A STUDY ON HIGH SCHOOL STUDENTS' PROBLEM IN MATHEMATICS SUBJECT

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Abstract: This article tries to revealed about the high school students' problem in mathematics subject. For this a data is collected through questionnaire method.A total of seven high schools of the district Baksa of Assam is purposefully selected in the survey. The questionnaire method is conducted through the response sheet in order to get the data. As the data is collected afresh, so this can be regarded as a primary data collection. why the majority of students in this particular area are poor in mathematics subject is focused in this article. Some basic problems and factors are identified and trying to well defined.Based on response sheet of the evaluated test, students' performance is categorized into different sections. These categories are considered as a fuzzy set based on the personal category. Since the collected can be regarded as imprecise data, so the process of defuzzification is used here to convert the data into precise form. The centre of gravity (COG) or the centroid of area (COA) method is used to get the centroid of the data sets or to get the defuzzified value.
Keywords: Fuzzy sets, centre of gravity, defuzzification, learning assessment.

1. Introduction:

In all education system, starting from elementary education, mathematics subject is considered as a major part of education.Science, commerce, humanities and social sciences, in every field the use of mathematics concept is very important. This article focuses on the education system of Board of Secondary Education of Assam (SEBA). In this education system, in class x there are compulsory five subjects and one elective subject. So, the HSLC examination under this board conduct on six subjects. Securing the good result in this HSLC examination depends on so many factors mainly in rural areas.In this article, only the Baksa district of BTAD (Assam) is selected as the research field. The district Baksa is one of the four districts of BTAD of the state Assam. Majority of peoples in this district has less education. This district can also be considered as one of the rural areas of the state Assam. The main languages that the citizens of this particular area speak in Bodo, Assamese, Bengali, Nepali, Santhali etc. in general most of the students consider the subject mathematics as the hard subject as compared to other in school education. As per as the pattern of the syllabus and chapters, 2021, the chapter included in mathematics subject for class x, NCERT are namely real numbers, polynomials, pair of linear equations in two variables, quadratic equations, arithmetic progressions, triangles, coordinate geometry,

introduction to trigonometry, some applications of trigonometry, circles, area related to circles, surface areas and volumes, statistics and probability. In this paper, the performance of a certain group of students of class x, under SEBA, in mathematics subject in the area of algebra and geometry is discussed.The concept of learning assessment in academic is not a new one. Most of the study and researchers work on this area. So, the concept of learning assessment is a fundamental for the study of human cognitive action. Most of the process of measurement of educational performance, in general is usually expressed in numerical, based on some examination results. Various methods and techniques are performed in evaluation student exam scores. The use of fuzzy logic of the principles of fuzzy logic is more flexible as compared to other methods. The classical method adheres to a constant mathematical rule, evaluation with fuzzy logic has great flexibility (Akini T.C., 2010). Ashwani Kumar Garg, Regional Institute of Education (NCERT), Bhopal, presents some reasons behind regarding mathematics a difficult subject. These are due to language problem students do not understand the questions properly, during classroom teaching teachers do not use mathematics related teaching learning materials, many schools do not have a separate mathematics teacher in the school. One teacher teaches all subjects in a class. Previously it was a misconception that mathematics is required only for being an Engineer, Mathematician or Scientist and hence the subject was treated as a difficult by the society. The school student had a fear psychosis of the subject (Mendel J.M., 2016). We consider mathematics as socially produced knowledge that characterizes the social and imaginary interactions manifested in culture; the multiple explanatory forms of socio-cultural experiences; the ways of reading, understanding and explaining how human culture constitutes itself and the multiple methods and codes of mathematically reading sociocultural realities (Mendes I.A., 2018).Students have many misconceptions in the use of symbols in algebra, which affect their learning and solving algebraic problems (Ebiendele E. P, 2013). According to a report of the superintendent of the New York City schools in 1929, more high school pupils failed in mathematics than in any other subject. In one particular school more than half of the pupils failed in first-term algebra and failure in high school mathematics as a whole was 26.9 per cent, the next greatest failure being in foreign languages [W.D. Reeve (1936)]. The main obstacles that students faced problems in mathematics related to the mains areas under discussion were: language problems, difficulties in transitioning literature word to mathematical word, difficulties in procedure to solve algebraic problems, use of incorrect formulas or theories, difficulties in language of algebra. There also some non-mathematical factors that the students faced problems in mathematics subject. Such as anxiety, over confidence, carelessness lacks of attention. By this study, I want to assured that the various problems of the mathematics subject in high school students under this particular region will be identified clearly and will helps various researcher to study in a wide range.

