Students’ Experiences of Mathematics and How They Affect Further Engagement with Mathematics

Patrick Korbel

Supervisors: Assoc. Prof. Nicholas Buchdahl and Assoc. Prof. Sivakumar Alagumalai

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School of Mathematical Sciences,
Faculty of Engineering, Mathematical and Computer Sciences,
University of Adelaide
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Abstract

The aim of this research was to investigate what factors affect senior secondary school students’ attitudes towards mathematics, intentions to continue studying mathematics and mathematical literacy. In particular, this research was primarily interested in what happens “inside the classroom” and what effects this can have on students. The research was focused on the behaviours and practices of mathematics teachers and students in the classroom - how they teach, learn and interact.

The research involved Year 10 and Year 11 students in mathematics classes from a range of schools across Adelaide, South Australia. This group was the focus of the research because they are nearing the end of their compulsory mathematics education, making substantive decisions about their future education and considering pathways to further study and careers. This is can be crucial turning point for many students, so we must understand what influences them.

In Australia and internationally, there are persistent and wide-spread concerns about students’ engagement in mathematics at all levels of education. These concerns are often prompted by declining rates of enrolment in mathematics, particularly at the senior secondary school level where advanced mathematics subjects are part of an important pathway into further education. This research is a response to those concerns and an attempt to find out in which areas we can improve mathematics education to engage and retain more students.

However, the study of mathematics is not just for those with plans to become mathematicians or engineers. There is a growing need for mathematical literacy throughout society, so that we are prepared to engage in critical thought and debates and interact with an increasingly technological world. This research has been borne out of a personal
The primary data collection tools for this research were participant observation of mathematics classes, a survey questionnaire and a mathematics test. The participant observation was used to investigate classroom behaviours and practices to inform the development of the survey. The survey and the test were used together to measure students’ attitude towards mathematics, their intentions to continue studying mathematics, how often they and their teachers did certain things in their classes and their mathematical literacy.

A combination of analysis of variance, logistic regression and hierarchical linear modelling techniques were used to investigate what factors significantly affected attitudes towards mathematics, future intentions and mathematical literacy. In particular, logistic regressions and hierarchical linear models were used to develop models that sought to explain the variance in students’ attitude, intentions and literacy.

For mathematical literacy, the analysis indicates that some of the most important factors were country of birth, educational expectations, parental education, attitudes towards mathematics, the use of technology in the classroom and being assigned mathematics projects. This indicates that factors both “inside” (e.g. teachers’ use of technology) and “outside” the class (e.g. students’ background) are important to students’ mathematical literacy.

For attitudes towards mathematics, the analysis indicates that some of the most important factors were sex, language spoken at home, educational expectations, teachers, roaming the class, doing work from the textbook with and without other students. This again points to the importance of what happens inside and outside of the classroom.

For intentions to study mathematics, the analysis indicates that some of the most important factors were the perceived value of mathematics, attitudes towards mathematics, university entrance and prerequisites, interest in mathematics and the advice of teachers. These results highlight the importance of student attitudes towards mathematics and its general perception as a useful and necessary subject.

One of the most significant conclusions from this research is the importance of what happens inside and outside the classroom.
Students bring with them to their mathematics classes a lot more than a pencil case, textbook and exercise book. Students bring with them certain values, beliefs and perceptions about mathematics that they have learned and digested outside the classroom (and in previous classrooms) that affect their engagement with mathematics.

At the same time, what happens inside the classroom can and does make a difference to students and their engagement with mathematics. Above all, this research points to the fact that any interventions or initiatives should not ignore what happens inside the classroom nor what happens outside the classroom. Both aspects, and their complex and changing interactions, must be considered.

The results and process of this research suggests many avenues for future investigation and study. Future analyses should consider the multi-level and hierarchical nature of school education, the change in students’ engagement with mathematics over time and how best to capture the frequency of teacher and student practices in useful scales.
Contents

1 Introduction 1

2 Literature Review 7
   2.1 Motivations for the Research ........................................ 7
   2.2 Focus of the Study ..................................................... 15
   2.3 Research Methods .................................................... 23
   2.4 Summary ............................................................... 31

3 Methodology 33
   3.1 Variables ............................................................... 34
   3.2 Attitudes Towards Mathematics ........................................ 40
   3.3 Mathematical Literacy .................................................. 42
   3.4 Research Methods ..................................................... 44

4 Effects on Mathematical Literacy 59
   4.1 Introduction ............................................................ 59
   4.2 Background and Education ............................................. 60
   4.3 Attitude (Instrumental Motivation) .................................... 71
   4.4 Attitude (Self-concept) ................................................ 76
   4.5 Attitude (Intrinsic Motivation) ....................................... 82
   4.6 Teacher’s Practices .................................................... 85
   4.7 Required Practices .................................................... 90
   4.8 Student’s Practices ................................................... 93
   4.9 Effective Teaching .................................................... 97
   4.10 Sources ............................................................... 99
## CONTENTS

