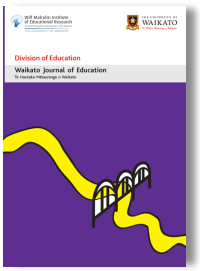

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Understanding inspirational teaching in mathematics through prospective teachers' perception and experience

Rustam Effendy Simamora
Universitas Borneo Tarakan
Indonesia

Fadhlan Muchlas Abrori
Universitas Borneo Tarakan
Indonesia

Abstract

Understanding how mathematics teacher educators (MTEs) inspire prospective mathematics teachers (PMTs) is essential for advancing mathematics pedagogy and developing future mathematics. This study explored the qualities of inspiring MTEs, the nature of their classroom environments and teaching practices, and the impact of their teaching on PMTs' development. Through a case study approach combined with narrative inquiry, data were gathered via two rounds of semi-structured interviews with 20 undergraduate PMTs. Narrative analysis revealed that inspiring MTEs embody a blend of personal and professional qualities—knowledgeability, self-discipline, friendliness, authoritativeness, graciousness, enthusiasm, humour, and humility—which underpin a supportive and engaging learning environment. Their teaching practices featured clear, insightful explanations; a balance of challenge and support; and encouragement of self-discipline, independent learning, and creative mathematical thinking. These experiences fostered not only academic growth but also shaped PMTs' beliefs, attitudes, and aspirations as future educators. The findings highlight the need for teacher education programmes to intentionally cultivate such qualities and practices in MTEs to prepare mathematics teachers who can inspire and empower their students.

Keywords

Inspiring educator; mathematics teacher educator; narrative-case study; pedagogy of inspiration; prospective mathematics teacher.

Wilf Malcolm Institute of Educational Research, Te Kura Toi Tangata Division of Education, University of Waikato, Hamilton, New Zealand
ISSN: 2382-0373
Contact details: Rustam Simamora erustam@borneo.ac.id
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Introduction

The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires. – William Arthur Ward

Over the past two decades, researchers across various fields have examined inspiration as a psychological construct (Thrash, 2021; Thrash & Elliot, 2003). These studies include investigations in areas such as the field of sports (Snelgrove et al., 2022), business (Hani et al., 2022), tourism (Liu et al., 2022), and the arts (Okada & Ishibashi, 2017). Given its significance, some educational scholars have also explored inspiration (e.g., Lambie et al., 2022), although it remains under-explored in mathematics education. More empirical research is needed, particularly regarding the pedagogy of inspiration in the education of prospective mathematics teachers (PMTs). This approach has the potential to address various challenges and optimise student development.

Mathematics teacher educators (MTEs) who deeply understand individual student experiences can make informed pedagogical decisions that enhance PMTs' engagement and academic success. By adapting their instructional approaches accordingly, MTEs can reshape PMTs' perceptions of mathematics and inspire them to pursue their goals with greater confidence and motivation (Lugosi & Uribe, 2022; Matney et al., 2022; Tamsah et al., 2021). Investigating the inspirational experiences of PMTs is essential for advancing our understanding of the pedagogy of inspiration in mathematics education. Although it holds significant potential, this field has been insufficiently investigated, especially regarding inspiration as a psychological construct. To address this gap, this study examines PMTs' experiences with inspirational teaching in mathematics content courses. Our inquiry centred on three key research questions: (1) What are the qualities of inspiring mathematics teacher educators? (2) What are the classroom environment and teaching practices like in inspirational mathematics teaching? (3) What are the impacts of inspirational teachings on prospective mathematics teachers?

Literature review

Pedagogy and teachers' personal characteristics play a vital role in shaping PMTs' identities, as inspiration often arises from admiration of these qualities (Watkins & Mortimore, 1999; Conti & April, 2020; Sjaastad, 2012; Tamsah et al., 2021). When pedagogy focuses on the educator as a source of inspiration, it is referred to as the "pedagogy of inspiration" (Barnett, 2007). In this context, MTEs inspire PMTs through a combination of their personal and professional qualities, teaching strategies, and relationships with students.

The terms "inspiring teacher" or "inspirational teaching" have been widely discussed in educational literature, with many studies focusing on this type of pedagogy (see Bradley et al., 2015; Bryson & Hand, 2007; Cornejo-Araya & Kronborg, 2021; Derounian, 2017; Gorny-Wegrzyn & Perry, 2021; Lamb & Wedell, 2013, 2014; Williams et al., 2016). However, this pedagogy has received limited attention in mathematics education, particularly when inspiration is conceptualised as a psychological construct. Defined in this way, inspiration involves three core elements: evocation, transcendence, and approach motivation (Thrash, 2021; Thrash & Elliot, 2003). *Evocation* occurs when an external object, such as a person or idea, triggers inspiration. *Transcendence* involves recognising greater possibilities beyond the ordinary, and *approach motivation* is the drive to pursue and realise these new ideas or visions. Inspiration also consists of two component processes: being *inspired by* and being *inspired to*. Being *inspired by* refers to being moved by the intrinsic value of a stimulus, while being *inspired to* means being motivated to extend or actualise that value. When both processes are present, inspiration is said to occur (Cui et al., 2020; Thrash, 2021). Thus, *inspiration* can be defined as an experience that encourages an individual to bring a new idea to fruition. In light of this conceptualisation, an MTE can be viewed as an evocative figure or source of inspiration for PMTs.

Barnett (2007) suggested that educators inspired PMTs through their personal qualities, disposition, energy, and deliberately planned teaching approaches. Inspirational learning experiences with MTEs can profoundly influence PMTs, deepening their mathematical understanding, fostering enthusiastic and independent engagement, and strengthening their emerging identity as future

mathematics educators. Inspiration can ignite intrinsic motivation and energise PMTs in their mathematics learning (Conti & April, 2020; Lugosi & Uribe, 2022). Schoenfeld (2022) noted that the classroom environment significantly shaped PMTs' beliefs about mathematics. Therefore, fostering inspirational learning should be a priority in mathematics education, especially in preparing future teachers. When PMTs are inspired, they can pass this inspiration on to their future students once they become teachers (Cui et al., 2020; Thrash, 2021). Uitto et al. (2018) revealed that inspiring educators play a pivotal role in shaping students' lives by offering encouragement, instilling confidence, and opening new pathways for learning. The educator's guidance created emotional connections, empowering PMTs to pursue their aspirations with belief in their potential.