2. Materials and methods:

Thepurpose of this article is to determine the reason for which the students have a fear on mathematics subject. This article is a type of descriptive research study., where the date is collected afresh and so here, the collected data are primary. The methodology consists of the following major sections:

i. Preparation of a set of multiple choices questions for evaluation test
ii. Conducting Questionnaire method through the response sheet

iii. Processing of the collected data obtained from section ii.

iv. Defuzzification of the data

Questionnaire method is used in this study to observe students' performance in their mathematics subject. For this, a total of 100 students from the high schools (i) Alari High School, Barimakha (Bodo Medium); (ii) Barimakha High School, Barimakha (Assamese and Bodo Medium); (iii) Rupahi High school, Rupahi (Assamese and Bodo Medium); (iv) Bathou Ashram High School, Rupahi (Bodo Medium) and (v) U.N. Academy, Mushalpur (Bodo Medium) of the district Baksa, Assam werepurposefully selected to conduct the study. A set of questionnaires, consisting of multiple-choice questions from each of the chapters of class x mathematics text book is provided to the students to answer it.Before it is used, that instrument have been tested for validity and reliability. The validation of the contents of the questionnaire sheet is conducted by two subject concerned teachers.The set of questionnaires is based on knowing mathematical formulae, application of formulae, understanding numerical problems and some basic concepts.The validity of the questionnaire sheet included the eligibility of the questions, appropriate concepts, a definite instruction to give the response and various types of interpretation. After collecting the response sheet, an interview is conducted to the students to relate with their response sheet. For this, a total of 60 students were selected because (1) they willingly participated, (2) they have good communication skills, (3) they want to determine their performance on mathematics subject. Based on students' performance in response sheet, the performance is categorized into excellent, good, average satisfactory and unsatisfactory. These criteria are formed byidentifying the students' performance in the corresponding response sheet test within the scale from 0 to 100. These criteria can be considered as a fuzzy based on the personal criteria.

3. Processing of the Data:

Lest us consider a set of linguistic grades L = $\{A, B, C, D, E\}$ characterizing the students' performance on response sheet test, where A stands for very good, B stands for good performance, C stands for average performance D stands for poor performance and E stands for very poor performance. The number of students that shows the above-mentioned performances are given in the following table 1.1

Table 1.1: Number of students in the respective performance

Groups	Very Good (A) (76-100)	Good (B) (56-75)	Average (C) (46-55)	Poor (D) (32-45)	Very Poor (E) (Less than 30)	Total Students
Algebra (G_1)	4	6	9	5	6	60
Geometry (G_2)	2	4	5	7	12	

Now, let us consider the membership function m from the set L to the closed interval [0, 1], which is defined as:

$m: L \longrightarrow [0, 1]$ and is given by $y = m(x) = \frac{n_x}{n}$, where n_x is the number of students that shows the above-mentioned performances for each x in L, and n is the total number of students. Then the fuzzy subset of the set L ca be defined as:

$$G = \left\{\left(x, \frac{n_x}{n}\right) : x \in L\right\}$$

Now, we consider in L, the set of real intervals as $E \to [0,1), D \longrightarrow [1,\ 2), C \to [2,3), B \to [3,\ 4), A \to [4,5]$. Then we must have, $\sum_{i=1}^{5} y_i = m(A) + m(B) + m(C) + m(D) + m(E) = 1$, where $y_1 = m(E)$, $y_2 = m(D)$, $y_3 = m(C)$, $y_4 = m(B)$ and $y_5 = m(A)$.From the above table 1.1, we can find that $m(E) = \frac{20}{60} = 0.33$, $m(D) = \frac{10}{60} = 0.16$, $m(C) = \frac{12}{60} = 0.2$, $m(B) = \frac{13}{60} = 0.21$ and $m(A) = \frac{5}{60} = 0.08$. Then bar graph of the membership function $y = m(x)$ is drawn below:

