

Why is the mathematics educator called inspiring?

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Abstract

Inspiration plays a significant role in sparking or enhancing the learning motivation of prospective mathematics teachers (PMTs). Inspiration will also influence the mathematical identity of PMTs' when they become professional mathematics teachers. A mathematics teacher educator (MTE) can be a source of inspiration for PMTs; hence, a study must identify and explain why an MTE is considered inspiring. This study attempts to develop the theory of inspiring MTEs profiles based on the experience of PMTs. This study included 21 students and 7 lecturers of the Mathematics Education Department in a public university in Indonesia. This qualitative research was conducted employing a grounded theory constructivist approach. The findings revealed that inspiring MTEs possessed the following characteristics: "creating a sense of comfort, being knowledgeable, being motivating, providing fun and enjoyable learning, imparting new insights and comprehension, and being disciplined and authoritative." According to this theory, an inspiring MTE creates a sense of comfort through their gracious, friendly, humble, and humorous personality. Fun and enjoyable learning in this study is learning that provide a sense of comfort, fun learning, interactive learning, and carrying out evaluations. MTEs give new insight and understanding by explaining in detail, systematically, and easily understood, sharing creative ideas, and providing scaffolding. Implications of this finding are discussed.

Keywords: Constructivist Grounded Theory, Learning Motivation, Mathematics Educator Profile, Mathematics Identity, Pedagogy for Inspiration, Pedagogy of Inspiration, Prospective Mathematics Teacher

Introduction

Inspiration is a commonly used or spoken term in daily life. The concept of inspiration as a psychological construct has just attracted attention in the past decade. Inspiration is commonly

linked with the process of generating creative ideas and has the power to influence individuals and society (Oleynick et al., 2014). As a psychological construct, inspiration was first initiated by Thrash and Elliot (Thrash, 2021; Thrash & Elliot, 2003; 2004). Barnett (2007) conceptualizes inspiration in higher education as part of pedagogy. Inspiration plays a fundamental role in the intellectual development of students, especially in a rapidly changing world where the change direction is difficult to predict. Practitioners or educators in mathematics education should pay attention to the role of inspiration and the great potential of inspiration in mathematics teaching and learning activities at every level of education. However, attention to the vital role of inspiring pedagogy in universities is still lacking. It is difficult to find research reports in Indonesia that explicitly elaborate on the pedagogy of inspiration in universities.

Mathematics, one of the compulsory subjects in formal education, is still often perceived as a sophisticated subject, even by Mathematics Education students themselves (Noviantari, 2022). Several studies have shown that students have difficulty explicitly learning mathematics at various levels of education, and this is a long-standing problem (Booth & Thomas, 1999; Kamii & Russell, 2012; Lange, 2009; Li & Schoenfeld, 2019; Tambychik & Meerah, 2010; Wilson & Goldenberg, 1998). Through the pedagogy of inspiration, problems like this can be anticipated or minimized. Due to the transforming nature of inspiration (Thrash, 2021), a theory of inspiration is needed as input or consideration in designing learning to anticipate or solve problems in the mathematics education field (Barnett, 2007; Deemer et al., 2021). Through inspiring mathematics learning, interest or intrinsic motivation in learning mathematics can be triggered or enhanced. Motivation matters because it mediates student achievement (Jehadus et al., 2022).

One of the most recent studies on the role of inspiration in mathematics education shows that inspiration increases students' interest, mathematical self-efficacy, and achievement. Even if a mathematics topic is sophisticated, learning mathematics is still enjoyable for students who experience the inspiration (Simamora, 2021). Meanwhile, exploring the experience of prospective teachers is indispensable because it will help teacher educators to develop prospective teachers as future teachers (Kaasila, 2007; Lutovac & Kaasila, 2021; Pellikka et al., 2022). Research on inspiring teacher models has been carried out by Cornejo-Araya and Kronborg (2021). However, it is limited to gifted students aged 9 to 11 years and does not specifically theorize about mathematics and its learning context.

Several studies on inspiration in universities have been conducted (Bradley et al., 2015; Derounian, 2017), but they do not specialize in the field of mathematics education and do not view inspiration as a psychological construct, as proposed by Thrash and Elliot (2003; 2004). The research conducted by Simamora (2021), although related to mathematics education and using the inspiration of Thrash and Elliot, theorizing about the profile of inspirational mathematics teacher educators (MTEs) has not been generated. The research is also limited to the inspiring experience of prospective mathematics teachers (PMTs) from elementary to high school. On the other hand, research exploring PMTs' experiences is needed because understanding their experience means understanding their mathematics identity. The mathematical identity of PMTs, a relationship of PMT to mathematics, will affect their professional development as teachers in the future (Kaasila,

2007; Lutovac & Kaasila, 2021; Marschall & Watson, 2022). So, research is urgently needed to understand the profile of inspiring MTEs based on PMT experiences.

In this study, we define inspiring MTE profiles as qualities that MTEs possess, both personality and way of teaching mathematics, that can increase interest and inspire PTE to master mathematics or mathematical course. The inspiration that plays a vital role in increasing interest, mathematical efficacy, and learning achievement in mathematics is significant to explore. Research on the PMT experience to produce a substantive theory of why MTE is inspiring or how the PMT learning experience identifies MTE as an inspiring educator will play a role in PMT's and MTE's professional development. This finding will be advantageous in optimizing the potential of PMT in higher education to become an inspiring mathematics educator in the future. Practically, research findings are also valuable for planning, implementing, or developing learning carried out by MTE because these findings will recommend what attitudes or behaviors of MTE are needed by students, what kind of learning atmosphere and interaction should be created, or what mathematical skills need to demonstrate, or what personality qualities are exemplified by educators to students.