Several scholars have examined inspirational teaching across various contexts, highlighting shared elements such as passion, supportive relationships, and engaging pedagogy. Bryson and Hand (2007) emphasised that student engagement is central to inspirational teaching, fostered through teachers' passion and relational investment. Derounian (2017) and Bradley et al. (2015) found that inspiring educators in higher education motivate students by creating supportive environments and demonstrating subject passion, though their studies did not focus on mathematics. Williams et al. (2016) added that inspirational teaching involves stimulating content, real-world relevance, and strong teacher-student relationships. Lamb and Wedell (2013, 2014), in English language classrooms, showed that empathy, competence, and adaptability are key, while Gorny-Wegrzyn and Perry (2021) introduced the "pedagogy of kindness", stressing care, compassion, and emotional support. Cornejo-Araya and Kronborg (2021), studying gifted education, developed a model centred on passionate, knowledgeable teachers who challenge and support students, though their work also excluded mathematics and higher education. However, while research on inspirational teaching has been conducted across various educational contexts, a significant gap remains in understanding its role in mathematics education. This study seeks to address this gap by examining the experiences of PMTs, as they play crucial roles in shaping the learning of future students.

Method

The objective of this study was to explore and describe the qualities of inspiring MTEs, the classroom environments and teaching practices that foster inspiration, and the impact of inspirational teaching on PMTs. Due to this study being bounded by place and time, a case study research strategy was appropriate to achieve the research objectives (Creswell & Poth, 2016). We also considered our study a form of narrative inquiry as it focused on participants' lived experiences, using their personal stories as key data (Clandinin, 2006). Following Clandinin's idea, this research explored how individuals made sense of their experiences within context. This method aligned with our goal of understanding the inspirational experience of the PMTs. Moreover, *analysis of narratives* was incorporated to analyse the participants' narratives (Polkinghorne, 1995). The data analysis aligned with the study's goal of understanding these experiences through a mixed case study-narrative inquiry approach (Merriam & Tisdell, 2015). We generated themes and categories (Polkinghorne, 1995) to gain insights into inspirational teaching in mathematics, as reflected in PMTs' experiences and perceptions.

Participants

The research was conducted in the Mathematics Education department of a public university in Indonesia. One of the department's primary challenges was consistently low enrolment numbers, which significantly influenced its admissions process. Although a test was administered to evaluate prospective PMTs, the limited number of applicants led to a less competitive selection process compared to other universities. As a result, the department adopted a more inclusive admission policy, accepting all applicants who participated in the test, even if their scores fell below the expected standard. This approach reflected the department's commitment to expanding access to higher education in mathematics education, particularly in a region where specialised study opportunities were limited. However, it also posed challenges for educators, who had to accommodate a wide range of student abilities and levels of preparedness in their courses.

Table 1. ***Demographic Profile of Participants and Their Nominated Inspiring Mathematics Teacher Educators***

Participant	Semester*	Sex	Nominated Inspiring Educator	Inspirational Course
Ade	5	Female	Budi	Advanced Calculus
Alesha	5	Female	Adi	Advanced Calculus
Annisa	7	Female	Adi	Complex Variable Analysis
Auliya	3	Female	Adi	Trigonometry
Cheryl	3	Female	Adi	Trigonometry
Diah	3	Female	Adi	Trigonometry
Dian	3	Male	Adi	Trigonometry
Dillah	5	Female	Murni	Differential Equations
Dinah	5	Female	Adi	Differential Equations
Elane	7	Female	Adi	High School Mathematics
July	7	Female	Maya	Algebraic Structures
Kia	9	Female	Adi	High School Mathematics
Lione	5	Female	Adi	Differential Equations
Lucy	5	Female	Jerry	Analytical Geometry
Naomi	7	Female	Budi	Linear Algebra 1
Putri	5	Female	Budi	Linear Algebra 2
Rizka	3	Female	Adi	Trigonometry
Sari	3	Female	Alyanna	Calculus 2
Windy	3	Female	Adi	Trigonometry
Winny	5	Female	Tari	Advanced Statistics

Note: *) Semester: Refers to the semester when the final interview was conducted (October 2022). All participant names, including those of the mathematics educators, are pseudonyms to ensure anonymity.

The initial student participants in this study were 23 undergraduate PMTs majoring in the Mathematics Education department. They were selected using the Inspiration Scale (IS) (Thrash & Elliot, 2003), which was modified and validated by an expert in assessment. The IS measured both the frequency and intensity of inspiration experienced by PMTs, focusing on four aspects: inspiration during mathematics content courses (MCCs), being inspired by educators or learning activities, feeling motivated to engage in the courses, and recognising inspiration within the courses. The instrument was distributed online, and 23 PMTs of the 114 respondents were provisionally selected based on criteria having high inspiration scores, having a total score of 48 or more (with a maximum possible score of 56 and a minimum of 8). Of the 23 PMTs, 20 agreed to participate in this study (see Table 1).

Data collection

Data collection for this study involved semi-structured interviews conducted from March to October 2022. The first round of interviews explored participants' mathematics learning journeys, their perceptions of the subject, the influence of teachers on their decision to pursue mathematics education, and their experiences of inspiration during mathematics education courses, including pedagogy and MCCs. The interview guidelines were aligned with Derounian's (2017) conceptualisation of inspirational teaching, focusing on aspects related to inspirational learning experiences. PMTs were invited to recount moments of inspiration, share their thoughts and feelings, and describe the traits of inspiring educators and teaching practices based on their experiences.

The second round of interviews focused specifically on PMTs' experiences of inspiration in MCCs. The guidelines for this round were refined based on reflections from the first interview. PMTs were asked to identify the most inspiring mathematics educator and course, describe the educator's personality traits and teaching methods that motivated their learning, and elaborate on additional characteristics that left a lasting impression. They also discussed the learning environment and shared

their most inspiring moments with the educator, reflecting on how these experiences transformed their perceptions of mathematics.

Data analysis

This study employed an *analysis of narratives* approach (Polkinghorne, 1995) suited to the data and research aims. The collected data were examined using inductive thematic analysis (Braun & Clarke, 2006), involving repeated readings of interview transcripts, identifying segments reflecting participants' perceptions and experiences, grouping them into categories, and developing overarching themes. All processes—transcription, coding, and theme development—were conducted in Bahasa Indonesia to preserve linguistic and cultural nuance, with translation into English undertaken only during manuscript preparation. Coding combined theory-driven and inductive strategies (Fereday & Muir-Cochrane, 2006). The theory-driven approach, informed by prior research on inspirational teaching, identified constructs such as knowledgeability, friendliness, and self-discipline. The inductive approach generated codes from participants' accounts, allowing new elements to emerge while remaining consistent with established concepts.

