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A Case Study about Beliefs and Attitudes in Mathematical Problem Solving among the Higher Secondary Students in Nagaon District of Assam: India

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Abstract

This paper endeavorto study about Beliefs and attitudes on Mathematical Problem Solving, a case study on 858 (498 male and 360 female), Higher Secondary levels of scienceas well as artsbehavioral standard of students are being selected as the sample data for consideration. There is about 34 different subject related educational and beliefs Standard Questionnaire which are first time administered to our students and the subject or items reliability (cronbach's alpha) is 0.87. It is also given emphasisto learn their beliefs about six domains on mathematical problem solving which are identified as important of understanding, predetermine sequence of steps, time consuming math's problems, have several ways of solutions; kind of Mathematics Instruction and usage of technologic equipment's. There are 18 positively and 16 negatively stated subject or items which are included to each domain on mathematical problem solving. The study revealed that the beliefs more than half of the students on mathematical problem solving followed in the direction of strongly agreements on positive statements and not agree on the negative statements to all other domain besides beliefs about following predetermine sequence of steps. For this statements the belief of the students are going agreement on negative statements but the positive statements are not belief.

Key Words: Beliefs, Attitudes, Mathematical, Thinking, Problem, Solving

1. INTRODUCTION

Beliefs and attitudes play a significant role in mathematics teaching especially strongly related to learning activities. There is grown research considerably about beliefs and attitudes in many different countries in world. Leder and Forgaszstrongly claimed that, "In everyday language, the term "belief" is often used loosely and synonymously with terms such as "attitude", disposition, opinion, perception, philosophy, and value. Because these various concepts are not directly observable and have to be inferred, and because of their overlapping nature, it is not easy to produce a precise definition of beliefs."As defined by Polya[1] mathematical problem is a problem that presents an objective which does not have an obvious solution or solution process. However, mathematical problems must meet at least three conditions, such as individuals must accept an engagement himself or herself with the problem. Again they must encounter a block and see no immediate solution process, and they must actively explore a variety of approaches to the problem. Teachers' ample knowledge about their students is very important concerned in coordinating a real problem solving. Raymond[2] identified that a problem solving means different things to different people, while others have been observed as a goal; process; basic skill; mode of inquiry; mathematical thinking and finally teaching perspective.

Several empirical researches has proved that the term problem solving has been studied in developed countries as can be seen in the work of earlier famous authors such as[3,4,5]. And all are agreed that a problem occurs only when someone is confronted with a difficulty for which an immediate answer is not available. This piece of article generally, look and specifically seeks to look into higher secondary student's beliefs about mathematical problem solving by focusing on the understanding process of awareness and solution of mathematical problem solving among the students levels and general in our country.

2. LITERATURE REVIEW

In this article literature it is important, particularly because of the word as problem, even within the domain of mathematics education, frequently means different meanings in different things in different people concerned. Few related literature such as Borasi, 1986; Blum &Niss,

1991; Nesher, Hershkovitz&Novotne, 2003; Wilson, Fernandez &Hadaway, 1993; Goos, Galbraith &Renshaw, 2000 etc. to be considered its defined. Mathematical problem must meet at least three criteria; individuals must accept an engagement with problem, they must encounter a block and see no immediate solution process, and must actively explore a variety of approaches to the problem.

Chapman (1997) has defined problem solving means different things to different people, having viewed as goal, process, and basic skill, mode of enquiry, mathematical thinking behaviour and teaching approach.Polya's comprises four models of understanding the problem, devising a plan, carrying out the plan, looking back and later, identified and suggest that problem solving comprises entry, attack and review. The focus of every study however, has been on students' understanding, beliefs, abilities and attainment.

3. METHODOLOGICAL SCOPE

A case study investigation is undertaken in the year 2019, and the participants who were age groups 17 and 18 year-old amongarts and science school children of higher secondary level. Standard frame questionnaires, interviews in different college students in Nagaon District of Assam their exposed beliefs about the nature of beliefs and attitudes problem solving, perceptions of themselves as problems solves, and finally different secondary data such as magazines, journals, books and authentic governmental published documents are used in the extensive study.

