



# SUMMARY OF DOCTORAL THESES

Vol-X



Editors  
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**STATUS OF HIGHER SECONDARY MATHEMATICS  
IN RELATION TO PARTICIPATION, ACHIEVEMENT  
AND CURRICULA ASPECTS: A CASE STUDY IN  
GOALPARA DISTRICT OF ASSAM**



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**Statement of the Problems:**

“This study is about the problems related to participation achievement and curricula aspects in higher secondary mathematics with special reference to secondary level in Goalpara district of Assam.” The extension to secondary level was made under the justification that the rate of participation in mathematics in higher secondary level directly depends on the achievement level in mathematics in high school leaving certificate (HSLC) examination. Evidence emanating from research literatures identifies socio-economic, environmental, individual and curricula aspect as the major factors that have influential effects in the participation and achievement in mathematics. Generally, the socio-

economic and environmental factors affect all the scholastic subjects' area uniformly and have no extra effect in mathematics education. Under this perspective the socio-economic and environmental factors are kept under the control variables in the present study. It is a case study research to investigate the underlying causes of poor participation and low achievement rates in mathematics in higher secondary level.

### **Aim and Objectives of the Study:**

The study set the following aim and objectives to meet the goal of the research.

1. To assess the status of mathematics in higher secondary and secondary level in terms of participation and achievement.
2. To examine the attitude and belief in teaching-learning mathematics and toward mathematics.
3. To assess the level of math anxiety and mathematical literacy in secondary mathematics.
4. To examine the curriculum of higher secondary mathematics in terms of its status and structure.
5. To examine the pedagogical practices in the curriculum of higher secondary mathematics.

### **Hypothesis and Research Questions:**

To attain the above objectives the study proposed to formulate 27 number of null hypothesis as stated herein below. The study also addressed 8 (eight) number of research questions in relation to curriculum and pedagogical practices.

#### **1. Null Hypothesis for Participation and Achievement in Mathematics:**

**H<sub>0</sub>1 (a):** There is no relationship between participation and achievement in mathematics in Arts stream.

**H<sub>0</sub>1(b):** There is no relationship between participation and achievement in mathematics in Science stream.



**H<sub>0</sub>1(c):** There is no relationship between participation and achievement in mathematics in Commerce stream.

**H<sub>0</sub>1(d):** There is no significant difference in the participation in mathematics between arts and science stream.

**H<sub>0</sub>1(e):** There is no significant difference in the achievement in mathematics between arts and science stream.

**Null Hypotheses Regarding Gender Disparities in Participation in Mathematics in Higher Secondary Level:**

**H<sub>0</sub>2(a):** Gender difference is not significant in relation to participation in mathematics in Arts stream.

**H<sub>0</sub>2(b):** Gender difference is not significant in relation to participation in mathematics in Science stream.

**H<sub>0</sub>2(c):** Gender difference is not significant in relation to participation in mathematics in Commerce stream.

**Null Hypotheses Regarding Gender Disparities in Achievement in Mathematics in Higher Secondary Level:**

**H<sub>0</sub>3(a):** Gender difference is not significant in relation to achievement in mathematics in Arts stream.

**H<sub>0</sub>3(b):** Gender difference is not significant in relation to achievement in mathematics in Science stream.

**H<sub>0</sub>3(c):** Gender difference is not significant in relation to achievement in mathematics in Commerce stream.

**Null Hypotheses Regarding Appeared in HSLC Examination**

**H<sub>0</sub>4(a):** Gender difference is not significant in relation to the number of appeared in the HSLC Examination.

**H<sub>0</sub> 4(b):** Rural-urban difference is not significant in relation to the number of appeared in the HSLC Examination.

**Null Hypotheses Regarding Passed in HSLC Examination**

**H<sub>0</sub> 5(a):** Gender difference is not significant in relation to the number of passed in the HSLC Examination.

**H<sub>0</sub> 5(b):** Rural-urban difference is not significant in relation to the number of passed in the HSLC Examination.

**Null Hypotheses Regarding Passed in Mathematics in HSLC Examination**

**H<sub>0</sub> 6(a):** Gender difference is not significant in relation to the number of passed in Mathematics in the HSLC Examination.

**H<sub>0</sub> 6(b):** Rural-urban difference is not significant in relation to the number of passed in Mathematics in the HSLC Examination.

**Null Hypothesis for Attitude and Belief towards Mathematics:**

**Ho 7(a):** There is no relationship between the causes of underachievement (CUA) in mathematics and different habits to study mathematics.