Nvivo® software supported data organisation and retrieval. Related codes were clustered into categories and refined into themes through constant comparison across participants and interview rounds (Miles et al., 2014). For example, within *Knowledgeability* (under Qualities of Inspiring MTEs), theory-driven coding identified subject mastery, broad insight, and topic connectivity, while inductive coding emphasised linking mathematical concepts and offering accessible explanations (see Table 2). Member checking (Creswell & Poth, 2016) confirmed accuracy and resonance, with only minor adjustments to theme frequencies. No new codes or categories emerged, indicating data saturation (Miles et al., 2014).

Table 2. ***Example of Coding Interview Excerpts into Themes***

Representative Quote	Codes	Theme	Section
Q: *How important are the aspects you mentioned earlier, broad insight and good appearance?* **A:** Very important. For example, if the lecturer's insight is not broad, like when what is being taught is actually related to another topic but they don't know it, then it is incomplete. Also, if their appearance is good, it makes us feel comfortable.	Subject mastery; broad insight; ability to connect topics	Knowledgeability	Qualities of Inspiring MTEs
Q: *What have you achieved or realised?* **A:** When I worked on the presentation task yesterday, I observed the lecturer's delivery style and wanted to be like that. So I practised at home and then presented it, and the lecturer liked it.	Emulation of role model; motivation to improve; applying learned approaches	Strengthened beliefs, attitudes, and behaviours	Impacts of Inspirational Teaching

Research quality

To ensure the rigour of this qualitative study, peer review, peer debriefing, and member checking were employed (Creswell & Poth, 2016; Nowell et al., 2017). Author 2 served as the peer briefer, independently reviewing coded transcripts, comparing them with the initial coding framework, and resolving discrepancies through discussion with the first author, thereby providing external validation and minimising researcher bias. Member checking was undertaken after the second-round interview data had been analysed and preliminary themes had been identified. A detailed report, including translated excerpts and thematic interpretations, was distributed to participants via a dedicated WhatsApp group created solely for communication between participants and the researchers. Participants were asked to review the findings, assess their accuracy against their own experiences and perspectives, and provide comments or corrections. They were also given the option to participate in

follow-up interviews to clarify or expand on their feedback. Most participants confirmed the accuracy of the analysis, and five volunteered for additional in-depth interviews, which further substantiated and refined the themes. Reliability was further supported by the consistent use of a semi-structured interview guide across all participants, ensuring systematic exploration of key topics (Creswell & Poth, 2018).

Findings

The findings are presented in three areas: qualities of inspiring MTEs, the classroom environment and teaching practices in inspirational mathematics teaching, and the impacts of inspirational teaching on PMTs.

Qualities of inspiring mathematics teacher educators

The findings of this study highlighted the key qualities that inspiring MTEs embodied, as recognised by the participants. The participants ranked these qualities—knowledgeability, self-discipline, friendliness, authoritativeness, graciousness, enthusiasm, humour, and humility—from the most prominent to the least (see Figure 1 for the representational transcript). They were essential in shaping a positive classroom environment and inspiring PMTs. Together, they formed the foundation of inspirational teaching, driving PMTs' academic success and fostering personal growth.

Knowledgeability

Participants acknowledged knowledgeability as a key trait of inspiring MTEs. A strong grasp of the subject matter was seen as essential for building PMTs' trust and maintaining the integrity of the learning process. Among the 20 participants, three-quarters emphasised that inspiring MTEs should be highly knowledgeable. For instance, Dinah (Semester 5) highlighted the importance of expertise, noting that MTEs must deeply understand their field to provide accurate and thorough explanations. Similarly, Annisa (Semester 7) highlighted how an MTE demonstrated content mastery, modelled problem-solving strategies, and encouraged reflective learning. For the detailed transcript of students, see Figure 1.