Methods

The problem formulation in the research is “what is the grounded theory of the MTE profile that inspires PMT when studying in a higher education?” Because the nature of the research question refers to the production of a theory, the most suitable research method is the qualitative method using the grounded theory approach (Charmaz, 2014; 2017; Creswell & Poth, 2018). The grounded theory used in this study is a constructivist approach because in analyzing the data, the researcher is aware of the subjectivity or relativity of the participants in telling their experiences (Charmaz, 2014; Creswell & Poth, 2018). Constructivist grounded theory in this research included recruitment and sampling of participants, data collection, initial coding, focused coding, categorizing, constant comparative, theory building, and writing report research (Charmaz, 2014). This approach recruit's participants more than once.

Data collection was carried out using forms, interviews, and observation. Coding (initial and focused), categorizing, and constant comparative were part of the data analysis. (This procedure will be explained later). Following the constructivist paradigm, the theory emphasizes understanding rather than causal explanations of why and how PMT participants get inspired. The theory constructed in this study is also based on the researchers' interpretation and reflection on the participants' experience (Charmaz, 2014), which was narrated at the time of the interview; therefore, this grounded theory is not to be generalized.

Participants

Student Participants

The student participants in this study were PMTs, students of the Mathematics Education Department at a university in North Kalimantan, Indonesia, who met the criteria for having received high inspiration according to the inspiration scale (IS) (Thrash & Elliot, 2003). IS

was developed to select participants. Researchers adapted the IS following the context of learning mathematics in universities. The IS was packaged in an online form, and 114 students responded. From the 114 students, 22 students with IS high scores were selected as participants.

The first interview was conducted with 22 participants. However, one of the participants was identified as not experiencing high inspiration when the first interview was conducted, and two selected participants did not follow the second interview because they had no appropriate interview schedule. So far, there have been 19 participants. New participants were recruited individually to serve as a theoretical sample after categorization in the third interview. This interview needs two participants to obtain theoretical saturation (Charmaz, 2014; Charmaz & Thornberg, 2021). Finally, the research was conducted using 21 student participants (PTEs). Participants were not used as samples to represent the population but as data sources to construct a theory (Charmaz, 2014) of inspiring MTE profiles. Each interview was audio-recorded, transcribed verbatim, and analyzed using a grounded theory approach.

Lecturer Participants

Based on the results of the second interview with PMTs, it was found that there were seven mathematics teacher educators (MTE) who were the most inspiring in the Mathematics Education Department. In this Mathematics Education Department, 14 lecturers actively teach mathematics courses. It is important to be informed that the names of students and lecturer participants in this article are pseudonyms.

Table 1. Lecturers' Background Identified as Inspiring MTEs

No	Pseudonym	Education	Sex	Subject*	f**
1	Affandi	Master Education	Male	Complex Variable Analysis	1
				High School Mathematics	3
				Advanced Calculus	1
				Differential Equation	2
				Trigonometry	6
2	Budi	Doctor Education	Male	Spatial Analytical Geometry	1
3	Deddy	Master Mathematics	Male	Linear Algebra 1	1
				Linear Algebra 2	1
				Calculus	1
4	Cahyani	Master Education	Female	Differential Equation	1
5	Susan	Master Education	Female	Calculus 2	1
6	Utari	Master Education	Female	Advanced Statistics	1
7	Wulan	Doctor Education	Female	Algebraic Structure	1
				Number of participants	21

*) The courses taught gave participants the inspiration

***) Sum of participants stated the lecturer was an inspiring

Table 1 shows two of the most inspiring according to MTEs to more than one participant. Mr. Affandi was the most inspiring according to 13 participants; Mr. Deddy was the most inspiring according to three participants. Researchers conducted observations and

interviews with MTEs identified as inspiring (inspiring-MTEs) to check the suitability of the inspiring MTE profiles constructed based on data analysis from interviews with PTEs. Complete observations were made by the student researcher team (author three) when inspiring-MTEs taught as usual in the classroom. The researcher made field notes based on these observations. Interviews with MTEs were also semi-structured, with the main questions emphasizing how they inspired PTEs (Creswell & Creswell, 2017).

Data Collection

Data collection began in early March 2022 and lasted until early July 2022. In September, in the second and third weeks of 2022, the researcher again collected data through interviews with lecturers who were identified as inspiring MTEs to increase the validity or credibility of the research findings. This study used data from a form, four interviews, and observations (Creswell & Poth, 2018; Creswell & Creswell, 2018) on MTEs identified as inspiring MTEs. The criteria of participants have a high inspired experience with a minimum IS total score of 48 (maximum IS total score of 56). Interviews are this study's primary data collection technique with a semi-structured approach (Creswell & Poth, 2018). Just as when distributing forms to select participants, when conducting interviews, the definition of inspiration was given to participants. Inspiration in this study is the inspiration for learning mathematics, defined as the emergence of new awareness or ideas to be better obtained from the lecturers or the learning implemented so that students become motivated to realize the awareness or new ideas.

Three interviews with PTEs and one interview for each Inspiring-MTEs were conducted to collect data for constructing the theory of inspiring MTE profiles (Creswell & Poth, 2018). The first interview was conducted online using *zoom* because almost all participants did fast, a spiritual practice, during data collection in April 2022. According to Kaasila (2007), narrative analysis is a suitable way to represent and understand experiences in educational research. Therefore, the central questions in the interview are questions that ask participants to tell stories. In the first interview with PTEs, the main question asked to tell: 1) what the participants felt when they were inspired when they studied in college, 2) their perception of lecturers and learning methods that inspired them, 3) inspiring experiences while studying in college, 3) three or less the most inspiring MTEs who teach mathematical courses. This study defines *mathematical courses* as subjects that focus on mathematics, such as Calculus, Linear Algebra, Statistics, and others.

