The analysis of learning obstacle of mathematics belief

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Abstract. Mathematical beliefs are essential to be improved, especially for mathematics education students, to be more optimistic in overcoming difficulties. Accurate beliefs affect how students “welcome” mathematics lessons. However, the reality is that many mathematics education students still think that mathematics is an ambiguous, abstract, complicated, formulaic subject so that they experience excessive anxiety when learning mathematics. This study aims to knowledge and analyses the learning barriers faced by prospective teacher students in developing mathematical beliefs at FKIP UHAMKA Jakarta. The instrument used was a belief questionnaire for preservice students. This study focuses on the description of 3 (three) components of mathematical belief, namely the object of mathematics education, class context and itself.

1. Introduction

Teacher education is a priority program to improve the quality of human resources. Pre-service teacher students are educated to explore their abilities both pedagogically, professionally, personally and socially because the teacher is one of the factors that determine the quality of learning. Qualified teachers will produce quality students, so teacher education becomes one of the essential aspects of providing competent teachers. Math teacher competency is an 'integrated set' or 'combination' of mathematics teacher skills, knowledge, values, and beliefs. [1] Teacher competence is essential because teachers are necessary for the creation of new culture and new values that benefit students. [2] There have been many regulations governing the importance of developing teacher competency. Teacher education requires that graduates have the knowledge and competence to prepare students for a competitive society. [3]

The expertise in question is not only related to cognitive abilities, but also its useful aspects, namely belief. The development of knowledge in prospective teacher students because of knowledge in mathematics will affect how he teaches later. Purwanto et-al. Says that mathematical understanding plays a vital role in giving direction to teachers to make decisions and their behavior in mathematics classes. [4] Belief can arise from the desire to manifest itself to act and succeed.[5] Then, mathematical belief is essential when they become a student and later when they have entered into society.[6]

Mathematical belief affects how students “welcome” mathematics lessons, [6] which is the result of experience. Mathematics Education Study Program students who later will be educated to become mathematics teachers are known to experience still difficulties in dealing with mathematics. That can be seen when studying mathematics; they are often not confident in explaining the mathematical material studied. They look unsure about learning mathematics. Whereas with ethical, accurate beliefs,
prospective teacher students are expected to be able to realize the potential situation to be able to think forward mathematically.[7]

If pre-service students have the right beliefs, then they will try even more in learning mathematics, because ideas have a direct relationship with one's business, so beliefs become the foundation of learning.[8] However, this does not appear to students when dealing with math problems, more quickly discouraged and unsure of their own. Mathematical belief is part to improve especially for mathematics education students to more motivation in overcoming difficulties. For a pre-service teacher of mathematics, having a positive belief in learning mathematics, it is very helpful to become a professional mathematics teacher in the future. [7]

In this study, three things affect the beliefs of mathematics, which are related to the content of mathematics, the context in the classroom, and itself. Based on the background of the previous history, it is necessary to research the analysis of learning difficulties towards the mathematics of prospective teacher students.

2. Methodology

2.1. Participants and Contexts
This study was conducted to analyze the barriers to student learning, especially regarding the difficulty of challenging mathematical beliefs. This research method is qualitative descriptive, which aims to describe the obstacles associated with accurate ideas. The study was conducted at one of the Lembaga Pendidikan Tenaga Kependidikan (LPTK) in Jakarta ist the 5th-semester students Mathematics Education Study Program totaling 124 respondents. The intended mathematical skill focuses on three dimensions, namely the content of mathematics (mathematics as a certainty of knowledge), the context in the classroom (such as the role of the teacher and the learning of mathematics as a systematic process) and itself which is related to innate abilities and fast learning abilities.

2.2. Data Collection and Analysis

2.2.1. Questionnaire. The questionnaire about mathematical belief was given to prospective teacher students to collect responses about the views of mathematics while attending learning in lectures. Indicators of understanding in mathematics clarified into 5 (five) signs, namely certainty of knowledge, the role of lecturers, systematic processes, innate ability, and quick learning [9] with five answer choices in the form of a rating scale. Before done instrument validity and reliability.

2.2.2. Observation. Perform direct addressing during lectures on campus. This observation was conducted to obtain and explore information about the learning difficulties of prospective teacher students, which has an impact on their mathematical beliefs.

2.2.3. Interview. The purpose of the meeting is to find information related to mathematical beliefs. The discussions conducted with respondents who had low, medium and high levels of accurate ideas. Also, interviews conducted with several lecturers who taught the students.

2.2.4. Analysis of documents. After getting the results of a mathematical belief questionnaire and interviews with relevant parties in research, to produce a more reliable report. Existing documents analyzed. In general, this research activity is seen in the following figure 1.[10]
3. Results and Discussion

3.1. The Certainly of Knowledge
The first dimension of mathematical beliefs is related to the certainty of knowledge. That revealed that trust in mathematics meant to see mathematics as a definite and unchanging content of experience. That gives meaning to give confidence to the truth. The results of the statements given to respondents from 10 items about beliefs related to knowledge certainty shown in Figure 2.