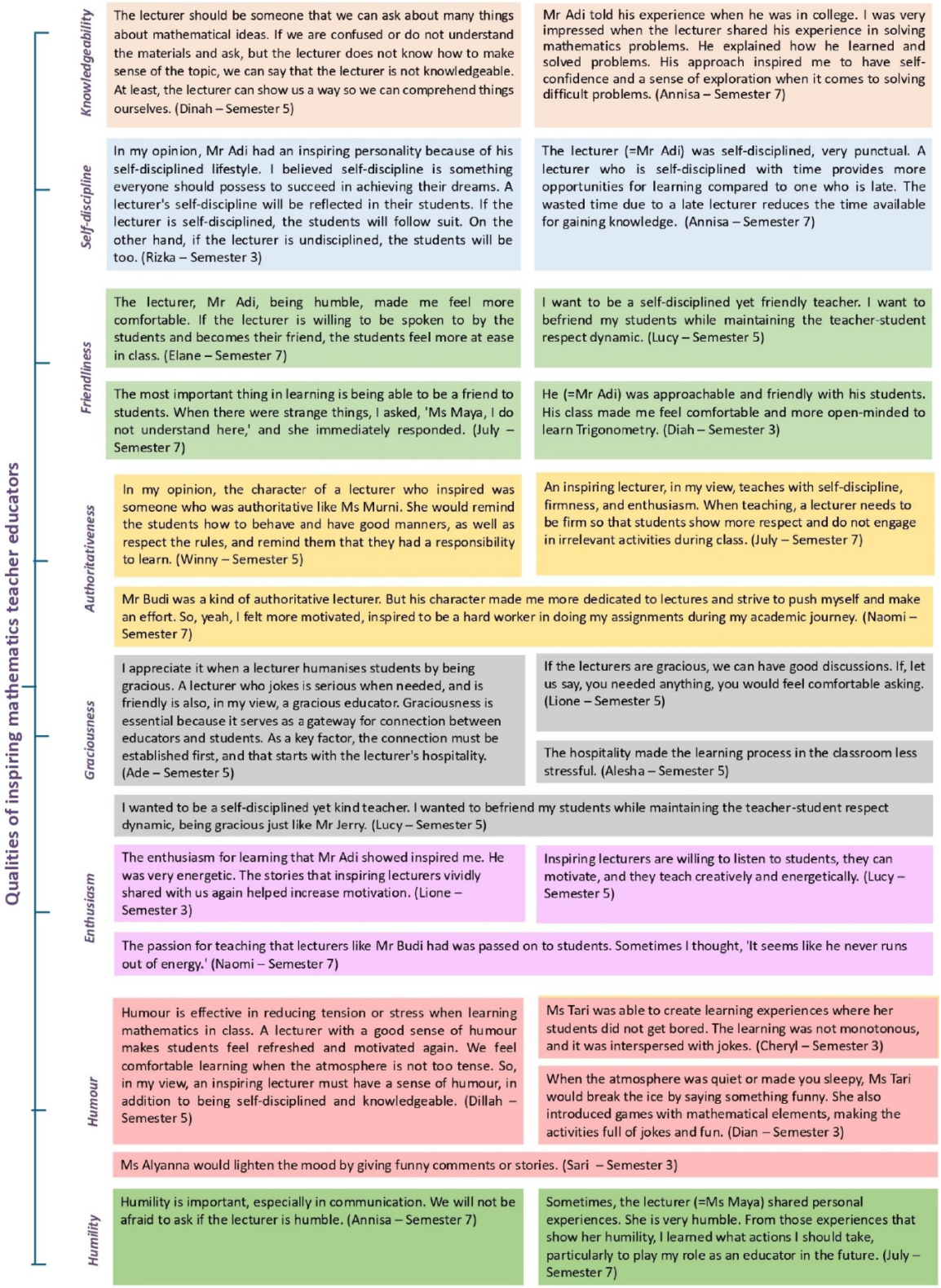
Self-discipline

Self-discipline emerged as a core trait of inspiring MTEs and was highly valued by PMTs, reflecting a commitment to consistency, responsibility, and professionalism in teaching. This quality not only influenced MTEs' instructional practices but also motivated participants to adopt a similar mindset in their own learning. Half of the 20 participants highlighted that inspiring MTEs should demonstrate self-discipline. Rizka (Semester 5) observed that a lecturer's self-discipline set the tone for student behaviour, fostering a culture of responsibility and success in the classroom. Likewise, Annisa (Semester 7) emphasised that punctuality and self-discipline directly enhanced both the efficiency and quality of the learning experience.

Friendliness

Friendliness was recognised as a vital trait of inspiring MTEs, significantly enhancing student comfort and engagement. An approachable and open attitude helped create a positive learning environment. Among the 20 participants, nearly half (nine participants) believed that inspiring MTEs should be friendly. For example, July (Semester 7) emphasised that being a friend to PMTs was essential in learning, as it allowed students to interact without fear of judgement, fostering active participation. Elane (Semester 7) highlighted how approachability makes PMTs feel comfortable, encouraging engagement and improving classroom dynamics. Similarly, Lucy (Semester 5) reflected on the importance of maintaining this balance in her teaching philosophy. Dian (Semester 3) also noted that friendliness helps build a strong rapport and deeper connections between educators and students.

Figure 1. Themes of Inspiring Mathematics Teacher Educators' Qualities and Example Quotations



Authoritativeness

Authoritativeness was recognised as an important trait in inspiring MTEs. Among the 20 participants, about half believed inspiring MTEs should be authoritative. For example, Winny (Semester 5) noted that a good lecturer respects the rules and reminds PMTs of their responsibility to learn, reinforcing academic and behavioural standards. July (Semester 7) highlighted the link between self-discipline, authority, and enthusiasm, emphasising that authority was not just about control but also about fostering respect and keeping students focused. Similarly, Naomi (Semester 7) pointed out that an authoritative presence could motivate, as firm yet supportive guidance helped PMTs take their studies seriously and build a strong work ethic.

Graciousness

Graciousness emerged as a defining quality of inspiring MTEs, significantly shaping the classroom atmosphere and student engagement. Seven of the 20 participants expressed that inspiring MTEs were gracious and possessed hospitable and kind personalities. For instance, Ade (Semester 5), in her transcript, further emphasised the importance of graciousness in fostering strong connections between educators and PMTs, and Alesha (Semester 5) said how a gracious attitude helped ease the inherent challenges of mastering mathematics. The approachable and hospitable nature of gracious educators also encouraged meaningful dialogue and collaboration. Lione (Semester 5) also noted how graciousness fostered open communication, allowing PMTs to seek guidance and contribute to discussions without fear of judgement. The influence of graciousness extended beyond the immediate classroom setting, inspiring PMTs to emulate similar behaviours in their teaching aspirations. Lucy (Semester 5) also reflected on her vision as a future teacher how the graciousness of her educators shaped her professional identity, balancing approachability with respect and authority.

Enthusiasm

Enthusiasm was identified as a critical attribute of MTEs, playing a significant role in igniting PMTs' motivation, engagement, and enthusiasm for learning. Seven of the 20 participants expressed that inspiring MTEs were enthusiastic. For instance, Lione (Semester 5) shared her perception and illustrated how an educator's passion for teaching and willingness to share inspiring personal experiences could profoundly influence PMTs' motivation to learn. Furthermore, participants pointed out that motivating educators responded effectively to PMTs' needs and taught creatively, as Lucy (Semester 5) noted. Her response highlighted how an educator's ability to engage with PMTs and employ innovative teaching methods plays a key role in maintaining motivation and making learning enjoyable and impactful. Another example, Naomi (Semester 7), reflected on how enthusiasm could be contagious; her statement underscored how an educator's sustained enthusiasm could inspire PMTs to approach learning with a similar sense of dedication and energy.

Humour

Humour was another significant trait identified by participants as contributing to the inspirational qualities of their MTEs. A quarter of the 20 participants expressed that inspiring MTEs had a good sense of humour. For example, Dillah (Semester 5) noted that a lecturer with a good sense of humour helped PMTs feel refreshed and motivated. Similarly, Cheryl (Semester 3) stated that humour not only lightened the mood but also kept students engaged, ensuring their sustained connection to the lesson. Additionally, humour was seen as a tool to re-engage PMTs when the classroom atmosphere became too quiet or disengaged. Dian (Semester 3) shared his experience with integrating games into mathematical content, demonstrating how humour refreshed the class while still aligning with learning objectives. Likewise, Sari (Semester 3) highlighted how humour helped educators ease tension and foster a positive classroom environment.

Humility

Humility was recognised as a vital trait in inspiring MTEs. It played a significant role in fostering open communication and meaningful learning experiences. Three of the 20 participants expressed that inspiring MTEs demonstrated humility. For instance, Annisa (Semester 7) highlighted the importance of humility in facilitating student interaction, when humility contributed to deeper connections between educators and PMTs, with educators sharing their personal experiences to enrich the learning environment. Similarly, July (Semester 7) reflected on her experiences that showed the lecturer's humility, and she learned what actions she should take, particularly in playing her role as an educator in the future.