The second interview with PTEs was conducted in person. In this second stage, the question asked about their mathematics biography (Kaasila, 2007) (experience in learning mathematics from elementary to secondary school, their motives for choosing the mathematics department), and tell the most inspiring MTE was according to their experience and why the participants called the MTE inspired them. The third interview with PTEs was also conducted in person to elaborate on whether the grounded theory about the inspiring MTE profile had achieved theoretical saturation. In the third interview, the main question asked participants to examine whether the Inspiring-MTE profile needs more properties or not

and to clarify the relationship between component constructs of the profile. Each participant was asked whether the MTE personality or acts – such as providing a sense of comfort, being knowledgeable, providing fun and enjoyable learning, motivating, imparting new insights and comprehension, being authoritative, and being disciplined – inspired them to learn mathematical courses. Interview with MTEs was conducted in person to examine the credibility of research – consistency inspiring-MTEs profile theory constructed by data from PTEs. The main questions asked to inspiring-MTEs were how to motivate, encourage, enhance, or keep students' interest in learning mathematical courses for the long term.

Observations were conducted to check the suitability of the inspiring MTE profiles constructed based on data analysis from interviews with PTEs. The student team made complete observations (Creswell & Creswell, 2018) when inspiring-MTEs taught as usual in the classroom. The researcher made field notes based on these observations. As in the interview transcripts for the PTEs, coding was also carried out on the field notes from the observations and interviews with the MTEs. If there were new codes related to the inspiring MTEs profile, the code would be integrated into the inspiring MTEs profile that had been compiled after the second interview so the conclusion of the inspiring-MTE profile would be obtained. So far, conclusions about the inspiring profile of MTEs had been tentative. This conclusion has been examined in the third interview with PTEs recruited as a theoretical sample. New coding or category on personality and teaching MTEs did not appear in the interview. Thus the research has reached saturation (Charmaz, 2014). Thus, the theory of the profile of inspiring-MTEs has concluded.

Data Analysis

Initial coding, focused coding, and categorization were carried out in this study (Charmaz, 2014; Charmaz & Thornberg, 2021). Memo writing was carried out, from participant recruitment and theoretical sampling, coding, and theory construction, to report writing. Constant comparisons were made from data collection to theory formulation. This study's coding and categorization are meant to make coding and qualitative categories based on interview data. Line-by-line coding helped the researchers understand the participants' experiences and perspectives (Charmaz, 2014). Constant comparison means comparing data with data, data with coding, data with categories, coding with coding, coding with categories, and categories with categories.

Memo writing is the writing of ideas that arise in the minds of researchers, starting from the recruitment of participants to writing theories. The researcher's reflection when coding and categorizing was also written as part of the memo. An explanation of the profile of inspiring-MTEs in this finding is developed from memo writing. The theoretical sample in the grounded theory research approach is the recruitment of participants to inform the categories of codes compiled to achieve theoretical saturation. The grounded theory reaches theoretical saturation when the researcher looks for more data during theoretical sampling, but the nature or characteristics of the categories are not new (Charmaz, 2014; Charmaz & Thornberg, 2021). In short, theoretical saturation is reached when no more coding needs to be added

(Charmaz, 2014). Initial codes were obtained by coding the interview results by selecting words or phrases that summarize the lines or sentences transcribed verbatim. An example of how the author does coding can be seen in Table 2.

Table 2. Example of Initial Coding

Interview	Initial Coding
Interviewer: “Tell me about the one that gave you, Lestari, the most inspiration. Tell me about the personality of the lecturer so you got the inspiration to learn mathematics.”	
Participant: “Actually, to be honest, Sir, yeah, because Mr. Deddy teaches online, it’s scary. It is scary, like you must pay attention to this. But, when offline, learning is different. It’s more relaxed. Sometimes he makes us laugh. Oh yeah, the Calculus. In Calculus, we don’t stress too much, Sir. It seems, e..., ‘you have to understand now’ so he gave us time to study, then search first in LMS (<i>Learning Management System</i>). So, we have time to study for lectures. Then during the lecture, Mr. Deddy gave us time for us to ask what material was not understood. Then, if there was, he explained and gave and related quiz. Relax but seriously. The material will be understood, Sir, when he is teaching.”	<p><i>Being relaxed</i> <i>Being humorous, giving comfort, giving understanding, providing some learning resources, creating interactive learning, carrying out evaluation</i></p>
Interviewer: “What is the importance of humor for the lecturer, Lestari.”	
Participant: “From a humorous point of view, I might have explained in an online interview, Sir, that the lecturer-student relationship is important. Well, for me, personally, I think that the lecturer is humanist if he is friendly”	<p><i>Making a connection, being humanist, being friendly</i></p>

As we see in Table 2, the initial codes generated from the interview were transcribed verbatim. The codes were generated by reading line-by-line interview text. Initial codes were provisional and grounded in the interview data. Codes were kept short, simple, active, and analytic. The most significant and/or most frequently occurring initial codes were used as focused codes and then categorized or grouped according to their characteristics (Charmaz, 2014; Charmaz & Thornberg, 2021). Codes and categories generated through data analysis on interview data can be seen in Table 3.