4.11 Conclusion .......................................................... 100

5 Effects on Attitude Towards Mathematics .......................... 107
  5.1 Introduction .......................................................... 107
  5.2 Background and Education ....................................... 108
  5.3 Teacher’s Practices .................................................. 116
  5.4 Required Practices .................................................. 121
  5.5 Student’s Practices .................................................. 125
  5.6 Effective Teaching ................................................... 132
  5.7 Sources ............................................................... 134
  5.8 Conclusion ............................................................ 137

6 Intentions to Study Mathematics ........................................ 145
  6.1 Introduction .......................................................... 145
  6.2 Background .......................................................... 146
  6.3 Attitude (Instrumental Motivation) ............................... 149
  6.4 Attitude (Self-concept) .............................................. 154
  6.5 Attitude (Intrinsic Motivation) ................................... 158
  6.6 Factors Influencing Intentions .................................... 163
  6.7 Teacher’s Practices .................................................. 171
  6.8 Required Practices .................................................. 175
  6.9 Student’s Practices .................................................. 176
  6.10 Sources ............................................................... 179
  6.11 Conclusion ............................................................ 180

7 Intentions to Study Advanced Mathematics ........................ 187
  7.1 Introduction .......................................................... 187
  7.2 Background and Education ....................................... 188
  7.3 Attitude (Instrumental Motivation) ............................... 194
  7.4 Attitude (Self-concept) .............................................. 199
  7.5 Attitude (Intrinsic Motivation) ................................... 204
  7.6 Factors ............................................................... 209
  7.7 Teacher’s Practices .................................................. 215
  7.8 Required Tasks ........................................................ 216
  7.9 Student’s Practices .................................................. 217
CONTENTS

7.10 Sources .................................................. 219
7.11 Conclusion ............................................. 220

8 Hierarchical Linear Modelling ............................................. 229
  8.1 Introduction ........................................... 229
  8.2 Literacy .................................................. 230
  8.3 Attitude .................................................. 252

9 Conclusion ...................................................... 275
  9.1 Main Findings ........................................... 278
  9.2 Limitations .............................................. 290
  9.3 Future Research ......................................... 298

Appendices

A Literacy ...................................................... 319
B Literacy (HLM) ............................................... 343
C Attitude ...................................................... 419
D Attitude (HLM) ............................................... 447
E Intentions to Study Mathematics ............................. 499
F Intentions to Study Advanced Mathematics ................. 519
G PISA and TIMSS ............................................. 541
H Participant Observation ...................................... 547
I Rasch Analysis ............................................... 613
J Survey Questionnaire ........................................ 621
K Mathematics Test ......................................... 631
L Ethics Approvals ............................................ 657
List of Tables

4.1 Effect of Background and Education Variables on Literacy .................. 68
4.2 Effect of Teacher’s Practice Variables on Literacy .......................... 89
4.3 Effect of Required Practices Variables on Literacy .......................... 92
4.4 Effect of Student’s Practices Variables on Literacy .......................... 96
4.5 Effect of Effective Teaching Variables on Literacy .......................... 98
4.6 Effect of External Sources Variables on Literacy ............................ 100

5.1 Effect of Background and Education Variables on Attitude ................ 115
5.2 Effect of Teacher’s Practices Variables on Attitude ......................... 119
5.3 Effect of Required Practices Variables on Attitude ......................... 124
5.4 Effect of Student’s Practices Variables on Attitude ......................... 131
5.5 Effect of Effective Teaching Variables on Attitude ......................... 133
5.6 Effect of External Sources Variables on Attitude ............................ 136