Classroom Environment and Teaching Practices

The findings identified key themes related to classroom environment and teaching practices in inspirational mathematics teaching. MTEs created a supportive and engaging environment that encouraged PMTs to participate actively. They provided clear and insightful explanations, helping PMTs understand complex mathematical concepts. The balance of challenges with adequate support was a central aspect of the teaching approach, ensuring PMTs were challenged and guided in their learning. MTEs also encouraged self-discipline and independent learning, motivating PMTs to take responsibility for their progress. Lastly, fostering creativity in mathematics learning was a critical practice, with MTEs promoting innovative ways to approach problems and think mathematically. (Refer to Figure 2 for a detailed overview of each theme and a representative transcript.)

Creating a supportive and engaging learning environment

A welcoming and relaxed classroom atmosphere was crucial in fostering a supportive and engaging learning environment that inspired PMTs. By cultivating a comfortable atmosphere, building positive relationships, and incorporating engaging methods like ice-breakers, MTEs helped PMTs stay motivated, focused, and confident in their learning. The personal and social attributes of the MTEs, such as being approachable, kind, and attentive, played a central role in creating an environment that met PMTs' expectations.

Humility was highlighted as an essential trait in MTEs, preventing them from appearing intimidating and allowing PMTs to feel more relaxed and confident in the learning environment. For instance, Auliya (Semester 3) noted that a humorous and approachable teaching style helped reduce stress, making learning more enjoyable despite its challenges. Participants also praised the balance of relaxation and productivity in several MTEs' classrooms. All participants emphasised that inspirational mathematics teaching should be both comfortable and engaging, as reflected in the interviews with Elane (Semester 7) and Ade (Semester 5). Ice-breakers and games were highlighted as effective tools for maintaining engagement and fostering a supportive atmosphere. More than a third of the participants valued using these activities to re-energise the class, particularly when attention declined. For example, Dian (Semester 3) observed that ice-breakers helped break the monotony of long lessons, while Windy (Semester 3) found them to be an effective strategy for keeping PMTs engaged and motivated throughout the session.

Providing clear and insightful explanations

Participants emphasised the importance of gaining new insights and refining mathematical thinking skills. MTEs who provided clear, structured, and engaging explanations were central to these inspiring moments. All participants highlighted the importance of clear explanations, with 17 explicitly noting that the inspiring MTEs provided such clarity. For example, Putri (Semester 5) highlighted the importance of insightful teaching, particularly in understanding the deeper meaning behind mathematical terms. She underscored the role of educators in guiding PMTs to think critically and develop a comprehensive understanding of mathematics. Additionally, participants praised MTEs for broadening their perspective on mathematics. Lucy (Semester 5) and Naomi (Semester 7) reflected on how inspiring MTEs helped them connect mathematical concepts to broader life skills.

Figure 2. Themes of Classroom Environment and Teaching Practices with Example Quotations

The ability to provide detailed explanations was also highly valued. Fourteen participants acknowledged that inspiring MTEs excelled in clarifying mathematical ideas. For instance, Elane (Semester 7) and Annisa (Semester 7) noted that detailed explanations allowed PMTs to move beyond surface-level knowledge and develop a deeper understanding of mathematical concepts. Furthermore, sharing personal experiences enriched the learning process. Four participants found personal stories, especially those related to problem-solving, particularly inspirational. For example, Lione (Semester 5) and Annisa (Semester 7) reflected on how these experiences enhanced their understanding and motivation in learning mathematics.

Balancing challenges with effective support

Participants emphasised that when paired with the right level of support, challenging academic tasks fostered intellectual growth and emotional resilience. The balance between challenge and support was crucial in promoting perseverance and development. For instance, Alesha (Semester 5) highlighted the importance of proving mathematical concepts to deepen understanding. Additionally, more than half of the participants stressed the significance of feedback, guidance, and encouragement in providing this support. For example, Rizka (Semester 5) described how receiving feedback during a project motivated her learning process. Further, discussion and question-and-answer sessions were considered essential components of a supportive classroom environment, with over half of the participants recognising their value. Annisa (Semester 7) noted that an interactive and relaxed classroom atmosphere encouraged critical thinking, making PMTs more engaged and confident in their learning. Similarly, Dian (Semester 3) shared that discussions and quizzes helped strengthen PMTs' problem-solving skills. Moreover, clear explanations and constructive feedback during discussions further enhanced understanding.

Half of the participants highlighted the importance of this feedback in refining their mathematical thinking. As an illustration, Alesha (Semester 5) pointed out that discussions allowed PMTs to freely express their opinions, which were later revisited and analysed, providing clarity and reinforcing learning. Moreover, MTEs who were approachable and actively corrected misconceptions were highly valued for their role in fostering deeper comprehension and intellectual engagement.

Encouraging self-discipline and independent learning

Three participants highlighted how their lecturers' self-disciplined teaching approach fostered self-discipline and encouraged independent learning. By setting high expectations, modelling punctuality, and following structured lesson plans, these lecturers indirectly motivated PMTs to adopt similar habits. Half of the participants viewed disciplined lecturers as role models for organisation and time management, helping them stay focused on their studies. They also appreciated MTEs who reinforced discipline, as it helped them meet deadlines and avoid procrastination. For instance, Putri (Semester 5) recalled how Mr Budi's emphasis on punctuality and task completion motivated her and her peers to stay on track. This structured approach improved academic performance and instilled a strong sense of responsibility and accountability. Naomi (Semester 7) further emphasised this by stating that an inspiring lecturer, like Mr Budi, was firm, disciplined, and concise in delivering clear and straightforward material.

Beyond fostering self-discipline, more than half of the participants recognised the role of MTEs in promoting independence. These educators encouraged PMTs to take ownership of their learning and develop autonomy. For instance, Elane (Semester 7) shared how Ms Maya's relaxed teaching style maintained learning goals while fostering independent study. Similarly, Lucy (Semester 5) appreciated Mr Jerry's enthusiasm for inspiring self-directed learning. She recalled how he assigned tasks that required PMTs to prove mathematical formulas rather than simply delivering lectures. His approach, which positioned him as a facilitator rather than a lecturer, encouraged students to engage deeply with mathematical concepts, fostering independence and critical thinking.