Table 3. Initial Codes, Focused Codes, and Categories

Initial Codes	F*	Focused Codes	Categories
Being friendly	8	Being Friendly	
Being gracious	7	Being gracious	Creating a sense of comfort
Being humble	3	Being humble	
Being humorous	5	Being humorous	
Being knowledgeable	13	Being knowledgeable	Being knowledgeable
Explaining mathematics application	3	Being knowledgeable	
Being relaxed	10	Providing a relaxed but serious learning	
Carrying out evaluation	13	Carrying out evaluation	Providing fun and enjoyable learning
Creating interactive learning	11	Creating interactive learning	
Giving challenges	15	Providing a relaxed but serious learning	
Giving feedback	11	Creating interactive learning	
Giving ice breaking or game	7	Creating fun learning	
Being motivating	7	Being motivating	Being motivating
Conveying the flow of lectures	4	Explaining in detail, systematically, and easy to	
Explaining in detail	14		
Giving easy-to-reach explanation	6		
Giving instant solutions	4	Sharing creative ideas	
Giving understanding	18	Explaining in detail, systematically, and easy to understand	Imparting new insights and comprehension
Opening the mind	7	Providing scaffolding	
Providing guidance	7		
Proving theorems, formulas, or properties in mathematics	11	Giving understanding	
Sharing creative ideas	3	Sharing creative ideas	
Sharing problem-solving experience	4	Explaining in detail, systematically, and easy to understand	
Being authoritative	8	Being authoritative	Being authoritative
Being disciplined	10	Being disciplined	Being disciplined
Appreciating students' effort	1	-	-
Being enthusiastic	2	-	-
Being humanist	1	-	-
....			

*) The number of student participants who proposed the code

We can see from [Table 3](#) that some initial codes were not included in focused coding because their frequency was small or less significant. Data analysis, according to interview data generated in some categories, begins by providing a sense of comfort until being disciplined. This result achieved saturation in the third interview with PTEs, classroom observation when inspiring-MTEs were teaching, and interview with each MTE. This finding implied that the profile of the inspiring MTE is providing a sense of comfort, being

knowledgeable, providing fun and enjoyable learning, motivating, imparting new insights and comprehension, being authoritative, and being disciplined. Figure 1 depicts the visualization research methodology.

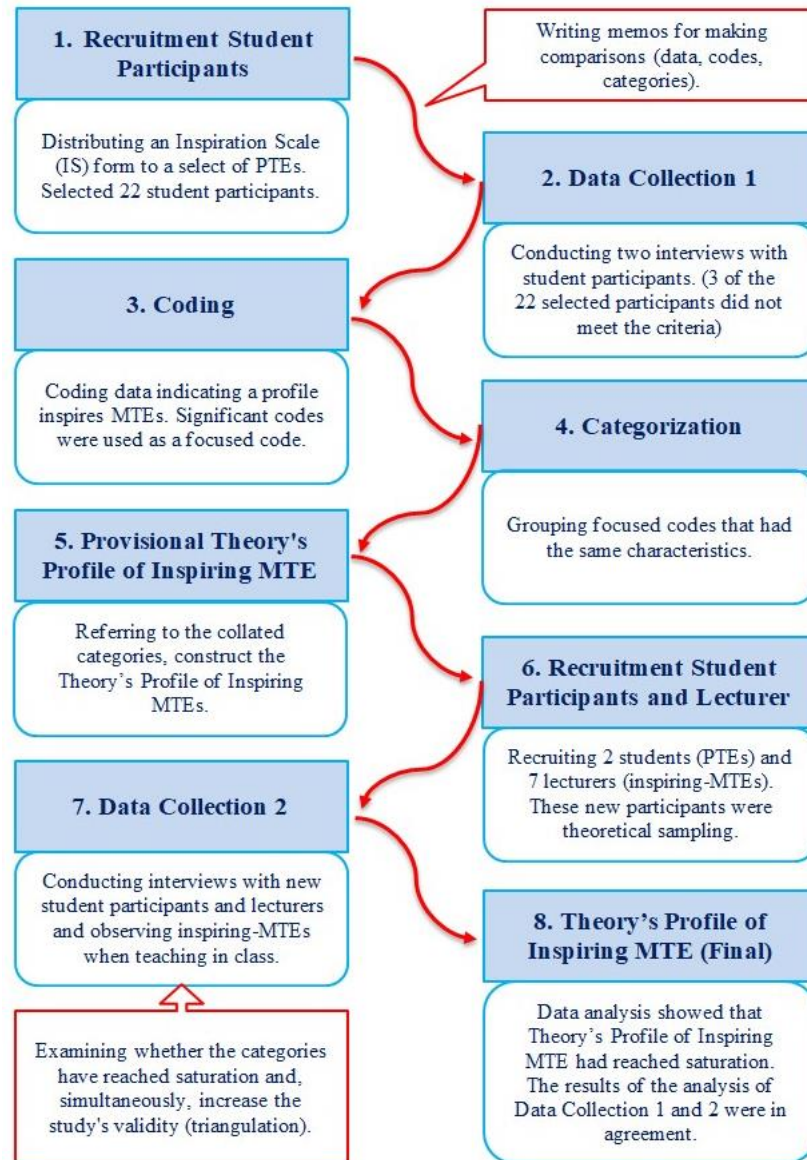


Figure 1. Visual Representation of Construction of Inspiring Mathematics Teacher Educator Profile Theory

Research Quality Evaluation

The grounded theory research validity test was carried out by checking the theory's originality, credibility, resonance, and usefulness (Charmaz, 2014; Charmaz & Thornberg, 2021). *Originality* refers to the novelty of the theory being built, *credibility* refers to the consistency of the data, *resonance* refers to the suitability of the theory generated with participants' experience, and *usefulness* refers to the practical use of the theory. The originality of this research is demonstrated by the presence of an inspiring MTE profile theory

using the inspirational constructs of Thrash and Elliot (2003), which are new. An inspiring MTE theory like never before. Research credibility is indicated by the achievement of theoretical saturation and data consistency from participant interviews with observations of MTE. The resonance of the research is shown by representing the participants' experiences that become insights for others. Meanwhile, in terms of usefulness, it is shown by the practicality of the theory in designing learning.

