

Conscientization On Dimensions Of Mathematical Beliefs Among Prospective Teachers At Secondary Level

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Abstract

The success of all students has an intimate relationship with good teachers and one of the main components of student's success will depend upon the belief about the subject. The method of education must start from the life situation and reality of life and the teacher has a vital role in the development and influence of belief. The effectiveness of teaching depends upon teacher's different types of skills, beliefs, feelings, emotions etc. Beliefs have generally been perceived through the personal experiences and interactions with immediate environmental setting. Our curriculum focuses on the aspects of cognitive development of students but the hidden aspect of teaching and learning activities is 'belief'. This society needs the teachers who are innovative and make changes according to the needs of the students. This study focusses to explore the responses of prospective teachers towards their belief in mathematics. Many researches argued that individual's belief influences in modification of their behaviour and ability to make decisions throughout the life by focusing on these beliefs. The purpose of study is to identify the beliefs about the nature of mathematics, beliefs about mathematics in daily life, beliefs about competence in mathematics, beliefs about mathematics teaching and learning among prospective teachers. The study adopted survey method. Sample for the study consisted of 60 prospective teachers in mathematics. The tool used for collecting the required information is Mathematical Belief Inventory consisting of four dimensions: the beliefs about the nature of mathematics, beliefs about mathematics in daily life, beliefs about mathematics teaching and learning, and beliefs about competence in mathematics. The percentage analysis reveals that prospective teachers have high beliefs that mathematics increase thinking power, includes abstract concepts, develops logical thinking, develops scientific thinking, helps in day today activities, has its own formula, symbols and rules and uses different methods in teaching and learning.

Key words

Mathematical beliefs, Prospective teachers.

Introduction

Mastery of mathematics in teaching and learning is a key element that influences success in education and in future society. Students' mathematical learning processes and success are influenced by cognitive and affective factors. Affective factors may be as important as cognitive factors for mastery of learning. These affective factors included mathematics related beliefs such as students' mathematical beliefs towards mathematics, beliefs on mathematical competency, motivational beliefs, beliefs about learning context, beliefs about social context, which impacted mathematical performance (Schunk & Grootenboer, 2004). Success of every student depends upon the effectiveness of delivering the content knowledge by teachers. Knowledge about how to make teaching simple and use of appropriate teaching method in order to understand concept is related to the belief and commitment of teachers towards pedagogical practices in the classroom (Fennema & Frankle, 1992). Turner, Christensen and Meyer (2009), conducted a study on teachers' beliefs about student learning and motivation and their manifestation in classroom instruction. The study concluded that teachers' beliefs play a significant role in shaping their instructional behaviours, what students learn, it is important to examine their characteristics, their content and their expression.

Studying teacher beliefs is an important prerequisite to changing and improving teaching at school; nevertheless, we ought to keep in mind that student also develop beliefs and that these beliefs have a crucial influence on their mathematics learning. Pehkonen (1997) categorised belief into several parts: beliefs in mathematics as a discipline, beliefs about teaching and learning and beliefs about mathematics learning. A number of studies described that, there are many factors which influences the teaching process among prospective teachers. "Knowing" mathematics means being skilful and efficient in performing procedures and manipulating symbols without necessarily understanding what they represent (Thompson, 1992). According to Raymond (1997), mathematical beliefs refer to the beliefs of mathematics as discipline, how mathematics is learned and teach. McLeod (1992) stated that there are four categories of mathematical beliefs among students. Beliefs about mathematics, beliefs in self-including, self confidence in learning mathematics, beliefs about teaching and beliefs in social context. According to Op't Eynde and De Corte (2003). students mathematical related beliefs system are constituted by their beliefs about mathematics education, beliefs about the self and beliefs about the class context. Also point out that the category beliefs about mathematics education contain: students' beliefs about mathematics, about mathematical learning and

problem solving, beliefs about mathematical teaching. Students' beliefs about the self-refer to their intrinsic goal orientation beliefs related to mathematics, extrinsic goal orientation beliefs, task value beliefs and self efficacy beliefs. The category beliefs about students' specific class context, one can differentiate between beliefs about role and the functioning of their teacher, beliefs about the role and functioning of the students in their own class about beliefs about socio- mathematical norms and practices in their class.

It is a well-known fact that good teachers have a tremendous impact on students understanding, quality of learning and students' achievement. If students' beliefs can be positively influenced by their teachers, then students' actions can be positively influenced, which means that students' achievement in mathematics will improve. Smith (2014), conducted a study on how teacher beliefs about mathematics affect student beliefs about mathematics. There is no indication from this study that what teachers believe about mathematics affects what students believe about mathematics. Study also concluded that teachers generally do not actively think about their mathematical beliefs when creating lesson plans and when teaching. According to Pajares (1992), beliefs of teachers about mathematics, mathematics teaching and learning have important role in determining how teachers make students learn mathematics. During the teaching process, teachers must convey their beliefs in an intension of practice. In mathematics education, mathematics beliefs are seen as a predictor of successful teaching; therefore, it is important that the beliefs held by prospective teachers with respect to the mathematics. Thus, the present study aims to identify major dimensions of mathematical beliefs and to analyse the factors influencing these dimensions among prospective teachers at secondary level.

Objectives of the study.

- To identify major dimensions of mathematical beliefs
- To analyze the mathematical beliefs of prospective teachers at secondary level.

Methodology

The study adopted survey method.

Sample

The population for the study comprised of prospective teachers among various BE.d colleges of Kerala state. The present study was conducted on a sample of 60 prospective teachers at secondary level selected from of Kozhikode and Thrissur districts of Kerala state.

