EASTERN

Recent Trends of Mathematics & its Applications

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A Study on Curricula Aspect of Mathematics in 10+2 Standard: An Ex Post Facto Research Study in Goalpara District of Assam

Abdul Wahed

Abstract

This study deals with the curriculum aspect of mathematics in +2 standard in Arts, Science and commerce stream of Assam. The knowledge of mathematics is mandatory and utmost required for all the branches of learning. But the amount of knowledge of mathematics and the branches of mathematics to be taught for the necessity of different streams should not be same. Attempt was made to find out the answer of an important question whether the syllabus of mathematics in +2 standard is feasible for all the streams. The investigator selects purposively Goalpara District of Assam under the study. An opinion poll was conducted regarding the views on the present mathematics syllabus of +2 standard in the study area among the mathematics teachers of Higher Secondary Schools and Colleges. This study reveals that majority teachers opined for change in the curriculum so that it become viable for all the streams and the status of mathematics education can be improved in all aspects.

Introduction

Mathematics enables us to interpret and manipulate the ideas in all branches of learning as well as in all our daily activities from dawn to midnight (Betsur, 2005). The importance of mathematical learning has

repeatedly been emphasized by the educators (Arunachalam.2001; Wilkins & Ma, 2002; Lall, 2005; Noyas, 2011.) and in India National Report, 2008. But now a day, it has been a matter of grave concerned for Mathematics stake-holders that the level of achievement and commitment of the students to learn Mathematics is reducing day by day. In many countries there are short fall of the qualified person with sound mathematical knowledge as required by industry and business sector of the countries (Report of the Royal Society, 2008; Kounine et.al. 2008). Moreover, in a study of international comparison of post-16 mathematics education in 24 different countries Hodgen et. al. (2010) revealed that England, Wales and Northern Ireland have the lowest levels of participation in upper secondary mathematics. This has a great impact in modern science and technology as well as in the field of economy of a country. So, an in depth study is felt necessary to investigate the status of mathematics curricula in Assam in upper secondary level which is the base of higher education.

Mathematics is deeply involved with all the issues affecting society (Ambrosio, 2003). In view of the importance of mathematics and considering its deteriorating situation many researchers (Varadarajan, 1983; James, et.al. 2012) pointed out that the curriculum of mathematics should be reframed keeping it related to everyday life. So that it has got wide applications and professional opportunities for the young generation. In the new curriculum there should be a different philosophy and set of values, so as to fulfill the need, hope and aspirations of the majority students (Noyas, 2007).

The choice of the topic is disposed on the current world trend and research emphasis on the curricula aspect in post-16 mathematics in different countries. Hodgen et. al. (2010), in a report of Nuffield Foundation, suggested offering different types and level of mathematics in post-16 curriculum within the context of current and projected social and economic needs. They also pointed out that many countries such as Germany, Hong Kong and New Zealand have already been introduced compulsory basic mathematics into upper secondary level. But they introduced separate optional papers for basic and advanced course to fulfill the socio-economic necessity and demand for STEM (science, technology, engineering and mathematics). It should be noteworthy to mention herein that the national curriculum of upper secondary mathematics in China has been introduced separate optional papers for

humanities group, science and technology, advance level mathematics in pure and applied groups. It consists of 5 required modules (compulsory) and 4 optional series.