Results and Discussion

The results of data analysis show that the MTE identified as inspirational in this study is an MTE capable of having a significant positive effect on the participants' mathematical identity, such as understanding sophisticated topics in a course.

In semester one, I studied integral in Calculus 1. In Semester 2, I also learned (integral) in Calculus 2. Semester 3 (I also studied integral in the course) Advanced Calculus. Nevertheless, it was only in semester four that I solved trigonometric substitution integral problems using two times the integration. So, I, Wow! was so glad I noticed how the lecturers behaved in the Differential Equations (course) presentation. Then I want a presentation like that. I practiced at home, and I presented it, and it worked I am also motivated to show that I can, for example, achieve the highest grades. (Dina, Semester 4)

The participant above explained how she connected her mathematical identity with a lecturer who was identified as an inspiring MTE. An MTE that made the participant overcome her inability in a sophisticated topic she identified as an inspiring MTE. Dina, the participant above, previously stated that the same MTE gave her a sense of comfort in learning. The PMT then made the MTE which inspired her as a role model. Data analysis shows that MTEs inspire PMTs by providing a sense of comfort, being knowledgeable, motivating, providing fun and enjoyable learning, giving new insights, and understanding, and being disciplined and authoritative.

Creating A Sense of Comfort

Many participants stated that they got inspiration from MTEs by giving them a sense of comfort. The inspiring MTEs gave a sense of comfort through their gracious, friendly, humble, and humorous personalities. This comfort made participants comfortable communicating with lecturers, especially in gaining new insight or understanding.

Being Gracious

Seven participants (7 from 21 participants) reported that they felt comfortable starting from the gracious personality of the lecturer. Inspiring MTE built closeness with participants. *“The main key before teaching is the ‘bond’ between lecturers and students. It must be established first and starts from the hospitality of the lecturer”* (Lestari, Semester 4). The participant referred to an MTE who she thought was inspiring and had a gracious personality. She stated

that the most important thing in learning is a good relationship between students and lecturers. The lecturers' hospitality made the classroom learning atmosphere less tense so that participants could maximize their interactions with MTE. *"The hospitality makes the learning process in the classroom less stressful"* (Nur, Semester 4). *"If the lecturers are gracious, we can invite good discussions ... If, for example, you need anything, it will be asked"* (Nurul, Semester 4).

Being Friendly

Eight participants stated that a friendly lecturer profile matters in learning because it makes participants feel comfortable.

In my opinion, the most important thing (in learning) is being able to be a friend to students ... When there are strange things, (I ask) 'Ms. Wulan, I do not understand here, so she immediately responds. Some lecturers are afraid of students. So, if something is not understood, we are afraid to ask. Later, I will ask my friends. (Yuli, Semester 6).

Participants stated that when the lecturer became a friend to the participants, they would not hesitate to ask questions when they did not understand. On the other hand, when the lecturer is not friendly, they prefer not to ask even though they do not understand.

Being Humble

Some participants stated that humble lecturers provide a sense of comfort for participants because being humble makes participants not hesitate to give opinions or ask things they do not understand. *"Personally, the lecturer is humble, (I feel) more comfortable. If the lecturer is (willing) to be spoken to by the students, the students feel more comfortable in class. So, (feels) comfortable"* (Lina, Semester 6). *"Humility is important, especially in communication. We are not afraid to ask if the lecturer is humble."* (Nisa, Semester 6).

Being Humorous

Participants explained that a humorous lecturer provides a sense of comfort for participants because, with the presence of humor, participants feel more relaxed and avoid fear. They felt better prepared to learn. In addition, humor also overcomes boredom. Sheryl, a participant, said that Ms. Tari inspired her through her personality: *"Ms. Tari can create learning so that her students don't get bored. The learning is not monotonous, interspersed with jokes"* (Sheryl, Semester 2).

Being Knowledgeable

Thirteen out of twenty-one participants stated that MTEs' broad-mindedness inspired them. Broad insight, in this case, is the knowledge possessed by lecturers and how to apply that knowledge in relevant contexts when lecturers teach. The broad insight possessed by an MTE will also earn his students' respect. *"If a student's insight is wider than that of the lecturer, just imagine, he fears that the lecturer will not be respected"* (Lestari, Semester 4). When a

lecturer does not show how one material is connected to another, even though the materials are still very related, according to participants, it is a failure of an MTE in teaching mathematical subjects. *“If the insight is not broad, for example, what is being taught has something to do with this material, but you don’t know it, it means that the lecturer is not knowledgeable”* (Dina, Semester 4).

Providing Fun and Enjoyable Learning

Fun and enjoyable learning in this study is learning that provide a sense of comfort, fun learning, interactive learning, and carrying out evaluations. Fun learning in this theory is also called ‘relaxed but serious’ learning. The term refers to a relaxed learning atmosphere, but participants still gain mathematical competence and face challenges when working on practice questions, quizzes, or projects. Evaluation refers to quizzes and reflections followed by participants whose results are transparently accepted by PMT.