Fostering creativity in mathematics learning

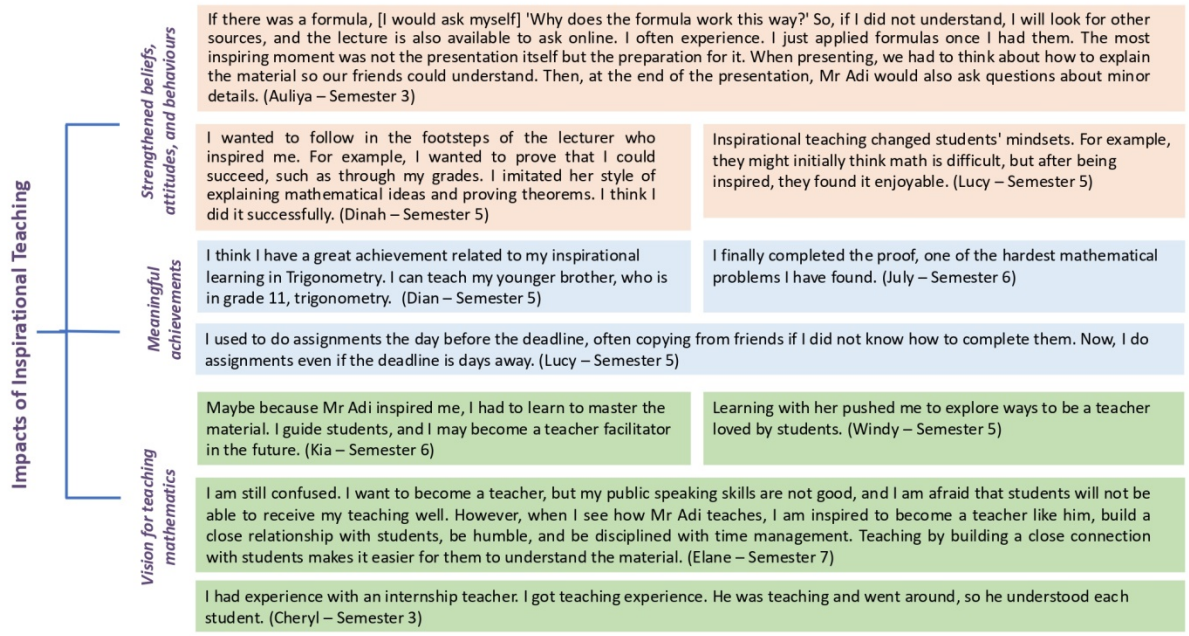
Creative teaching methods were crucial in inspiring PMTs to engage with mathematics dynamically and innovatively. MTEs who incorporated interactive activities, problem-solving exercises, and real-world applications encouraged PMTs to explore mathematical concepts from multiple perspectives. This approach fostered critical thinking and problem-solving skills, moving beyond rote memorisation. Six participants highlighted how their most inspiring classroom experiences were linked to creativity. For instance, Dian described how a lecturer's engaging teaching style broke the monotony of traditional lectures, keeping PMTs attentive and involved.

MTEs who promoted creative thinking were particularly valued for encouraging independent and imaginative learning. Annisa (Semester 7) reflected on the transformative power of creative problem-solving, emphasising how it helped PMTs explore innovative solutions. Similarly, Elane (Semester 7) (Semester 7) and Lucy (Semester 5) appreciated lecturers such as Ms Maya and Ms Tari, who shared creative ideas and maintained an engaging classroom atmosphere. In addition to fostering creativity, lecturers who provided quick and effective solutions to complex problems were also seen as inspiring. Kia (Semester 9) also recalled how Mr Adi demonstrated a new formula to solve a challenging problem efficiently, reinforcing the importance of adaptability and innovation in mathematical thinking.

Impacts of Inspirational Teaching

The impacts of inspirational teaching on PMTs were profound and far-reaching, shaping their development as learners and future educators. Inspirational teaching strengthens PMTs' beliefs, attitudes, and behaviours, nurturing confidence, perseverance, and a sense of responsibility. Meaningful achievements emerged as PMTs translated their learning into tangible accomplishments, such as excelling in academic tasks and overcoming challenges. Moreover, these experiences inspired a vision for teaching mathematics as prospective teachers reflected on the qualities and strategies they would adopt to create impactful and meaningful learning environments for their future PMTs. (Refer to Figure 3 for a detailed overview of each theme and the corresponding representative transcripts.)

Figure 3. Themes of the Impacts of Inspirational Teaching with Example Quotations



Strengthened beliefs, attitudes, and behaviours

Inspirational teaching shaped PMTs' beliefs, attitudes, and behaviours, significantly impacting their academic journey and self-perception. All participants reported feeling more enthusiastic about their learning after experiencing inspirational teaching, and 14 participants noted that their beliefs, attitudes, and behaviours had strengthened through inspirational mathematics teaching. Auliya (Semester 3) described how her mindset towards mathematical formulas had shifted, becoming more positive and engaged. She developed a more significant curiosity about the reasoning behind formulas. She took a more proactive approach to learning by seeking additional resources and making an extra effort to understand the subject.

PMTs grasped concepts more effectively and developed disciplined and efficient study habits, contributing to their academic improvement. The guidance of inspiring educators built confidence and encouraged PMTs to take a more active role in their learning. Dinah (Semester 5) expressed her desire to follow the example set by the lecturer who had inspired her. This reflection showed how inspirational teaching provided a model for PMTs, motivating them to improve their academic skills and approach learning with incredible determination. Lucy (Semester 5) also described the change in mindset resulting from inspirational teaching.

Meaningful achievements

Inspirational teaching fostered meaningful achievements, with all participants identifying significant accomplishments they found motivating. These achievements ranged from mastering difficult problems and earning high grades to developing a more positive attitude towards learning. For example, Dian shared how the knowledge gained in class extended beyond the classroom, strengthening his understanding and boosting his confidence in explaining complex mathematical concepts. July (Semester 7) reflected on her perseverance in Algebraic Structures, demonstrating how inspirational teaching empowered PMTs to persist through challenges and experience the satisfaction of overcoming

difficulties. Similarly, Lucy (Semester 5) described a shift in her approach to assignments as a valuable achievement, illustrating how inspirational teaching instilled responsibility and self-discipline, encouraging PMTs to take a more proactive role in their studies.

Vision for teaching mathematics

Inspirational teaching significantly influenced prospective teachers' visions for their future roles in mathematics education. For example, in Figure 3, Kia (Semester 9) reflected on how exposure to effective teaching practices encouraged her to view herself as a facilitator, guiding students towards independent learning. Similarly, Windy (Semester 3) emphasised fostering positive student-teacher relationships.