4. OBJECTIVESAREAOF STUDY

In this research article we do like to report on mathematical problem solving beliefs and attitudes among the Higher Secondary Science and arts level of students is being attempted the following objectives to understanding present instructional choices, beliefs problems such aspredetermined sequence of steps, time consuming,and multiple ways of solution, usage of technologic equipment, attitudes, impact and to extensive investigation and inclusive recommendation and conclusion for further mathematics education in Nagaon District of Assam, India.

5. DISCUSSION ON PROBLEM SOLVING

5.1Importance of Problem Solving in Mathematics Education

Problem solving has occurred since the beginning of human being discovered the importance of food and shelter or to flee from the predators[6]. As the advancement of human environment resulted in unforeseen environmental contingencies, new problems discovered and led to the urgency to formulate alternative new methods and technics of finding answers to peculiar scenarios. At the same time, mathematics originated as an answer to these requests and the improvement of mathematics presented more paths to realize difficult tasks. Schroeder and Lester[7]clearly identified that Problems creates "an atmosphere for students to make known on their conceptions about the nature of mathematics and develop a relational perceptive of mathematics" as the most crucial task of problem solving in mathematics.

By doing so the best level of time and resourceful period of student's life can be put to proper use and adequate monitoring of progress can be carried out systematically. Efficient problem solvers can evaluate scenarios cautiously in mathematical term as "their knowledge is well fitted and made "surface features", they were found to emphasize more on "structural features" of problems to of abundant schemata[8]. For a good problem solver to rely, entirely on "monitor and regulate their problem solving skills" thereby obtaining savvy solutions" to problems. The resemblance of learning how to play baseball and mathematics solving was compared by Lester[4] and conclude that it takes time to master the act of problem solving and hence become a good problem solver.

5.2 Problem Solving Study in India

India is a developing country having with vast chunk of human resources. The Indian Government has realized the importance of educational development and therefore, provides required importance in educational structure as well as in functional. A multi-level of structured functional education system is prevailing in India. There have been many studies related to education issues in India, while discussing the education and caste in India, Chauhan[9] pointed out that low school enrolment and completion rates, high dropout and failure rates are reported the characteristic amongst the weaker and under privileged section of the society.

The topography of mathematics education in India calls for a very wide vision to surround and comprehend. It is not only a matter of scale and magnitude in numbers of children and teachers that constitute the system, but also messy democratic modes of functioning in which there are pulls from many social and political aspirants of society. In this concerned such as the important of mathematics education a group of researchers from HomiBhaba Center for Science Education (HBCSE), Tata Institute of Fundamental Research Mumbai, and India have develop research for mathematics education in India[10,11]. For the greater interest they study in the evolution of teaching sequence for bridging arithmetic and Algebra knowledge among the students[12]. An important agenda for mathematics education in India is extensive research in mathematics education. University departments, while undertaking research in education, by their typical structure, tend to attract largely people who are neither mathematically trained nor thus inclined.

5.3Problem Solving Study in Assam

In Assam, a significant state of north east India, several researchers[13,14,15,16]have been proved and revealed that attitude towards mathematics play a vital roles in achieving good performance in mathematics for the school and college students. An Evaluation of School Students' attitude Bora[15] attitude level is highly affected by gender of the students and environment of the schools. Further study may be carried out to investigate the causes of students' less positive attitude towards mathematics. On the study of Secondary school education in Assam, Das and Baruah[1] are significantly pointed out that academic as well as mathematics performances of the government and private schools are better than the schools not getting government aids. The study of present scenario of mathematics and science learning in Morigaon District of Assam, Bhagowaty[14] availed the problems and issues in Secondary Education. She also reported about the poor performance and lack of basic knowledge of mathematics from primary level to secondary level and it is a matter of fact that only 10% of students are interested to study science stream in Higher Secondary School level. It is because of negative attitude towards the subject of mathematics education and lack of awareness to create interest to the subject mathematics among the secondary school students. A case study on under graduate level students in the city college of Guwahati (Assam) Sarma and Ahmed[16] has found some major

problems on teaching and learning on mathematics. They also identified the major issues are found as fear and failure, disappointing course curriculum, crude assessment, lack of preparation and practice and use of technological tools and also the social influence that is the negative attitude towards the subject mathematics. From the mathematical ability investigation by Ahmed[17] are found that girls or women a little slower than the boys, which is not significant. Both boys and girls are found almost equal in their mathematical performances.