Providing A Relaxed but Serious Learning Atmosphere

The meaning of a ‘relaxed but serious’ learning atmosphere is based on a learning atmosphere that is free from the tension that suppresses participants. Participants feel free from anxiety and comfortable facing challenges (solving mathematical problems) or achieving competence. A relaxed atmosphere is evident from the learning that emphasizes the understanding of participants rather than completing the material. Learning is interspersed with humor and avoiding tension. A relaxed atmosphere is a requirement for participants to gain understanding, insight, or skills. *“If the learning atmosphere is not relaxed, it will be tense. Surely what is conveyed will not be understood”* (Herlina, Semester 6). The relaxed but serious atmosphere makes learning interesting. Understanding complex material or solving assigned mathematical problems is fun. *“Learning is fun, unique, challenging. We are moved to finish, I see”* (Chintya, Semester 4).

Seven participants stated the importance of ice breaking in the form of mathematical games or simple fun physical activities. *“When the atmosphere is quiet or makes you sleepy, Ms. Utari applies ice breaking, a game but it smells like math”* (Andi, Semester 2). According to participants, icebreaking is in the form of fun physical activities, such as drawing sketches. Participants were asked to draw the faces of their friends. Other students were then asked to guess to whom the sketch of the face belonged. This icebreaking is important for the participants because, with this activity, they are more relaxed, especially in calculating courses. *“Mathematics education students, especially when the lessons are all counting, usually require ice breaking, because students are bored, especially in the afternoon lessons, they are usually sleepy. If given ice breaking, it is usually fresher”* (Riska, Semester 2). However, other participants stated that such icebreaking was unnecessary if the learning was relaxed, and the lecturer felt comfortable.

According to some participants, icebreaking is needed during the lecture in classes that enter the afternoon or evening. Ice breaking is also needed when students feel less enthusiastic so that it can be held at the beginning of learning. It can also be in the middle of

learning. *“After the ice breaking, we immediately got excited about topic, maybe that was one of the methods that made me very inspired”* (Chintya, Semester 4).

Creating Interactive Learning

The interaction between lecturer-students and student-student aims to increase participants' understanding. This interaction can refer to the lecturer's feedback on questions or participant presentations. *“In my opinion, (interaction) must be balanced between students and lecturers”* (Ellis, Semester 4). One participant stated that he was excited when the learning used was student-centered. *“We are excited because we need to understand the material more deeply. Because things that are not understood, are explained again by the presenter. And, after the speaker explained, there was a question-and-answer session from the lecturer”* (Andi, Semester 2).

The inspiring feedback from PMT provides participants with an understanding and a fun learning environment. *“... for example, we have been given a project, then we have explained and there is a session where we correct it from the lecturer, from there I get more inspiration. Because, right, usually (when given feedback, I'll pay attention), ‘ohh, this is wrong, here's how to explain it ... ohh, like this’ from there, I got the inspiration, ‘ohh, it turns out like that”* (Riska, Semester 2). Interactive learning demonstrated by discussion, feedback, and scaffolding from inspiring PMT provides participants with a fun and understanding learning atmosphere.

Carrying out Evaluation

Giving an evaluation makes participants know their abilities and what needs to be done to overcome their shortcomings or weaknesses. *“Through the evaluation, we will know, ‘oh, this is the thing that need to be improved or to make it better”* (Riska, Semester 2). Participants stated how meaningful quizzes were as part of learning. Some participants stated the importance of providing opportunities for participants through assignments when they found out that they were lagging in the evaluation results. Giving them a 'second chance' inspires them. *“Suppose I got a score of sixty and I wanted to improve my score and Mr. Affandi allowed me by giving me a project. This experience encouraged me to apply it to my students in the future”* (Andi, Semester 2).

Motivating

MTE's inspiring personality profile and teaching methods encourage all participants to learn mathematics. This section discusses motivating, specifically, lecturers who express motivating sentences or share experiences that motivate participants. Seven participants stated that the inspiring MTE must motivate. *“Mr. Affandi told his experience when he was in college. I was very impressed when the lecturer shared his experience in doing the questions. He explained how he learns and solves problems”* (Sabrina, Semester 6). *“The enthusiasm for learning that Mr. Affandi showed inspired me. Stories that inspire lecturers help increase motivation”* (Lian, Semester 4).

Imparting New Insights and Comprehension

All MTEs identified as inspiring were able to provide an understanding of complex material according to data analysis. *“In my mind it is difficult, but the way the lecturers convey it looks so easy. It’s easy to understand. So, I was inspired to see how this lecturer easily delivered complex things. (Chintya, Semester 4).”* Participants’ understanding emerged when the MTE learning activities used language that was easy to understand, explained in detail and systematically, and provided scaffolding. MTEs give new insight and understanding by explaining in detail, systematically, and easily understood, sharing creative ideas, and providing scaffolding.

Explaining in Detail, Systematically, and Easy to Understand

Participants will always be faced with formulas, theorems, or properties in mathematical courses. Therefore, participants hope that MTE makes participants understand how the formula emerged and how to apply it in problem-solving. To fulfill this expectation, the inspiring MTE provided detailed and systematic explanations that were easy to understand. *“The lecturer explains it in more detail and Mr. Affandi explains in detail the formula, so I understand where the formula came from” (Anisa, Semester 6).*

Sharing Creative Ideas

Creative idea-sharing learning refers to the idea of how to understand something in a new way, such as quick ways to solve problems and provocative statements or questions that make participants think. It was an inspiring moment when participants got questions or statements that challenged their understanding. *“In learning, in my opinion, a lecturer’s personality that is provocative in a positive way is needed... It encourages students to do something” (Nurfah, Semester 4).*

