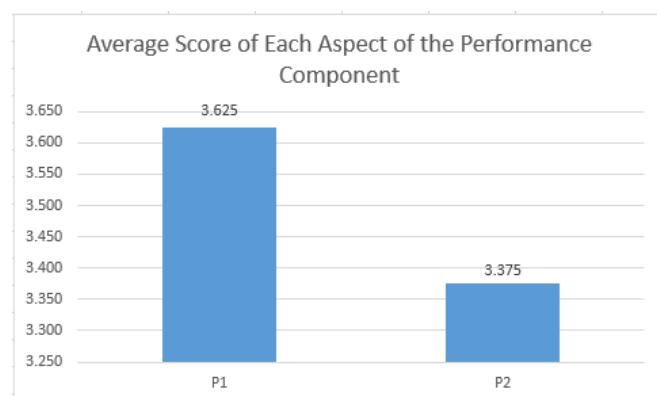


Figure 14. Average Score of Each Aspect of the Performance Component

Belief in Mathematics of Prospective Mathematics Teacher Students

Before describing the distribution of students' beliefs about the nature of mathematics, it is essential to clarify that this component reflects a person's beliefs about the meaning of mathematics and its usefulness in everyday life. The categorization of students' beliefs about the nature of mathematics is presented in [Figure 15](#).

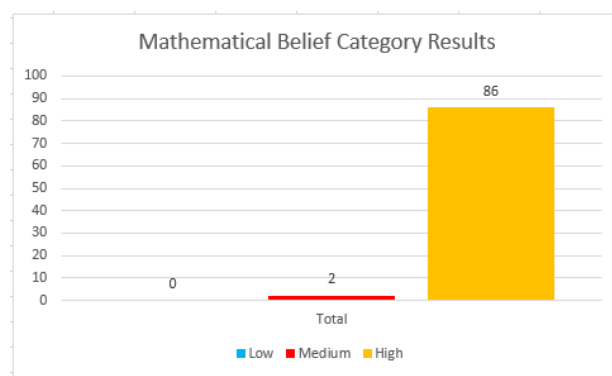


Figure 15. Categorization of Components of Belief in Mathematics

In the component of belief in mathematics, [Figure 15](#) shows that 86 students have a high category of belief in mathematics (97.73%), and two students have a moderate category of belief in mathematics (2.27%).

Table 6. Distribution of Respondents' Answers on the Component of Belief in Mathematics

No	Question Items	Answer					Average
		STS	TS	N	S	SS	
1	Mathematics is not just the science of numbers and calculations	0	2	13	22	51	4,386
2	Mathematics is used by humans in their lives	0	1	6	23	58	4,568

[Table 6](#) and [Figure 16](#) show that of the two question items in the component of beliefs about mathematics, students' beliefs that humans use mathematics in their lives have the highest average score, namely 4.568. In contrast, students' beliefs that mathematics is not only the science of numbers and calculations have the lowest average score, namely 4.386.

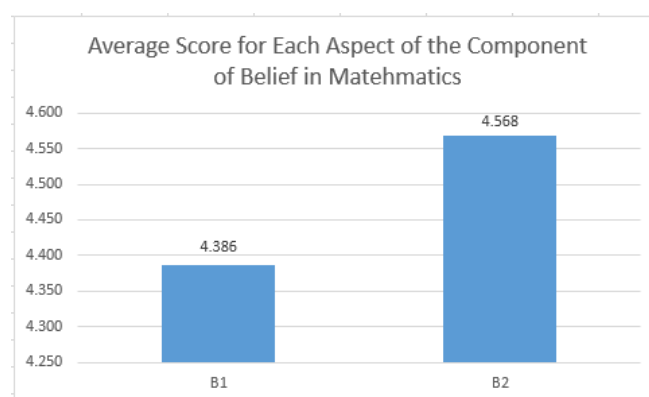


Figure 16. Average Score for Each Aspect of the Component of Belief in Mathematics

The study results showed that most prospective mathematics teacher students had a high category of mathematical identity. It means there is a match between the

mathematical identity of prospective mathematics teacher students and the profile of graduates of the mathematics education department. Specifically, one of the career paths for graduates of the mathematics education department is to become educators in the field of mathematics education or mathematics teachers. Ideally, a mathematics teacher should possess a positive mathematical identity (Handayani et al., 2022; Kurniawati & Noviani, 2022). Strengthening this identity early during teacher education can support the formation of teaching competence and confidence as future mathematics educators.

However, a closer examination of the components reveals variations across dimensions, particularly in the area of recognition, which was lower compared to interest, competence, and beliefs. This pattern suggests that while students may personally value mathematics and feel capable in their mathematical abilities, they may not consistently perceive affirmation or acknowledgment from others, such as lecturers, peers, or the broader academic community. From a socio-cultural perspective, recognition plays a central role in identity formation, as identity is co-constructed through interactions and the ways individuals are positioned within learning communities (Sfard, 2008; Wenger, 1998). Lower recognition scores may therefore indicate that institutional or cultural norms within the program provide limited opportunities for students to be publicly acknowledged as capable mathematics learners.