6.DATA ANALYSIS AND RESULTS

6.1Background of the Participant Students

In this study there were858 (498 male and 360 female) students of Higher Secondary level of science as well as arts are selected as the sample for the extensive study. Hereis about 14% of the total populations is selected as the sample in the whole Nagaon District of Assam. As in the year 2016, and a total number of students 2988 appeared in Higher SecondaryII (HS Final)Examination in Nagaon District, of Assam and near about same number of students also read in Higher SecondaryI (HS First) year. Here again have selected four different category students as in their results. The total students were 160 inRamanujan Junior College and have obtained percentage 83% and above in High School Leaving Certificate (HSLC) Examination. In the Concept Junior College total 147 students obtained percentage were 75% and above inHigh School Leaving Certificate(HSLC) Examination; and in Nowgong College as well as Alpha – Beta Junior College percentage were60%only and above in High School Leaving Certificate (HSLC) Examinationof total 154 and 105 students respectively. On the other hand of the total 126 and 166 students in High School Leaving Certificate (HSLC) Examination in Renaissance Junior College and Matrix Junior College percentage were50%andabove respectively. All the students in this piece of study have taken into consideration and covering minimum levels of eleven and twelve years' college students of experience considered in this beliefs and attitudes mathematical problem solving piece of study.

6.2 Beliefs and Attitudes about Importance of Understanding in Problem Solution among the Concerned Higher Secondary Levels of Students

The study examined the participants' responses to the importance of understanding why a mathematical problem solution be works. Four positively stated items and two negatively stated items were used. It can be observed in figure:I below, about one –thirdof students (73%) have positive believe about the importance of understanding problem solution. This shows that majority of Higher Secondary student have positive beliefs and attitudes about the importance of understanding problem solution.

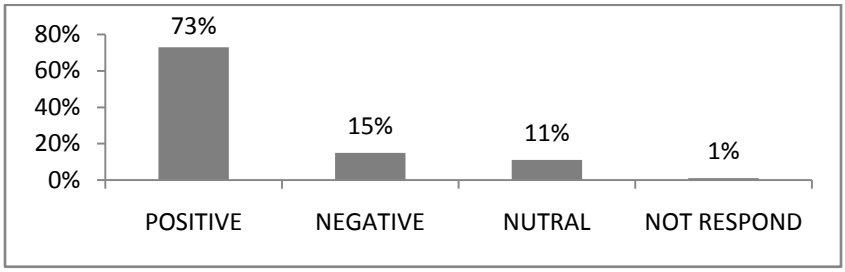

Figure:I Beliefs and Attitudes about the Stated Items

6.3Beliefs and Attitudes about the Use of Predetermined Sequence of Steps

In this investigated piece of article and the students' responses to questionnaire items related to a thought that there were found mathematical problems that can be solved with step-by-step procedures. Three positively stated items and four negatively stated items were used. Thus, as shown in figure: II below, only 31% of total participants have positive believe about the application of predetermine sequence of steps in solving mathematical problems.

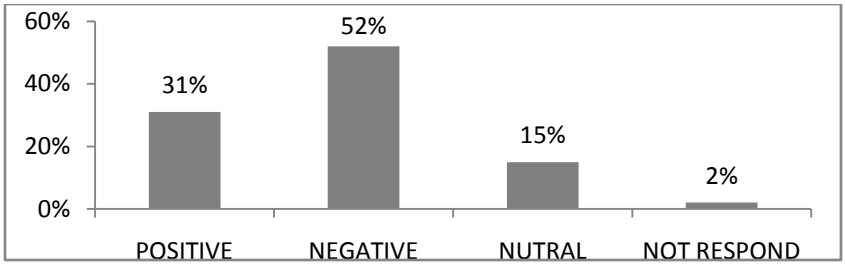

Figure:II Beliefs and Attitudes about Stated Items

6.4 Beliefs and Attitudes about Time Consuming Mathematics Problems

Time consuming is the crucial notion in mathematical problem solving. In the investigated piece of case study the participants' responses to the items related to time consuming in solving mathematical problems. There were two positively and two negatively stated items related to this category. Here, as shown in figure: III below, only 56% of participants have positive believe about the time consuming in solving mathematical problems. This also shows that majority of student have positive beliefs about the available time in solving mathematical problems.