Nearly all participants reported having a clear vision for teaching mathematics, with only one exception. Elane (Semester 7) initially hesitated to pursue teaching due to concerns about public speaking and her ability to explain concepts clearly. However, she was inspired by Mr Adi's teaching methods and aspired to build strong student relationships, maintain humility, and communicate mathematical ideas effectively. Cheryl (Semester 3) also expressed a desire to be friendly and considerate, inspired by her internship teacher's efforts to understand each student's level of comprehension. These reflections highlighted how participants' experiences with inspiring MTEs and prior teachers influenced their teaching aspirations. While the MTEs in this study did not always align perfectly with participants' expectations in terms of personality and teaching style, they were still regarded as inspirational, shaping the participants' mathematical identities and professional outlooks.

Discussion

Our findings align with and extend the discourse on inspirational and effective teaching by providing a mathematics-specific perspective. The distinction between these two forms of teaching is critical: inspirational teaching focuses on fostering motivation, engagement, and relational dynamics, while effective teaching encompasses broader pedagogical practices, including clarity, structure, and adaptability to diverse learning needs. The qualities of inspiring MTEs identified in our study—knowledgeability, self-discipline, friendliness, authoritativeness, graciousness, enthusiasm, humour, and humility—reflect elements highlighted in the literature. This reinforces the view that inspirational teaching is a multifaceted process that resonates with PMTs' cognitive and emotional needs. Bradley et al. (2015) highlighted the significance of passionate and committed teaching in fostering engagement, aligning with Bryson and Hand's (2007) assertion that meaningful relationships, passion, and relational warmth are central to inspiring teaching. Derounian (2017) underscored the emotional and relational aspects of higher education teaching, resonating with the humility and humour observed in our findings, which created supportive environments conducive to learning.

Relational warmth and inclusivity are essential for reducing stress and encouraging active participation in mathematics classes. Gorny-Wegrzyn and Perry's (2021) "pedagogy of kindness" aligns with the graciousness and friendliness demonstrated by MTEs in our study, fostering personal growth. Cornejo-Araya and Kronborg (2021) emphasised the impact of inspiring educators who challenge PMTs, a dynamic evident in MTEs' practices. Williams et al. (2016) similarly identified passion, clear content delivery, and real-world applications as hallmarks of inspiring teaching, which MTEs exemplified through their contextualised curriculum design. Creating a non-anxious and engaging learning environment is central to inspiration in mathematics education, as Boaler (2022) emphasisef. Nelson (2022) argued that such environments encourage open-mindedness and receptivity, while Cui et al. (2020) linked inspiration to insights that deepen understanding. Our findings reflect this connection, as participants gained valuable insights into mathematical concepts through re-proving theorems and formulas, a process that transformed their learning experience. Schoenfeld's (2022) advocacy for problem-solving mindsets and robust mathematical understanding underscores the importance of these practices.

The role of challenging tasks, paired with feedback (Ketonen et al., 2022; Lutovac, 2023) and scaffolding (Bature & Jibrin, 2015; Holton & Thomas, 2021), emerged as one of the key themes. MTEs

provided PMTs with opportunities to engage deeply with mathematical problems while offering guidance to navigate difficulties. This approach aligns with Ketonen et al. (2022), who highlighted the importance of scaffolding in promoting intellectual growth. Hagger and Hamilton (2019) and Battista et al. (2020) further stressed the value of self-discipline, a quality appreciated in Mr Budi's authoritative stance. However, striking a balance between authority and flexibility, as Battista et al. noted, is essential to foster creativity and intellectual independence.

Effective teaching intersects with pedagogical competence, content expertise, and adaptability, as highlighted by Nushi et al. (2022). The structured and systematic explanations provided by MTEs mirror these attributes, ensuring foundational clarity by linking definitions, theorems, and formulas. Smothers et al. (2022) emphasised the importance of psychologically safe environments in reducing stress and enhancing comprehension, a principle evident in the relaxed yet focused atmospheres created by these educators. Interactive and reflective practices bridged the domains of inspiration and effectiveness. MTEs encouraged student engagement through question-and-answer sessions, discovery-based tasks, and real-world applications. Walter and Hart (2009) asserted that addressing student expectations strengthens engagement and mathematical thinking, while Su and Wood (2012) emphasised the value of applying knowledge to real-life contexts. These approaches not only deepened PMTs' understanding but also fostered critical thinking and collaboration. The motivational impact of inspirational teaching is evident in the increased confidence and effort reported by participants. Sides and Cuevas (2020) linked self-confidence to academic performance, while Lugosi and Uribe (2022) described inspiration as a powerful motivator.

Participants in our study expressed a renewed interest in mathematics and a commitment to deepening their understanding, consistent with Peker and Ulu's (2018) findings on how classroom experiences shape PMTs' beliefs about mathematics. By integrating relational warmth, structured pedagogy, and contextual relevance, MTEs exemplify the dual roles of inspirational and effective teaching. These educators created inclusive and rigorous learning environments that addressed both cognitive and emotional needs, fostering deeper understanding and self-efficacy. This supports Hodges and Hodge's (2017) pedagogical vision, which emphasises the educator's role in shaping PMTs' motivations and learning outcomes. By situating these principles within mathematics education, our study extends the broader discourse on teaching excellence, offering actionable insights for educators aiming to inspire and engage learners in complex and challenging disciplines.

This study underscores the profound impact of inspirational teaching, captured through three interconnected themes: strengthened beliefs, attitudes, and behaviours; meaningful achievements; and a renewed vision for teaching mathematics. Participants described transformative shifts in how they perceived mathematics and in their self-concept as learners and future educators. This aligns with Barnett's (2007) insight into the paradoxical nature of inspirational teaching—its mechanisms may be elusive, yet its outcomes are unmistakably powerful. Such teaching opens PMTs to new possibilities, prompting significant changes in both mindset and practice. These findings are supported by the emotional dimensions of teaching identified by Su and Wood (2012), who argued that the relational aspects of teaching, such as empathy, encouragement, and understanding, are critical for inspiring change in students' attitudes and actions. Uitto et al. (2018) emphasised that teacher-student relationships grounded in trust and care play a crucial role in shaping students' emotional and professional development. In the present study, participants' strengthened beliefs and attitudes were closely linked to the relational and motivational approaches adopted by inspiring MTEs. These findings demonstrate how inspirational teaching fosters confidence and a sense of agency, supporting PMTs' growth both personally and professionally.