![Figure 2. Average response about knowledge certainty](image)

Of the 10 (ten) questions that given the most items agreed by respondents was item number 2 that "learning mathematics made me gain new knowledge" and the lowest or not approved by respondents was item number 6 that "I am confused about practicing mathematics in everyday life -day." The results of observations and interviews with prospective teacher students, from their mathematical belief level, conveyed that they found it challenging to apply explicit materials such as algebra, real analysis, and trigonometric identities.

3.2. The role of lecturer
The second dimension of mathematical beliefs is the role of lecturers. That is to provide the understanding and provide confidence that the knowledge taught is beneficial. In this second dimension, 16 statement items given. The results of the statement given to 124 respondents from 16 details about beliefs related to the Role of Lecturers presented, as shown in Figure 3.
Figure 3. Average response about the role of lecture

Of the 16 items above, the highest average in item number 6 is that “attention and motivation of the lecturer in learning mathematics make me eager to learn.” While the lowest average items are number 5 and number 12 that "I am annoyed at the mathematics lecturer who is lazy in checking assignments." and "Lecturers who pay less attention to the different ways of learning of their students." The results of interviews and observations of students said that they were accustomed to having lecturers who rarely checked the assignments, which made it less annoying if the lecturers did not check duties. And they are delighted if the lecturer gives attention and motivation in learning. That way students feel they have the confidence and confidence that they can attend lectures well. Teacher knowledge and beliefs are known to play crucial roles in shaping teacher teaching practice regarding mathematical problem-solving.[11]

3.3. Systematic Process

The third dimension is a systematic process, that learning in class is carried out sequentially according to the development of the cognitive structure of students. The results of the questionnaire are presented in Figure 4 below:

Figure 4. Average response about systematic process

In the picture above, it is known that item number 13 is the statement most agreed by respondents that "quiet classroom supports my learning." While item number 10 is the least approved by respondents, a statement that “comfortable atmosphere makes the concentration of learning
mathematics increase." Confirmation from the results of interviews and observations that the systematic process will run better if supported by excellent infrastructure and environment. But they said they would concentrate more if their minds had no problems. So the internal factors of students directly affect their concentration in learning.

3.4. Innate Ability
The fourth dimension of belief in mathematics is a natural ability, innate ability included in the internal factors of students that can affect the way students look. Examples of innate abilities include intelligence and interest. Average responses to fundamental skills presented in Figure 5.

![Figure 5. Average response about innate ability](image)

The results of the responses showed item number 1 was more approved by students, that "they were trying to do math assignments on their own." And item number 3, which is not supported, is a statement that "learning mathematics I always accept help from others." Interviews and observations show that they majored in Mathematics Education because of direction from parents. They realize that their mathematical ability is still relatively low. They know that there are still often difficulties and fears in solving more complex mathematical problems. However, they realize that what is more important in learning is enthusiasm and motivation to study harder.

3.5. Quick Learning
The final dimension of the proposed mathematical belief is fast learning. Fast learning included in the innate abilities of students. This fast learning can increase through regular and measurable experiences and exercises. The results of responses to mathematical beliefs related to fast education are presented in Figure 6 below:

![Figure 6. Average response about quick learning](image)
From the four items statement about the fast learning process above, the highest average in item number 3 is not much different from item number 2, which states that “they can solve math problems faster than the others.” Whereas the low number approved is item number 4, a statement that "I need to read more than three times to understand mathematical material." The results of interviews and observations to students that they need time to understand abstract mathematical material and analysis, such as in theoretical algebra courses, real analysis, and complex analysis.

Mathematical Belief is a first step or a person's self-stabilization of mathematics coupled with seriousness in which its nature contains truths that are still subjective. In belief, there is also learning that can help understand themselves and their environment because the process of belief formation influenced by factors that exist within and outside oneself. In general, the five dimensions of belief in mathematics shows in Figure 7 below.

![Five dimensions of mathematical belief](image)

**Figure 7.** Five dimensions of mathematical belief

### 4. Conclusion and Implication

The following are the conclusions obtained in this study. Of the 5 (five) dimensions used to assess mathematical beliefs. There are four types of learning constraints related to accurate theories namely 1) obstacles in practicing mathematics in everyday life [12] 2) barriers to the role of lecturers about assignments and attention and motivation to their students, 3) related to classroom facilities and conditions, 4) related ability in students. Finally, the authors suggest that the learning process emphasizes more on the practice of daily life. Lecturers or instructors should be more motivating and give more attention to prospective teacher students in teaching. Lecturers are expected to make learning in the classroom more enjoyable, for example, with varied learning models, games, icebreaking or innovative learning media, so that they can imitate them to practice when they teach later. And finally, prospective teacher students at the beginning of lectures are essential to provide awareness of the importance of mathematics, and mathematics is not a material that is difficult to understand.

From the picture above, the mathematics beliefs of prospective teacher students are, on average still low. The five means above, fast learning has the lowest value compared to the others. The ability to learn quickly influenced by the motivation and perseverance of students in exploring knowledge. Student habits in training themselves in learning. Belief in mathematics is one of the useful aspects
that influence students' success in learning mathematics. [5] Also, the development of mathematical views is essential nowadays because the beliefs in mathematics will change the way they choose their learning models later. [13] Teachers’ expectations related to mathematics encompass their views about the nature of mathematics, mathematics teaching (and learning), and assessment. [14]

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