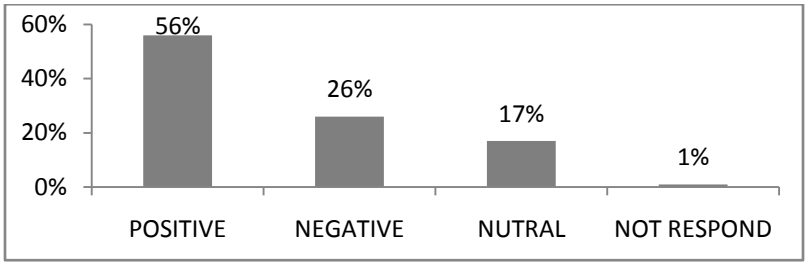

Figure:III Beliefs and Attitudes about Stated Items

6.5Beliefs and Attitudes about Problems of Multiple Ways of Solution

Problems of multiple ways of solutions attitudes are mostly emphasizing in learning mathematical problem solving education. The study examined the participants' responses to the items related to this category. There were four positively stated items and of them three were negatively stated items. Therefore, as it can be observed in figure: IV below, more than half i.e. 63% of students have positive believe about problems that have multiple ways of solution. This shows that majority of student have positive beliefs and attitudes about problems that have several ways of solutions.

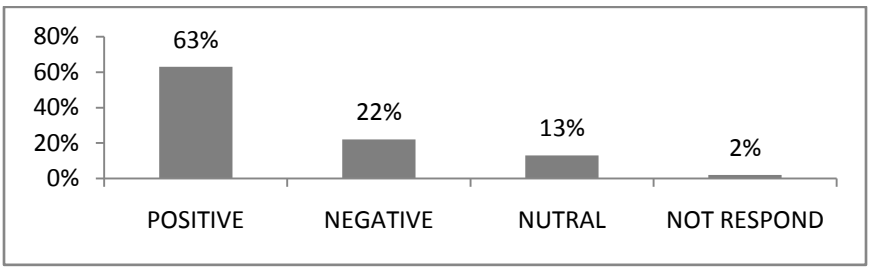

Figure:IV Beliefs and Attitudes about Stated Items

6.6 Beliefs and Attitudes about the Kind of Mathematics Instruction

A particular kind of mathematics instruction has been emphasizing to align with the whole process of learning mathematical problem solving skills. This study aimed to find out the kind of believe students held to the items related to the new principle of mathematics curriculum emphasized instruction. There were two positively stated items and two negatively stated items related to this category. Thus, as shown in figure:V below, more than half i.e. 57% of students have positive believe about mathematics instruction in learning. This shows that majority of student have positive beliefs and attitudes about mathematics learning instructions.

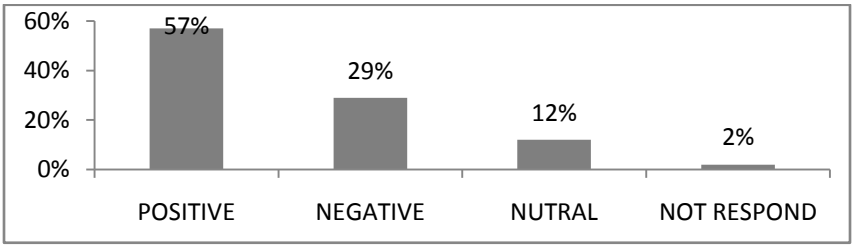

Figure:V Beliefs and Attitudes about Stated Items

6.7 Beliefs about the Usage of Technologic Equipment's

The usage of technologic equipment's in solving mathematical problems are mostly emphasizing in learning mathematics. The study examined the students' responses to the items related to this category. There were three positively stated items and three negatively stated items. Thus form the figure: VI about half i.e. 49% of students believed positive and same number i.e. 29% of students are negative and about 20% undecided and the rest 2% not respond about the usage of technologic equipment's on problem solving.