**Null Hypothesis for Math Anxiety, performance and literacy:**

**H<sub>0</sub> 8:** There is no relationship among the anxiety, performance and literacy in mathematics.

**H<sub>0</sub> 9(a):** The level of performance in mathematics has no relationship to sex factor.

**H<sub>0</sub> 9(b):** The level of anxiety in mathematics has no relationship to sex factor.

**H<sub>0</sub> 9(a):** The level of literacy in mathematics has no relationship to sex factor.

**H<sub>0</sub> 10(a):** There is no significant difference in the level of math-anxiety between male and Female.

**H<sub>0</sub> 10(b):** There is no significant difference in the level of math-performance between male and Female.



**H<sub>0</sub> 10(a):** There is no significant difference in the level of math-literacy between male and Female.

**H<sub>0</sub> 11:** There is no significant difference between pre-math anxiety and post-math anxiety level.

**H<sub>0</sub> 12:** There is no significant difference between pre-performance and post-performance in mathematics.

**Research Questions in Relation to Status and Structure of the Curriculum in Higher Secondary Mathematics:**

- (a) What is the modern trend of mathematics education in developed countries?
- (b) Are there any necessity of laboratory facilities and practical paper in mathematics?
- (c) Are there any need of separate options in mathematics curriculum for Arts, Science and Commerce streams?
- (d) To what extent the guidelines of NCF-2005 has been implementing in the textbook of mathematics for higher secondary mathematics?

**Research Questions in Relation to Pedagogical Practices in Higher Secondary Mathematics:**

- (a) What are the prevailing pedagogical practices in the country in teaching and learning mathematics?
- (b) Whether teachers' preparation is sufficient to meet the new emerging situation of technological and disciplinary development?
- (c) Whether the assessment process of students' learning progress and outcomes is appropriate in the present day context.
- (d) To what extend the guidelines of NCF-2005 has been implementing in the pedagogical practices of higher secondary mathematics?

**Methodology of the Study:**

The study is based on experimental results and empirical data collected through 2 (two) types of Formats, 3 (three) types of Questionnaires and 1(one) Test Paper

prepared by the investigator. The data were analysed using different statistical tools and tests of hypothesis with the help of SPSS.

This study is multidimensional in its nature and each chapter is based on its own methodology. The chapter- Participation and Achievement is purely quantitative and descriptive study and it reported the information of 45,332 (Arts=23052, Sc=4814, Com= 1347) number of higher secondary students belonging to nine institutions for a period of ten year (2002-2011). For secondary standard it reported the information of 6,250 (M=3848, F=2407) students appearing HSLC Examination in ten institutions for a period of ten year (2002-2011).

The chapter- Attitude and Belief is purely qualitative and descriptive study. Samples were collected by random sampling method. It reported the responses of 280 students (M=135, F=145) of higher secondary (223) and secondary (57) classes belonging to ten institutions of the district. It also reported the responses of 40 mathematics teachers of secondary level regarding attitude and belief toward mathematics and teaching in mathematics.

The chapter- Math Anxiety is based on experimental study conducted in 4 high schools in Dhupdhara locality. Experiments were performed with the help of Math Anxiety Scale (MAS) developed by S. Mahmood and his associates of A.M.U., Aligarh. It is a 5-point Likert type instrument that assesses positive and negative dimensions of math anxiety. The MAS has split-half reliability coefficient of 0.89 and internal consistency of Cronbach's alpha coefficient 0.87. It reported the responses of 80 (M=40, F=40) students of class-X through a questionnaire. It also reported the information regarding math literacy of the students' with the help of a test paper.

The chapter- status and structure of the curriculum of higher secondary mathematics is based on the extensive survey of literatures and text book analysis. The chapter related to pedagogical practices is based on the technique of 'Reviewed and Synthesized' of the related literatures in an extensive range of theoretical and empirical studies conducted so far in national and international level.



## 5. Summarization of Chapter Analysis and Findings of the study:

In Chapter-1, the study made a holistic approach in overviewing the present situation of mathematics education in Indian context in general and in particular to Assam. It also described the importance, necessity and focal points of the study.

The chapter-2 is related to review of literatures. The study made an extensive literatures survey related to Government Reports, Policies and documents in the field of education. It also covers the research works already conducted in the field of achievement and participation of the students in secondary mathematics; students' and teachers' attitudes and beliefs towards mathematics; anxiety of the students in mathematics; computer algebra system (CAS) and ICT based teaching-learning; curriculum and pedagogical practices in secondary mathematics in nation and abroad. Chapter-3 is related to the methodology of the study.

