CONTENTS

ACKNOWLEDGEMENT

LIST OF RESEARCH PUBLICATION & PRESENTATION

ABSTRACT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER-I: INTRODUCTION 1-31

1.1 Importance of school education 1

1.1 The importance of mathematics education 2

1.2 School education system in India with special reference to mathematics education 4

1.3 The education scenario in Assam 8

1.4 The process of mathematics teaching-learning 10

1.5 The philosophy of effective learning of mathematics 11

1.6 The role of mathematics teacher. 13

1.7 Role of domestic environment in effective teaching and learning 15

1.8 Role of school environment in effective teaching and learning 15

1.9 The role of syllabus and teaching materials in effective Teaching-learning 16
1.10 Appropriate tools for investigation of school level Mathematics education in Assam 18

1.11 Fuzzy concept 19

1.12 Fuzzy logic and its application 29

1.13 Objectives of the study 31

CHAPTER-II : REVIEW OF THE LITERATURE 32-47

2.1 Literature on Mathematics Education 32

2.2 Literature on Education system 38

2.3 Literature on application of fuzzy logic 41

CHAPTER-III : METHODS AND MATERIALS 48-78

3.1 Selection of study area 49

3.1.1 Description of HSLCE 49

3.1.2 Description of SLMO 50

3.1.3 Tools for analyzing the reflection criteria 51

3.1.4 Application of fuzzy logic to select the district 52

3.1.5 Formulation of fuzzy logic proposition 52

3.1.6 Application of conditional and unqualified
Proposition for the present study 54

3.1.7 The formation of fuzzy sets in the present content 54

3.1.8 Estimation of truth vales for the selected Propositions 55
3.1.9 Test for statistical significance 55

3.2 Selection of Schools 56

3.3 Collection of information from selected schools 57

3.4 Assessment of performance based on HSLCE and annual examination results 58

3.4.1 Comparison of performances through ranking based on HSLCE and class examination results 59

3.4.2 Application of fuzzy logic proposition to investigate reflection of performance in mathematics subject on other subjects using PSLCE 61

3.4.3 Fuzzy logic proposition with fuzzy quantifiers 62

3.5 Assessment of performance based on specially designed test on Mathematics i.e. Mathematical Ability Test (MAT) 64

3.5.1 The procedure and structure of MAT question paper 65

3.5.2 Testing learners’ consistency in performances in mathematics during three consecutive years 65

3.5.3 Use of average MAT score as mathematics performance indicator of schools 66

3.5.4 Use of MAT results to rank the selected schools through uniformity of performances 67

3.6 Analysis of course curriculum on the background of MAT performance 68
3.7 Design and Assessment of Educational Environment (EE) 68

3.7.1 Delineation of the academic situation into boarder groups 69

3.7.2 Division of the delineated groups into measurable Factors 70

3.7.3 Assigning proportionate values to the factors 70

3.8 Investigation of the effect of EE on mathematics Performance 74

3.8.1 Hypothesis testing through application of statistics 76

3.8.2 Application of Fuzzy Logic propositions to investigate the effect of EE and its components on MP 77

3.9 Comprehensive analysis and recommendation 78

CHAPTER-IV : RESULTS AND DISCUSSION 79-170

4.1 Analyzing selected area for investigation of mathematics education 80

4.1.1 Reflection of state level mathematics Olympiad Results on HSLCE results 80

4.1.2 General description of study area 85

4.1.3 Category wise selection of schools 86

4.1.4 Academic scenario of selected schools 88

4.2 Academic performance 90
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.1</td>
<td>Pass percentage of school leaving certificate (PSLCE)</td>
<td>90</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Students' performance in annual examination</td>
<td>95</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Mathematical performance in annual examination</td>
<td>95</td>
</tr>
<tr>
<td>4.2.4</td>
<td>Mathematics performance ranking vs. ranking of other academic parameters</td>
<td>96</td>
</tr>
<tr>
<td>4.2.5</td>
<td>Application of fuzzy logic proposition to Investigate reflection of performances in mathematics on overall subjects using PSLCE</td>
<td>103</td>
</tr>
<tr>
<td>4.3</td>
<td>Analysis of performances using MAT</td>
<td>110</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Consistency in mathematics performance during three consecutive years</td>
<td>110</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Ranking of schools based on uniformity in mathematics performance index (UMPI)</td>
<td>115</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Performances in different sub-areas of mathematics</td>
<td>117</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Analysis of syllabus &amp; text books with reference to students' performance in 13 different areas</td>
<td>136</td>
</tr>
<tr>
<td>4.3.5</td>
<td>Variations of school characteristics (EE components)</td>
<td>145</td>
</tr>
<tr>
<td>4.3.6</td>
<td>Variations of teacher characteristics (EE components) and its effect on MP</td>
<td>145</td>
</tr>
<tr>
<td>4.3.7</td>
<td>Variations of learners' domestic status (EE components) and its effect on MP</td>
<td>148</td>
</tr>
</tbody>
</table>
4.3.8 Variations of educational environment (EE) and its effect on mathematics performance 150

4.3.9 Investigation of the effect of educational environment (EE) on mathematics performance 152

4.3.10 Investigation of the effect of educational environment and its components on mathematics performance through fuzzy logic propositions 156

CHAPTER- V: CONCLUSIONS AND RECOMMENDATIONS 171-189

5.1 Background of the study 171

5.2 Prevailing academic scenarios and mathematics education 173

5.2.1 Methodology for fuzzy logic application 173

5.2.2 Reflection testing 173

5.2.3 Academic scenario 174

5.2.4 Performances in different sub-areas of mathematics 174

5.2.5 Learners’ consistency in mathematics performance 175

5.2.6 Uniformity of performances 176

5.2.7 Quantification of educational environment and investigating its effect on performance in Mathematics 177
5.3 Development of fuzzy logic procedure for investigating
effect of educational environment on performance in
mathematics

5.4 Syllabus and textbook with reference to learners’
performance in mathematics

5.5 Conclusions and Suggestions

5.6 Suggestions for further research

APPENDICES: PRO-FORMA (i-iv) & MAT QUESTIONNAIRE

REFERENCES