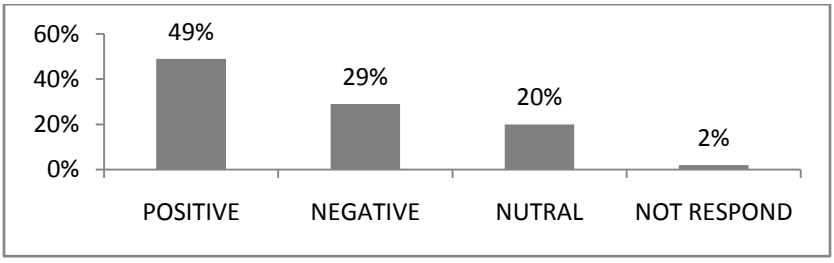

Figure:VI Beliefs and Attitudes about the Stated Items

7. RECOMMENDATION OF THE RESULTS AND CONCLUSIONS

In the finding recommendation section of thiscase study purpose was to extensive explore Higher Secondary students' beliefs and attitudes about mathematical problem solving. The summary of the results that major portion of the students strongly believe to the following statements as-

i. Though the item is negatively stated large numbers of all i.e. 93% of students have extensive believe in solve most mathematics problems, recommend that students should be taught in correct procedure.

ii. 89% of the total students have strong believed that any problem can be solved if you know the right steps to follow.

iii. 87% of the total students have believe two strong attitudes of statements that
   a) Student should share problem solving thinking and approaches with other students.
   b) In addition to getting a right answer in mathematics, it is important to understand why the answer is correct.

iv. 84% ofthe total students have believe two attitudes of statements that
   a) If a student is unable to solve a problem one way, there are many and alternative ways too to get the correct answer.
   b) It is possible to get the correct answer to a mathematics problem using methods other than the one the teacher or the textbook uses.

v. 81% of the total students strongly and firmly believe that good mathematics teachercan show students lots of ways techniques to look at the same questions.

vi. 79% of the total students supported the idea that if a student forgets how to do solve a mathematics problem the way the teacher could, it is also possible to develop different methods that will give the correct answer.

vii. 78% of the total participants belief two statements that
   a) A student who does not understand why an answer to a mathematics problem is correct could not really solve the problem.

b) Teachers should encourage students to write their own style of mathematical solve problems.

viii. 73% of the total participants did not believe about mathematics problems that take a long time to complete and solved problem. And also same i.e. 73% of total students valued a demonstration of good reasoning should be regarded even more than students' ability to find correct answers.

ix. 71% of the total students supported the idea of spending time in solving to a particular mathematical problem.

x. 68% of the total students did not believe that it is not important to understand why a mathematical procedure works as long as it gives a correct answer.

xi. Though, the statement was negatively stated, about 67% of total the students believe that problem solving is primarily the application of computational skills in mathematics. And 67% of the total students reported that memorizing steps is not that useful for learning to solve problems.

xii. 66% of the total students strongly belief the idea that teachers can create new learning environments for their students with the use of technology.

xiii. 65% of the total students believe that hard mathematics problems can be done if one just hangs in there.

xiv. 61% of the total students' indicated strong belief to the idea that mathematics problems that take a long time are not bothering.

xv. 60% of the total students believe two statements that

a) Students can learn more mathematics more deeply with the appropriate and responsible use of technology.

b) There is not only one uniform correct way to solve a mathematics problem.

From our extended research have cleared us that there is relationship between beliefs, attitudes and mathematics achievement especially the attainment regarding problem solving. This study is like to recommend that one criterion for a true mathematical problem that, an individual has no readily obtainable procedure for finding solution to a given problem. Mathematical problem solving beliefs and attitudes held by teachers-studentshave a significant aspect to be studied. Thus, for example, as characteristics of the nature of mathematical

problems, believe to the idea of sharing problem solving thinking and approaches with other students where mathematical problems that cannot be solved without, step by step procedures, this study seen it as one of the beliefs to be well investigated. The results of the present study may reinforce the need of mathematical problem solving. More specifically, encouraging mathematics educators to employ problem solving instructional strategies in all courses pursued under mathematics education program in extensive manner.

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