In the context of India, NCERT has been taking the responsibility of developing the school curriculum science 1975. In 2000, the National Curriculum Framework for School Education (NCFSE) was brought out to ensure the prevailing socio-economic needs. It was again reviewed in 2005 with a view to respond to the new developments and necessity. The National Curriculum Framework (NCF 2005) was developed by NCRT with the help of National Steering Committee and the position papers prepared by twenty-one Focus Groups. After that NCERT developed the Curriculum, syllabus and textbooks for schools in the light of the recommendations of NCF. The NCF-2005 was approved by Central Advisory Board of Education (CABE). The states and union territories either adopt or adapt the school curriculum and textbooks developed by NCERT. No doubt, the efforts and sincerity of NCERT to develop a better curriculum for school education is appreciable. But the change and reform made in the national curriculum for mathematics in higher secondary standard is not adequate to all of its measures. Moreover, the vision of the NCERT "all students can learn mathematics and that all students need to learn mathematics" is completely spoiled with the prevailing very low rate (8.15%) of participation in the subject in higher secondary standard. This is due to the fact that the curriculum of mathematics is not attractive for arts students and they have found no opportunities and advantage for their future perspectives. The present curriculum has been developed giving priority and importance to the need of the science students only and ignoring the necessity of others (Wahed, et.al.2013). It has been a matter of grave concerned that the curriculum of higher secondary mathematics is completely biased in the sense that there is no provision for separate papers for arts, science, commerce and vocational streams. But on the contrary many developed and developing countries have already been introduced two types of papers compulsory and optional in the curriculum of upper secondary mathematics. So to cope up India in general and in particular Assam with modern trend of mathematics education an in depth study is felt necessary in Goalpara District, a small part of the country.

Research Questions

In relation to the curriculums of mathematics in +2 standard of arts, science & commerce streams of Assam, this study proposes to address the following three important research questions.

1. What is the modern trend of mathematics education in developed countries?
2. Is the existing syllabus of Assam Higher Secondary Education Council in mathematics feasible for all the streams?
3. Are there any need of separate syllabus for arts, science & commerce streams in mathematics?

Methodology:

There are 9 institutions (5 colleges and 4 higher secondary schools) offering the study programme of mathematics in +2 level in Goalpara District of Assam. Moreover, there are 173 schools (Secondary & higher secondary standard) in the district offering compulsory mathematics programme up to 10^{th} class. All these 182 institutions constitute the population for the present study. Stratified sampling technique is applied for the study. At first 20 [Prof.& PGT] mathematics teachers are selected from the institutions of +2 standard. Besides these another 20 mathematics teachers are selected randomly from 161 graduate mathematics teachers working in the district. Thus, the sample size taken is 40 number of mathematics teachers and they were provided with a pre tested teachers' questionnaire. From these 40 respondents primary information are gathered regarding their views in the mathematics curricula of +2 standard. Secondary information regarding participation and achievement in mathematics in +2 level are gathered from official records as provided by the concerning authorities of the 9 institutions. The necessary information regarding the curricula of foreign countries are collected from the proper web pages. This study is descriptive in nature and simple statistical tools are applied to analyze the data.

A brief Review on the curricula of developed nations

To justify the feasibility of the mathematics syllabus in +2 standard in Assam it is necessary to look into the prevailing curricula of different countries around the world. Hodgen, et.al. (2013), in their study "towards universal participation in post-16 mathematics: lessons from high-

performing countries" forwarded from Nuffield Foundation highlighted the modern trend of mathematics education of a few developed countries in higher secondary level as presented herein below.

1. **England:**
   a) Schooling is compulsory up to the age of 16 but this will increase to age 17 by 2013 and age 18 by 2015. Mathematics is also compulsory up to age 16.
   b) Upper secondary stage begins after age 16 and post-16 mathematics is not compulsory, but students who choose this subject have options including AS or A level in mathematics.
   c) Participation rate in any mathematics at post-16 level are very low (20%) in comparison to other developed countries.
   d) There is wide range of vocational qualifications in post-16 education which includes mathematics in different level and standard depending on the course.
2. **Germany:**
   a) Upper secondary stage begins after age 16 and 20% students received general education where as 80% students take various courses of vocational education.
   b) Mathematics is compulsory on almost all general and vocational courses. But the standard of mathematics course varies between a basic or advanced course (in general education) and the types of vocational courses.
   c) More than 90% students participate in post-16 mathematics.
3. **New Zealand:**
   a) Schooling is compulsory up to the age of 16 and there are no compulsory subjects at senior secondary education.
   b) Two distinct options are available in advanced mathematics course. One is mathematics with calculus and other is mathematics with statistics. Moreover students can choose to take a greater or smaller amount of mathematics in each option and can choose to take modules from both the options.
   c) Participation rate in post-16 mathematics are very high (71%)

4. Singapore:

a) Upper secondary education begins at the age 16 and there are no compulsory subjects at post-16 education.

b) Arts and humanities students must take a science or mathematics option.

c) A levels students are required to take a contrasting subject as a result 80% students take some mathematics course at post-16 level.