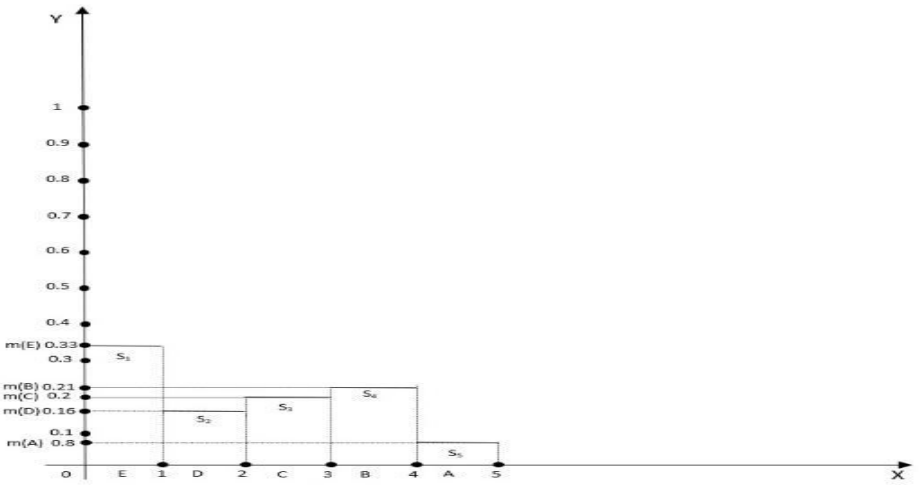

Fig. (i) Data representation of $G_1$by bar graph

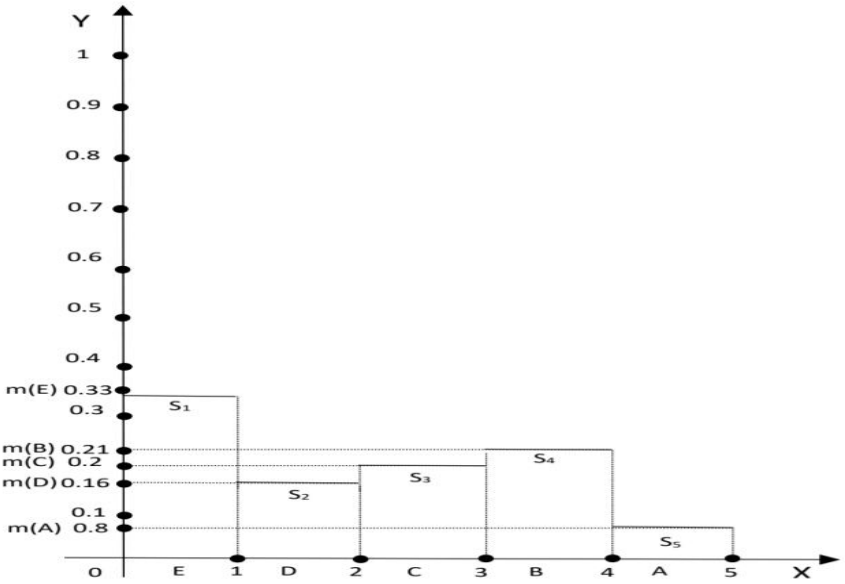

Fig. (ii) Data representation of$G_2$by bar graph

4. Defuzzification by Centre of Area Method:

We used the most common mechanics formula in fuzzy logic approach to measure the performance with the coordinates (x_c, y_c) of the centre of gravity, which is given by $x_c = \frac{\iint_F x dxdy}{\iint_F dxdy}$, $y_c = \frac{\iint_F y dxdy}{\iint_F dxdy}$,

In this article, we describe the performance of the students as very poor (E), if $x \in [0,1)$, as poor (D), if $x \in [1,2)$, as average (C), if $x \in [2,3)$, as good (B), if $x \in [4,5)$. Alternatively, if $x \in [0,1)$, then $y_1 = m(x) = m(E) = \frac{n_E}{n}$, if $x \in [1,2)$, then $y_2 = m(x) = m(D) = \frac{n_D}{n}$, if $x \in [2,3)$, then $y_3 = m(x) = m(C) = \frac{n_C}{n}$, etc.