Inspirational teaching fosters meaningful achievements, as participants in this study demonstrated not only academic success but also the ability to apply their learning in real-world contexts. The participants reported developing problem-solving skills, perseverance, and an appreciation for mathematics that transcended their academic requirements. For example, their ability to connect mathematical concepts to practical scenarios reflects a deeper level of engagement and understanding. These findings align with Lamb and Wedell (2014), who reported that inspirational teaching supports students' success beyond academic grades by providing skills and insights applicable to many areas of

life. The participants' ability to apply mathematical knowledge in meaningful ways illustrates the transformative potential of teaching that prioritises engagement and real-world relevance.

This study also highlights how inspirational teaching influences participants' visions of their future roles as mathematics educators. This finding aligns with Pellikka et al.'s (2022) concept of "possible selves", which emphasises how present experiences shape individuals' aspirations and professional identities. The inspirational teaching that PMTs experience through MTEs they find inspiring positively shapes their possible selves—how they envision teaching mathematics and the future-oriented identities they construct—standing in contrast to the negative impact of failure described in Lutovac's (2020) study. Lamb and Wedell's (2014) research further supported these findings, suggesting that motivational teaching enhances PMTs' sense of self-efficacy and determination, which are essential for their professional development. By modelling inspirational qualities, MTEs provided their PMTs with a template for effective teaching that balances structure with empathy and motivation with practical relevance. This mirrors the participants' aspirations to inspire their own PMTs, ensuring the continuity of motivational and impactful teaching practices.

The impacts of inspirational teaching are rooted in the approach motivation component of inspiration. According to Thrash (2022), approach motivation, which involves the desire to achieve positive outcomes and pursue personal goals, is a key factor in fostering inspiration. This aspect of motivation makes PMTs more independent and enthusiastic in their learning journey. For example, all participants reported feeling motivated during the course they deemed inspirational. They highlighted how their enthusiasm for learning and self-driven engagement had increased, aligning with the notion that inspirational teaching encourages PMTs to act with greater autonomy and optimism (Lamb & Wedell, 2014). The positive effects of this motivation can be seen in the PMTs' improved focus and passion for their mathematical studies, demonstrating the transformative power of inspirational teaching.

Limitation

This study is subject to several limitations that should be considered when interpreting its findings. The first limitation is that the research was conducted within a single department of one public university in Indonesia. This may limit the generalisability of the results to other contexts or institutions given the specific cultural and institutional characteristics of this setting. Additionally, the time frame of the study, which took place between March and October 2022, may have restricted the scope of understanding regarding the long-term impact of inspirational teaching. The transient nature of PMTs' experiences and the limited duration of data collection may not fully capture the lasting influence of inspiring educators on PMTs' motivation and professional development. Another limitation lies in the selection of participants. The study focused on PMTs with high inspiration scores, which could result in an overrepresentation of PMTs who had particularly positive experiences with inspiration, omitting those who may have had less impactful or even negative experiences. The perspectives of PMTs with lower levels of inspiration are not fully represented.

Furthermore, the reliance on self-reported data through semi-structured interviews introduces the potential for biases such as social desirability or recall bias. Participants' subjective accounts of their experiences may not always reflect the full complexity of the teaching practices or moments of inspiration they encountered. While the research aimed to explore the pedagogical qualities that inspire PMTs, it was concentrated on a select few courses and so may not have fully captured the diverse teaching methods and experiences across the broader mathematics curriculum. The study also lacks longitudinal data, meaning it does not assess whether the inspirational experiences reported by PMTs have a lasting effect on their teaching practices or professional identity as future educators. Without tracking the participants over time, it is difficult to determine whether the changes in motivation and engagement were sustained as they progressed through their academic careers and into the workforce. These limitations suggest that while the study provides valuable insights into the role of inspiration in mathematics education, further research involving a broader sample, longer time frames, and a wider range of educational settings is needed to build a more comprehensive understanding of how inspiration can be fostered in teaching and learning.

Conclusion and recommendation

This study highlights an understanding of how MTEs inspire PMTs. Inspiring MTEs exhibit knowledge, self-discipline, friendliness, authoritativeness, graciousness, humour, and humility. These qualities play a crucial role in shaping the classroom atmosphere and inspiring PMTs, laying the foundation for inspirational teaching that academically and personally influences PMTs. Inspiring MTEs fosters an engaging and supportive environment that encourages active participation. They offer clear, insightful explanations that help PMTs grasp complex mathematical concepts. One of the key elements of their teaching is the balance between challenge and support, ensuring PMTs are stretched and guided in their learning. MTEs also promote self-discipline and independent learning, motivating PMTs to take ownership of their academic journey. Ultimately, they encourage creativity in mathematics, inspiring PMTs to approach problems innovatively and to think critically and creatively about mathematical concepts. Inspirational teaching has left a lasting impact on PMTs, enhancing their understanding, beliefs, and attitudes and helping them achieve significant accomplishments. More importantly, it ignited a vision for teaching mathematics that emphasised creating engaging and supportive learning experiences for the next generation. Through these experiences, PMTs began to see themselves as capable learners and inspiring educators, able to carry forward the transformative power of teaching.

Based on these findings, it is recommended that MTEs focus on developing qualities that inspire students, such as empathy, encouragement, and the ability to foster strong connections with learners. They should also adopt teaching methods that promote critical thinking and problem-solving while providing the necessary support. It is equally important for MTEs to help them develop independence and self-discipline in their learning. Future research should explore how these findings can be applied to different educational contexts, such as primary and secondary schools. Studies involving diverse cultural backgrounds are highly recommended, as Lamb and Wedell (2014) found in their study of inspiring English teachers in Indonesia and China. They discovered that teaching styles in the two countries differ significantly in areas such as control, competition, and the sources of learning materials, indicating that teachers in both contexts work hard to ensure their practice is contextually appropriate. While the study provides valuable insights, it is important to note its limitations, particularly the small sample size of just 20 students. Further research with a more significant number of participants from various educational settings could confirm and expand on these findings.

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Ethics Approval and Consent to Participate

This study was conducted in accordance with established ethical guidelines. Participants were fully informed about the study's objectives, their voluntary participation, and their right to withdraw at any time. Anonymity was maintained through pseudonyms, and all data were anonymised to protect confidentiality. Findings were reported in a manner that preserved participants' identities, ensuring the study adhered to high ethical standards.

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