In Chapter-4 the study highlighted the fact that the rate of participation in higher secondary mathematics in arts stream was 1.66% only whereas it stood at 96.60% for science stream. The findings indicated a very high level of stream disparities regarding participation in mathematics. On the other hand the findings of the study revealed that there was no significant difference in the achievement level in mathematics between arts and science stream. Thus the findings supported the fact that the arts students have the same abilities as the science students in their achievement in mathematics. Hence, by increasing the rate of participation in mathematics in arts stream, the rate of achievement in mathematics can be improved. The study also reported gender disparities and stream (arts, science and commerce) disparities in the level of participation and achievement in mathematics.

In Chapter-5 it was sought to investigate the causes of avoiding mathematics, causes of under achievement in mathematics and the different learning approaches of the students towards study mathematics. Attempt was also made to investigate the attitudes and beliefs of the teachers about mathematics and in teaching mathematics. The study reported that the students' generally practiced moderate learning approaches to study mathematics. The study also reported that the *factor-lack of algebraic knowledge and unable to apply formula* and the *factor-lack of numerical and computing knowledge* were the prominent causes of



under achievement (CUA) in secondary mathematics. The study also revealed that the CUA was significantly correlated with the different study habits of the students. The remarkable finding of the study was that most of the secondary mathematic teachers are still in vagueness in their belief about the nature of mathematics and about the teaching of mathematics.

In the Chapter-6 the study sought to investigate the level of math-anxiety, performance and literacy of the secondary students with the help of experiment. The study reported that math-anxiety was negatively correlated with performance and literacy of the students in mathematics. Again, the performance and literacy of the students in mathematics was positively correlated. The study reported significant gender disparities in math performance and literacy; but in case of math-anxiety the gender difference was not significant. The remarkable finding of the study was that the remedial measures taken by the experiment to alleviate math-anxiety had positive effects.

In chapter-7, the study aimed at sensitizing the concern authorities with respect to the reform and modification of the curriculum according to the needs and expectations of the students for the benefit of the society. For this purpose the status and structure of the curriculum of higher secondary mathematics of different countries were discussed and compared to justify the feasibility of the existing curriculum of mathematics in India. Contents analysis of NCERT text books on higher secondary mathematics were also conducted in this chapter. The study reported that the curriculum is basically reflecting the priority and importance of the science stream only and there are no options for the needs of the arts stream. The study expressed concern that there is no provision for high attainers and separate option for basic skills. Moreover, there are no separate papers for arts, science, commerce and vocational streams depending on stream necessity as reflected in the curriculum of international community. Text book analysis of the study revealed that the exercises of the text book of higher secondary mathematics are dominated by the esoteric and express domain. The questions/statements from public and descriptive domain are found rarely. The horizontal mathematization of the NCERT text books of mathematics is very weak in compare to vertical mathematization. The study reported that the content of the class-XI text book of mathematics is introducing variety of topics and class-XII text book is dominated by calculus.



Chapter-8 is related to pedagogical practices in secondary and higher secondary mathematics. Regarding teaching mathematics at higher secondary level the study reported the need of using more teaching learning materials (TLM) including ICT and introducing practical-paper and project based work as reflected in the NCF-2005. The study expressed the view that in the new emerging situation of technological development the method of teaching mathematics need to be changed. The study expressed the need of rapid implementation of the school based continuous and comprehensive evaluation (CCE) system all over the country in the light of the recommendations of various educational bodies and commissions. The study reported the necessity of introducing students' self and peer assessment system of learning that provides students opportunities to evaluate their own work in the learning process and develop greater self-awareness. The study reported that the principal cause of general degradation in mathematics education is the prevailing mechanical and crude pedagogical practices in teaching-learning and assessment process. The finding is widely supported by the literatures surveyed.

### **Conclusion:**

The study set its aims to investigate the situation along two dimensions. One was to investigate the ground reality of the situation prevailing in the country. It was based on sample survey and experiment conducted by the investigator in the delimited study area. The findings of the ground reality are discussed in the chapters: participation and achievement, attitude and belief, and math anxiety in the study. The other investigation was related to curricula aspect which is a national agenda and it cannot be kept under confine in a specific area. Under this perspective the curricula aspects were investigated with the help of extensive literature survey conducted in national and international level. The findings of the literature surveyed were presented in the chapters- status and structure of the curriculum, and pedagogical practice in the study. The findings of the study are expected to be helpful in sensitizing the concern authorities to reframe the curriculum of higher secondary mathematics in view of the necessity of '*non-participating majority*' as well as '*talented minority*'.