5. China:

Wang Linquan, in his study "what challenges are we confronted within high school mathematic" upheld the issue about the fundamental structure of national curriculum standards of post-16 mathematics in china and he highlighted the curriculum as follows-

a) There are 5 required modules and 4 optional series in the post-16 curriculum of mathematics. The 4 optional series are limited optional series-1, limited optional series-2, freely optional series-3 and freely optional series-4.

b) Limited optional series-1 is provided for the students who are preparing for further study of social sciences and it consists of two groups.

c) Limited optional series-2 is provided for the students who prepare for further study of science and technology and it consist of three groups.

d) Freely optional series-3 includes 6 topics of introduction of modern pure mathematics ideas.

e) Freely optional series 4 includes 10 topics of basic methodologies of applied mathematics.

The above discussion makes it clear that the countries like England, New Zealand, Germany and China are providing separate optional papers in mathematics in post-16 curriculum. The picture of Singapore is quite different as the students of arts and humanities group must take either a science or mathematics option in upper secondary classes.

Analysis:

Feasibility of the Curriculum:

The percentage of participation and achievement in mathematics are found year wise separately for arts, science and commerce streams. Then their averages for10 years [from 2002 to 2011] are calculated and presented in the following bar diagram-1 & 2 for direct comparison. From the diagram it is evident that participation rate in mathematics is very low (diag-1) in arts and commerce streams but those who participate in the programme they can make achievements (diag-2) in the subject. On the contrary, the participation rate in mathematics is very high (diag-1) in science stream but their achievements are not so satisfactory (diag-2).