Several contextual factors may help explain this. In many Indonesian higher education settings, mathematics learning remains heavily assessment-driven, with limited emphasis on dialogic feedback or participatory classroom discourse. Such environments may inadvertently reduce opportunities for students to receive meaningful recognition. Furthermore, hierarchical lecturer–student relationships, common in the local academic culture, may restrict the kinds of interactions through which recognition is typically communicated. As a result, students may develop competence without necessarily feeling seen or validated in their mathematical efforts. These findings underscore the need for teacher education programs to cultivate recognition-rich environments intentionally. Identity development can be supported through coursework, mentoring, and collaborative learning experiences that encourage students to present their ideas, receive feedback, and participate more actively in mathematical discussions (De Backer et al., 2023; Holincheck & Galanti, 2025). Engagement in

professional or peer-learning communities has also been shown to strengthen both identity and pedagogical practice (Polizzi et al., 2021; Stoll et al., 2022).

The mathematical identity held by prospective mathematics teacher students is crucial to understanding how they adapt to new models and expectations in mathematics teaching. As revealed through content analysis of survey responses in previous studies, self-perception is an essential component of mathematical identity, influencing how they approach teaching and learning (Kurniawati et al., 2023; Kurniawati et al., 2023). The experiences of prospective teachers in various educational settings also contribute to the development of their identity. With a supportive academic environment for prospective mathematics teachers, their mathematical identity tends to develop more optimally.

The mathematical identity possessed by prospective mathematics teacher students needs to be continually developed over time. The development of the mathematical identity of prospective mathematics teachers can be facilitated, for example, through courses and guidance, with an emphasis on creating a conducive and supportive environment that encourages student participation in STEM education, particularly in mathematics (Dodsworth, 2019; Kang & Battey, 2017). Prospective mathematics teachers can enhance their mathematical identity and teaching practices through active involvement in a conducive environment or community, accompanied by collaboration within a mathematical community (Kitchen et al., 2021). Having a robust mathematical identity in prospective mathematics teacher students will positively impact teacher satisfaction and professional effectiveness in the future (Pujilestari et al., 2022; Yeigh et al., 2023). A strong mathematical identity not only enhances teacher preparation but is also associated with greater well-being and professional effectiveness in the long term (Yeigh et al., 2023; Zakariya & Wardat, 2024). Overall, the mathematical identity of prospective mathematics teachers should be understood as a dynamic, socially mediated construct shaped through personal experiences, academic culture, and participation in professional communities. Addressing weaker components, such as recognition, will be essential for developing well-rounded, confident future mathematics educators.

CONCLUSION

In general, prospective mathematics teacher students have a mathematical identity in the high category, precisely 70.45%. Specifically, this mathematical identity is

formed by five components: interest, recognition, competence, performance, and belief in mathematics. As many as 78.41% of prospective mathematics teacher students have high interest. The highest recognition is in the medium category, which is 55.68%. As many as 47.73% of students have high competence beliefs. While in performance beliefs, as many as 92.04% of students are in the high category. Related to beliefs in mathematics, as many as 97.73% of students believe in mathematics in the high category. Overall, the study indicates that prospective mathematics teachers demonstrate a generally high level of mathematical identity, with notable variation across its components. These findings suggest that teacher education programs have a solid foundation for supporting students' identity development, yet should pay particular attention to dimensions such as recognition, where students reported comparatively lower levels.

This study has several limitations. First, the sample was limited to 88 students from a single institution, which restricts the generalizability of the findings. Second, the cross-sectional design does not capture changes in mathematical identity over time. Third, the use of self-reported questionnaire data may introduce response bias, as students may overestimate or underestimate their actual competence or recognition experiences. Despite these limitations, the results offer important implications for mathematics teacher education. Programs should create structured opportunities for students to receive meaningful recognition such as peer feedback sessions, collaborative problem-solving activities, or public sharing of mathematical reasoning. Additionally, integrating reflective tasks, mentoring, and identity-focused discussions into coursework may help prospective teachers align their beliefs, competence, and performance more authentically. Future research should explore how mathematical identity develops longitudinally throughout teacher preparation, particularly examining how institutional culture, classroom discourse, and mentoring relationships influence the recognition component. Mixed-method approaches or qualitative follow-ups may also provide deeper insights into how prospective teachers interpret and negotiate their mathematical identity in different learning environments.

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First Author: Conceptualization, methodology, investigation, data analysis, writing, and visualization;

Second Author: Review and editing, including refinement of references;

Third Author: Substantive review and constructive feedback.

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