Tool

The tool used for collecting the required information is Mathematical Belief Inventory (Niranjana & Ganisha, 2018). The inventory was constructed on the basis of mathematical beliefs by considering the dimensions such as nature of mathematics, mathematics teaching and learning, mathematics in daily life and competence in mathematics. The tool consisted of 34 items. The reliability and validity of the tool was ensured by the developers. The reliability was ensured through test re-test method and also by split half method. The reliability coefficient obtained is 0.67 and 0.74 respectively. The validity of the tool is ensured through face validity and the criterion related validity coefficient is 0.69. The indices of validity and reliability reveals that the tool is highly reliable and valid.

Analysis and Discussion

In order to analyze the mathematical beliefs of prospective teachers at secondary level percentage analysis were used. The result of percentage analysis on the dimension on the belief about nature of mathematics is given in Table 1.

Table 1. Beliefs about Nature of mathematics among Prospective Teachers

No	Item	Percentage of agree	Percentage of disagree
1	Easy verification of result	28.3	71.7
2	Develops scientific thinking	95	5
3	Develops logical thinking	98.3	1.7
4	Accurate subject	95	5
5	Increase thinking power	100	0
6	Have exact answer	91.6	8.4
7	Gives importance to factual data	83.3	16.7
8	Has its own formula, symbols and rules	98.3	1.7
9	Includes abstract concepts	100	0
MEAN		87.76	12.24

Table 1 shows the beliefs about nature of mathematics of prospective teachers at secondary level. Among the prospective teachers, only 28.3 percent of prospective teachers agreed that result in mathematics can be easily verified, 95 percent of prospective teachers have the opinion that mathematics develops scientific

thinking, 98.3 percent prospective teachers believes that mathematics develops logical thinking, 95 percent of prospective teachers replied that mathematics is an accurate subject, 100 percent supports that mathematics increases thinking power, 91.6 percent think that mathematics have exact answer, 83.3 percent of prospective teacher's beliefs hat mathematics gives importance to factual data, 98.3 percent explained that mathematics has its own formula rules and 100 percent of prospective teachers agreed that mathematics includes abstract concepts.

Table 2.

Beliefs about mathematics in daily life

No	Item	Percentage of agree	Percentage of disagree
1.	Represents real world	50	50
2	Possibility of diversified activities	91.6	8.4
3	Helps in day today activities.	93.33	6.67
4	Must for banking transaction	100	0
MEAN		83.73	16.26

Table 2 indicates the beliefs about mathematics in daily life of prospective teacher at secondary level. Among the prospective teachers, 50 percent of prospective teachers marked their agreement that mathematics represents real world, 91.6 percent agreed that mathematics has the possibility of diversified activities. 93.3 percent agreed that mathematics helps in day today activities and 100 percent supported that mathematics must support for banking transaction

Table3.

Beliefs about mathematics teaching and learning

No	Item	Percentage of agree	Percentage of disagree
1.	Uses different methods	96.6	3.4
2	Clear rules for solving	88.3	11.7
3	Expanded through proper learning activities	85	15
4	Organize learning activities in an interesting way	80	20
5	Develops one's own strategy in learning process	65	35

6	Develops critical thinking	58.33	41.67
7	Have solutions by analyzing causes and effects	91.6	8.4
8	Forms general rules	91.6	8.4
MEAN		82.05	17.95

Table 3 depicts the beliefs of prospective teachers at secondary level about mathematics teaching and learning. Among the various items, the percentage of agreement of teachers to the beliefs that mathematics uses different methods, clear rules for solving, mathematics expanded through proper learning activities, mathematics organize learning activities in an interesting way are 96.6 percent, 88.3 percent, 85 percent, 80 percent respectively. Among the prospective teachers, 65 percent of prospective teachers agreed that mathematics develops one's own strategy in learning process, 58.33 percent supports that mathematics develops critical thinking., and 91.6 percent of prospective teachers agreed that mathematics have solutions by analysing causes and effects and it forms general rules.

Table 4.

Beliefs about competence in mathematics

No	Item	Percentage of agree	Percentage of disagree
1.	Finding solutions to mathematical problem is not difficult	31.67	68.33
2	Discover things themselves	58.3	41.7
3	Includes easily understandable ideas	11.67	88.33
4	Can find solutions through hardworking	91.6	8.4
5	Learned by rote learning	68.33	31.67
6	systematic study	80	20
MEAN		56.93	43.07

Table 4 indicates that the beliefs about competence in mathematics, majority of prospective teachers marked that finding solutions to mathematical problem is difficult (68.33 percent), and mathematics students

discover things themselves (58.3 percent). Only a few prospective teachers at secondary level believe that mathematics includes easily understandable ideas (11.67 percent). The majority of prospective teachers believe that mathematics solutions can find through hard working (91.6 percent), mathematics can learned by rote learning (68.33 percent), and mathematics includes systematic study (80 percent).

Conclusion

By analysing the data, it is observed that more than 80 percent of prospective teachers marked their positive beliefs towards nature of mathematics (87.76 percent) and beliefs about mathematics in daily life (83.73 percent). More than half of the prospective teachers marked their agreement towards beliefs about competence in mathematics (56.93 percent). The above result shows that the most influencing dimension of mathematical beliefs among prospective teachers is the beliefs about the nature of mathematics. The effectiveness of teaching is not only depending up on the skill of the teachers but also depends upon the feelings, attitude and beliefs of teachers in their duties. Furthermore, if we want students to view mathematics as a process, and not just memorizing rules, we need to focus first on changing the beliefs of teachers because their beliefs will influence students' beliefs.

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