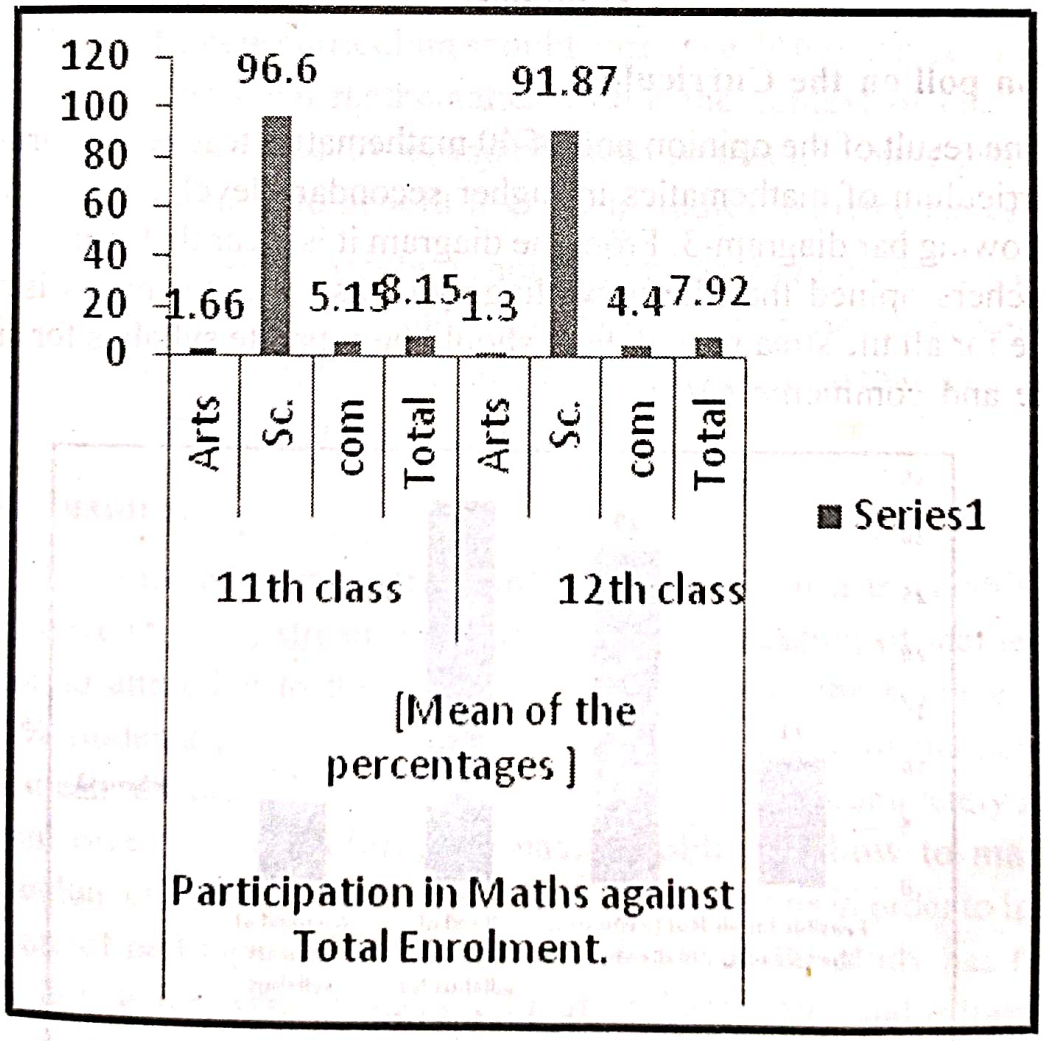

Diagram-1

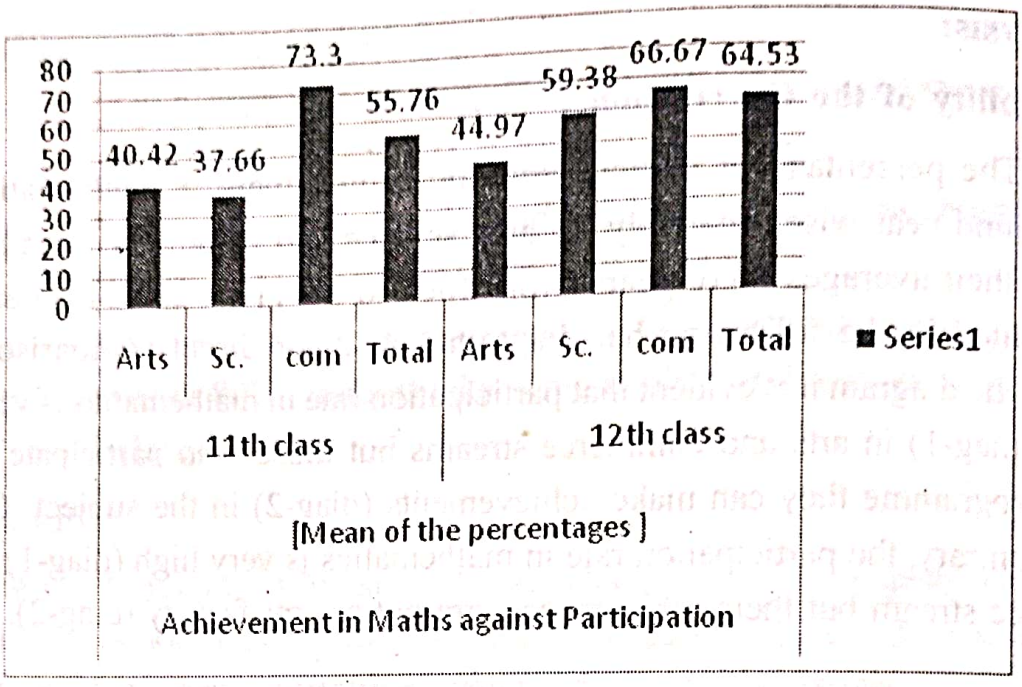

Diagram-2

Opinion poll on the Curriculum

The result of the opinion poll of 40 mathematics teachers regarding the curriculum of mathematics in higher secondary level are shown in the following bar diagram-3. From the diagram it is clear that majority of the teachers opined that the prevailing syllabus of mathematics is not feasible for all the streams and there should be separate syllabus for arts, science and commerce streams.