Providing Scaffolding

Inspiring lecturers use questions or statements as scaffolding to gain understanding through more effective participant thinking activities. The scaffolding gives a sense of pleasure to the participants. *“I like Trigonometry that Mr. Affandi teaches. Mr. Affandi explained, then asked so that we could understand the material better” (Elly, Semester 2).*

Being Disciplined

Half of the participants shared their experiences of how MTE inspired them through the disciplined personality of their lecturers. Disciplined MTEs made them also disciplined. The participants’ experience of seeing how a lecturer consistently appreciated their time for participants was unforgettable. *“On March 22 (2022), in the morning, Mr. Budi was still on duty. Then the landing time of the plane was right during our lecture hours. But he really values time. So, after landing from the plane, he immediately taught” (Lacey, Semester 4).*

Being Authoritative

For the eight participants, an authoritative personality is defining for an inspiring lecturer. Another participant stated that this personality is essential but does not determine whether lecturers why are called inspiring lecturers. “*In my opinion, the character of the lecturer who inspires is the first to be authoritative*” (Chintya, Semester 4). This authoritative personality is a balance so that the comfort provided by MTE does not make students too relaxed and still gives respect to the lecturers.

We can see that the finding above, inspiring-MTEs profile theory, resonances with one of the most inspiring-MTEs, Utari (Advanced Statistics Lecturer), in this research. She explained how she inspired her students more completely than other MTEs in the interview:

I get students more interested in learning or more motivated to learn by starting the activity by telling them the goals and benefits of studying the material. I show how it applies to their everyday lives. Also, we can encourage and motivate them by asking them why they are in class or studying and reminding them of the reason or end goal. It could be because ‘you want to make your parents happy; you want to get good grades, you want to graduate on time, or you want to get a bachelor’s degree.’ When choosing ways to learn, lecturers should also consider what their students are like. This method will make the class more fun. If the class is comfortable and fun, the students will be able to learn and understand the material well. I also give students some freedom in class and often break the ice to keep them from getting bored after learning. I help students understand the big ideas behind their learning and make classes fun and relaxed. It also shows how the material fits into their everyday lives or what they usually do. So, what they learn will have more meaning in the long run. I break up the material and learning goals into several parts so that students do not have to learn everything. Also, at the end of every lesson, I always test the student’s understanding of what they have learned by giving them an evaluation. If necessary, information from the last meeting will be brought up at the next one.

We can see that the lecturer motivates PTEs through the presented topic and reminds PTEs of the purpose of studying. Ms. Utari shared her insights on applying math topics and creating a fun learning environment for PTEs. She gave an understanding PTEs by dividing the topic into sections and providing evaluations. The learning carried out by inspiring MTE follows the profile of the theory built, as shown by this study. MTE observation corresponds to the theory’s profile of inspiring MTEs. Her character was friendly, humble, and creative. Her explanations were thorough, simple, and replete with creative ideas. The learning environment was enjoyable since she interacted with students, and students felt comfortable speaking with her. The learning contains humor and icebreakers to keep the student from becoming bored. In addition, the educator did evaluate at the end of the course and always offered words of encouragement. She conducted diverse learning models, such as dialogues and *learning by doing*, involving student participation in the learning process.

The results of data analysis show that inspiring MTEs have a profile of providing comfort, being knowledgeable, motivating, providing fun and enjoyable learning, imparting new insights and comprehension, and being disciplined and authoritative. An MTE identified as inspiring does not necessarily have all these profiles. MTE’s warm, friendly, and humble personality opens a good relationship between MTE and PMT. The good relationships forged

by educators provide opportunities for inspiration to enter students' consciousness (Barnett, 2007; Lamb & Wedell, 2013). From the energy aspect, MTE teaches with fun and provides challenges and feedback. Lamb and Wedell (2013) state that every teacher can inspire through any learning method because the cue to inspiring lessons is how to make personal connections with students. This good MTE-PMT relationship will encourage a sense of social integration and belonging to students that support achievement in learning mathematics (George, 2012).

The MTEs profile that inspires this grounded theory has similarities with the inspiring lecturer model, according to Derounian (2017). According to the research, the inspiring lecturer model consists of three most important characteristics: motivating, encouraging, and passion. The profile of MTE according to this grounded theory also has similarities with the model of a good lecturer according to the research of Su and Wood (2012), which is being broad-minded, willing to help, providing inspirational teaching, humorous, and providing quick feedback. Research results from Cornejo-Araya and Kronborg (2021) state that inspiring teacher models for gifted children are teachers who are knowledgeable and passionate, create an academically safe learning environment and teach outside and above the regular curriculum. The teacher's model that inspired this research corresponds to the MTE model that inspired this researcher on knowledgeable aspects of personality that create a pleasant learning atmosphere. Lamb and Wedell's research (2013) show that inspiring English educators are educators who are patient, attentive to the needs of students, encourage, pursue their profession, or have an impressive knowledge of the subject. The research also shows conformity with the grounded theory of the MTE model that inspired this research.

In this finding, enthusiasm does not appear clearly as part of the character or personality of MTE that inspires because data collection and analysis are sporadic for participants to associate this character with the character of an inspiring lecturer. (The MTE profiles presented in this grounded theory are sourced from significant focused coding for participants and researchers). Therefore, despite having an enthusiastic personality present in the initial coding, focused coding is no longer included. Meanwhile, humor can be seen as part of the character of MTE that inspires this grounded theory and can also be seen as part of the pedagogical qualities possessed by MTE. Pure mathematics often looks dry and rigid and makes students psychologically depressed because of the sizeable cognitive burden in understanding mathematical definitions, properties, theorems, or problems. Humor can overcome this mental stress. So, it is unsurprising that many participants identify Inspiring MTE with a humorous personality. According to Sviatlana et al. (2021), using humor as a pedagogical tool can help create conditions for developing professional activities and improving professional competence.