Therefore, in this article, the graphs (G_1 & G_2) depicted in figures (i) & (ii) of the membership function is the bar graph consisting of 5 rectangles in each graphas S_1, S_2, S_3, S_4 and S_5 whose sides lies on the X-axis and have equal length of 1 unit each. Here, $\iint_F dxdy$ is the area of each graph which is equal to $\sum_{i=1}^{5} y_i = \frac{n_E+n_D+n_C+n_B+n_A}{n} = 1$.

Now, $\iint_F x dxdy = \sum_{i=1}^{5} \iint_{F_i} x dxdy = \sum_{i=1}^{5} \int_0^{y_i} dy \int_{i-1}^{i} x dx = \sum_{i=1}^{5} y_i . \frac{1}{2} . (2i-1) = \frac{1}{2}\sum_{i=1}^{5} y_i(2i-1)$

And $\iint_F y dxdy = \sum_{i=1}^{5} \iint_{F_i} y dxdy = \sum_{i=1}^{5} \int_0^{y_i} y dy \int_{i-1}^{i} dx = \frac{1}{2}\sum_{i=1}^{5} {y_i}^2$

Therefore, we have $x_c = \frac{\iint_F x dxdy}{\iint_F dxdy} = \frac{\frac{1}{2}\sum_{i=1}^{5} y_i(2i-1)}{1} = \frac{1}{2}\sum_{i=1}^{5} y_i(2i-1)$

$$= \frac{1}{2}(y_1 + 3y_2 + 5y_3 + 7y_4 + 9y_5)$$

And $y_c = \frac{\iint_F y dxdy}{\iint_F dxdy} = \frac{\frac{1}{2}\sum_{i=1}^{5} {y_i}^2}{1} = \frac{1}{2}\sum_{i=1}^{5} {y_i}^2 = \frac{1}{2}({y_1}^2 + {y_2}^2 + {y_3}^2 + {y_4}^2 + {y_5}^2)$

Now, in our case for G_1, $y_1 = m(x) = m(E) = 0.33$, $y_2 = m(x) = m(D) = 0.16$, $y_3 = m(x) = m(C) = 0.2$, $y_4 = m(x) = m(B) = 0.21$ and $y_5 = m(x) = m(A) = 0.08$.

Therefore, $x_c = \frac{1}{2}(y_1 + 3y_2 + 5y_3 + 7y_4 + 9y_5) = \frac{1}{2}(0.33 + 3 \times 0.16 + 5 \times 0.2 + 7 \times 0.21 + 9 \times 0.08) = 2$ and $y_c = \frac{1}{2}({y_1}^2 + {y_2}^2 + {y_3}^2 + {y_4}^2 + {y_5}^2) = 0.1125$.

Again, for G_2, Similarly, for G_2, $y_1 = m(x) = m(E) = 0.2$, $y_2 = m(x) = m(D) = 0.11$, $y_3 = m(x) = m(C) = 0.08$, $y_4 = m(x) = m(B) = 0.06$ and $y_5 = m(x) = m(A) = 0.03$.

Therefore, $x_c = \frac{1}{2}(y_1 + 3y_2 + 5y_3 + 7y_4 + 9y_5) = \frac{1}{2}(0.2 + 3 \times 0.11 + 5 \times 0.08 + 7 \times 0.06 + 9 \times 0.03) = 0.81$ and $y_c = \frac{1}{2}({y_1}^2 + {y_2}^2 + {y_3}^2 + {y_4}^2 + {y_5}^2) = 0.0315$.

From this, it is clear that the performance of the students in algebra is better than the geometry.

5. Conclusion:

Fromthis article, it can be clearly revealed that, the group of 60 students has better performance in algebra compared to geometry. Application of fuzzy set theory, in this field of academic assessment expresses that, its uses have more flexibility as compared to statistical method. In this paper, we developed a new membership function for assessing the total performance of certain group of students. In general, most of the methods of assessment based on the principles of yes-no logic. In this paper, the principles of fuzzy logic is introduced to determine the performance of the certain group of students. Here, we introduced the group of

students under assessment as a fuzzy logic of a set L of linguistic labels and we used the centre of area method for defuzzification in converting the fuzzy data collected from the questionnaire method to a crisp number. Determining different performance result in the subject of mathematics, various types of problems that the students faced in school are the future aspect of the research work, where we keep on trying some more techniques of fuzzy set theory.

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