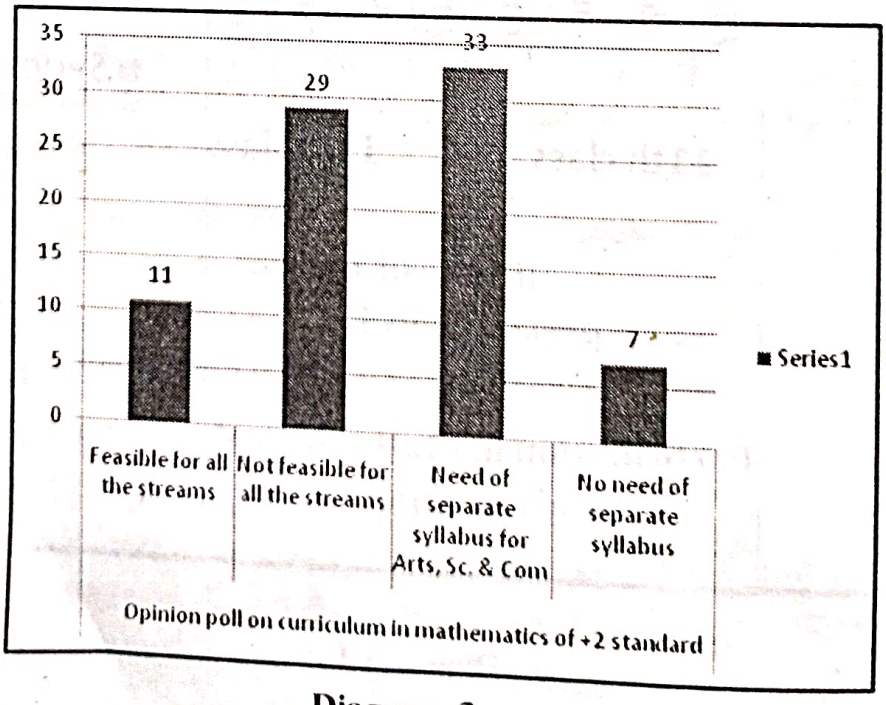

Diagram-3

Findings of the study

The findings of the study are summarized as follows-

1. The rate of participation in mathematics in higher secondary level are found very low in Goalpara District.
2. Majority of the teachers consider that the curriculum of Assam Higher Secondary Education Council in mathematics is not feasible for all the streams and they voted for separate syllabus in arts, science and commerce streams.

Recommendations of the Study

1. The new curriculum of upper secondary mathematics should be developed in order to ensure that a large majority of young people can participate in the study programme of mathematics.
2. The new curriculum should introduce different types and level of optional mathematics within the context of current and projected socio- economic need so that all young people can be placed to benefit from their studies in mathematics.
3. The new curriculum should be given more prominence in the knowledge and experience of computer software as an essential skill in employment and higher education so that it can attract more students.

Conclusions:

The rate of participation in mathematics in arts (1.66%) and commerce (5.15%) stream indicate that the curriculum of mathematics is not so attractive to them. On the other hand in the science stream 96.6% students participate in the study programmme of mathematics. That means the prevailing curriculum of mathematics is completely science stream oriented. Therefore, the basic problem is how to make the curriculum of mathematics acceptable to all the streams in order to increase the rate of participation in the subject. However, the study has its own limitation as it covers only a small part of the country and reframing of curriculum is a national agenda. Therefore, to arrive at a consensus on reframing of mathematics curriculum it requires further details study and research covering the whole state and nation.

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