Interestingly, many participants perceive and identify MTE as an inspiring discipline with character. Participants associate the discipline as a fundamental character (Barnett, 2007) and must be possessed by educators as part of character education (Lickona, 1999). As Wang (2022) found, educator self-discipline can increase student motivation. Participants realized that self-discipline is one aspect of achievement (Lukman et al., 2021) and that MTE should be exemplified. Unsurprisingly, the MTE that inspires this grounded theory has an authoritative character. Participants realized that a personality that provides comfort and a fun and enjoyable

learning atmosphere must be balanced by the MTE authority to maintain respect from PMT (Ketterman & Maner, 2021) and be conducive to learning (Popa, 2012). So, an authoritative personality is part of MTE, which is a good thing.

New insights in this grounded theory can be in the form of knowledge about the origin of a formula, proof of mathematical properties or theorems, quick ways to solve problems, and insights from MTE's experience in solving math problems. The participants in this study did not all logically study reasoning or mathematical logic. At the same time, in senior high school, they had to develop their understanding further when dealing with theorems. This case is the same as that faced by students taking Calculus in research (Case & Speer, 2021) who have difficulty reasoning on theorems. Participants need to understand how to think mathematically, which is identical to problem-solving, such as how to prove a theorem. Therefore, participants need a detailed, systematic, and easy-to-understand explanation. Both discussions and explicit explanations from lecturers are needed by PMT (Hodges & Hodge, 2017). The nature of inspiration that provides new and better possibilities is inseparable (Thrash, 2021; Thrash & Elliot, 2003; 2004). When experiencing inspiration, we can say that an MTE gives new insights and comprehension. This finding also shows the idea of Kaasila (2007) that the mathematical identity in the construction is under the PMTs' learning experience.

On this grounded theory, MTE that inspires creating fun and enjoyable learning has a relaxed but serious atmosphere, interactive learning, providing guidance, sharing creative ideas, and providing scaffolding and feedback. Interactive learning in this grounded theory refers to student-student and student-lecturer discussion opportunities. Fun in this grounded theory challenges PMTs in building their mathematical thinking skills (Li & Schoenfeld, 2019). The challenge comes when learning a new topic, assignments, projects, and quizzes. When trying to face difficulties in learning a topic, such as a deadlock in proving a theorem, MTE is expected to be present to provide support by providing scaffolding. This grounded theory reaffirms the vital role of scaffolding in improving quality mathematics learning (Nursaodah et al., 2022; Op 't Eynde et al., 2021). Likewise, feedback from MTE plays an essential role in learning (Op 't Eynde et al., 2021; Su & Wood, 2012). Especially when PMT makes a presentation or after PMT shows its performance.

MTE plays a vital role in building the mathematical identity of the PMT. Inspiring MTE can be a role model or inspiration source that triggers or enhance PMT motivation. Therefore, institutes for development learning and quality assurance at universities that prepare PMT to become qualified future teachers must pay attention to the personality of MTE. Inspirational personality is expected to be grown and developed in universities. A lecturer who has an inspiring MTE profile like this finding is the potential to develop pedagogy for inspiration Barnett (2007). This pedagogy is vital in the Mathematics Education department because this department prepares future mathematics educators. Increasing mathematical (thinking) skills will increase PMT motivation if the pedagogy is implemented. Problems in mathematics education can be reduced or also anticipated through this pedagogy. This finding reinforces that MTEs must implement pedagogical or psychological knowledge for learning support (Baier et al., 2019). This finding is

needed to build a positive relationship with PMT. Integrating this finding in mathematics pedagogy courses will further prepare PMT to become an inspiring educator in the future.

As we said before, the theory found in this study is not to be generalized to various times, places, cultures, or situations (Charmaz, 2014). As is generally the case with qualitative data collection, the leading data in this study were sourced from interviews. The credibility of the grounded theory in research is highly dependent on the truth of the participants' narratives. Participants in this study also came from the same university, so the grounded theory built through research perhaps only applies to the university where the research is conducted. Different inspiring MTE profiles generated in this finding exist. MTE that inspires in this study, in some ways, is very individual because the nature of inspiration itself tends to be individual (Thrash, 2021). Based on data analysis, the same MTE could be inspirational for one participant but less inspirational for another participant. While inspiring MTE's profile may very well be individualized, it does not diminish the significance of pedagogy of inspiration in higher education.

Conclusion

The results of this study indicate that inspiring MTE has a profile: "providing a sense of comfort, being knowledgeable, being motivating, providing fun and enjoyable learning, imparting new insights and comprehension, being disciplined and authoritative." According to this theory, an inspiring MTE creates a sense of comfort through their gracious, friendly, humble, and humorous personality. Fun and enjoyable learning in this study is learning that provides a sense of comfort, fun learning, interactive learning, and carrying out evaluations. MTEs give new insight and understanding by explaining in detail, systematically, and easily understood, sharing creative ideas, and providing scaffolding.

This grounded theory is built from the experiences of students who are prospective mathematics teachers. Further research in developing a grounded theory of inspiring mathematics teacher educator(s) will be very well carried out in the context of prospective mathematician students. This inspiring mathematics teacher educator research is also outstanding in using more than one university research setting. Likewise, research on mathematical experience at the primary and secondary education levels is highly recommended. Future research is crucial because an inspiring mathematics educator determines the mathematical identity of a student.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies, have been covered completely by the authors.

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