6.1 Effect of Background and Education Variables on Mathematics Intentions 148
6.2 Variables Not in the Model (Instrumental Motivation) ....................... 153
6.3 Variables Entered in the Model (Self-concept) ............................... 157
6.4 Variables in the Equation (Self-concept) ...................................... 158
6.5 Variables Not in the Model (Intrinsic Motivation) ............................ 162
6.6 Variables in the Equation (Intrinsic Motivation) ............................. 163
6.7 Effect of Factor Variables on Mathematics Intentions ....................... 170
6.8 Variables Entered in the Model (Factor) ...................................... 171
6.9 Variables in the Equation (Factor) ............................................. 171
6.10 Effect of Teacher’s Practices Variables on Mathematics Intentions .... 174
6.11 Effect of Required Practices Variables on Mathematics Intentions .... 176
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Table Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.12</td>
<td>Effect of Student’s Practices Variables on Mathematics Intentions</td>
<td>178</td>
</tr>
<tr>
<td>6.13</td>
<td>Effect of Source Variables on Mathematics Intentions</td>
<td>179</td>
</tr>
<tr>
<td>6.14</td>
<td>Significant Variables - Intentions to Study Mathematics</td>
<td>180</td>
</tr>
<tr>
<td>6.15</td>
<td>Variables Entered in the Model (Mathematics Intentions)</td>
<td>181</td>
</tr>
<tr>
<td>6.16</td>
<td>Model Summary (Mathematics Intentions)</td>
<td>181</td>
</tr>
<tr>
<td>6.17</td>
<td>Variables Not in the Model (Mathematics Intentions)</td>
<td>182</td>
</tr>
<tr>
<td>6.18</td>
<td>Variables in the Equation (Mathematics Intentions)</td>
<td>183</td>
</tr>
<tr>
<td>6.19</td>
<td>Classification Table (Mathematics Intentions)</td>
<td>184</td>
</tr>
<tr>
<td>6.20</td>
<td>Variables in the Equation (Second Model) (Mathematics Intentions)</td>
<td>185</td>
</tr>
<tr>
<td>7.1</td>
<td>Effect of Background and Education Variables on Advanced Mathematics Intentions</td>
<td>192</td>
</tr>
<tr>
<td>7.2</td>
<td>Model Summary (Background and Education)</td>
<td>193</td>
</tr>
<tr>
<td>7.3</td>
<td>Variables in the Model (Background and Education)</td>
<td>193</td>
</tr>
<tr>
<td>7.4</td>
<td>Variables Not in the Model (Instrumental Motivation)</td>
<td>198</td>
</tr>
<tr>
<td>7.5</td>
<td>Variables Not in the Model (Self-concept)</td>
<td>203</td>
</tr>
<tr>
<td>7.6</td>
<td>Variables in the Equation (Self-concept)</td>
<td>203</td>
</tr>
<tr>
<td>7.7</td>
<td>Variables in the Equation (Self-concept)</td>
<td>208</td>
</tr>
<tr>
<td>7.8</td>
<td>Variables in the Equation (Intrinsic Motivation)</td>
<td>208</td>
</tr>
<tr>
<td>7.9</td>
<td>Effect of Factor Variables on Advanced Mathematics Intentions</td>
<td>213</td>
</tr>
<tr>
<td>7.10</td>
<td>Variables Entered in the Model (Factor)</td>
<td>214</td>
</tr>
<tr>
<td>7.11</td>
<td>Variables in the Equation (Factor)</td>
<td>214</td>
</tr>
<tr>
<td>7.12</td>
<td>Effect of Teacher’s Practices Variables on Advanced Mathematics Intentions</td>
<td>216</td>
</tr>
<tr>
<td>7.13</td>
<td>Effect of Required Practices Variables on Advanced Mathematics Intentions</td>
<td>217</td>
</tr>
<tr>
<td>7.14</td>
<td>Effect of Student’s Practices Variables on Advanced Mathematics Intentions</td>
<td>219</td>
</tr>
<tr>
<td>7.15</td>
<td>Effect of Source Variables on Advanced Mathematics Intentions</td>
<td>220</td>
</tr>
<tr>
<td>7.16</td>
<td>Significant Variables - Intentions to Study Advanced Mathematics</td>
<td>221</td>
</tr>
<tr>
<td>7.17</td>
<td>Variables Entered in the Model (Advanced Mathematics)</td>
<td>222</td>
</tr>
<tr>
<td>7.18</td>
<td>Model Summary (Advanced Mathematics)</td>
<td>222</td>
</tr>
<tr>
<td>7.19</td>
<td>Variables Not in the Model (Advanced Mathematics)</td>
<td>223</td>
</tr>
<tr>
<td>7.20</td>
<td>Variables in the Equation (Advanced Mathematics)</td>
<td>224</td>
</tr>
</tbody>
</table>
LIST OF TABLES

7.21 Variables Affecting Intentions to Study Mathematics and Advanced Mathematics ........................................... 226

8.1 Effect of Background Variables on Literacy ............................ 230
8.2 Effect of Instrumental Motivation Variables on Literacy ............ 232
8.3 Effect of Self-concept Variables on Literacy .......................... 234
8.4 Model Statistics (Self-concept) ........................................... 235
8.5 Effect of Intrinsic Motivation Variables on Literacy .................. 236
8.6 Model Statistics (Intrinsic Motivation) ................................. 237
8.7 Effect of Teacher’s Practices Variables on Literacy .................... 238
8.8 Model Statistics (Teacher’s Practices) ................................ 239
8.9 Effect of Required Practices Variables on Literacy .................... 240
8.10 Model Statistics (Required Practices) .................................. 240
8.11 Effect of Student’s Practices Variables on Literacy ................... 241
8.12 Model Statistics (Student’s Practices) .................................. 243
8.13 Effect of Source Variables on Literacy ................................ 244
8.14 Model Statistics (Source) ................................................... 244
8.15 Significant Variables - Literacy .......................................... 245
8.16 Overall Model (Fixed Effects) (Literacy) .............................. 248
8.17 Overall Model (Variance Components) (Literacy) ................. 248
8.18 Effect of Background Variables on Attitude ......................... 253
8.19 Effect of Teacher’s Practices Variables on Attitude .................. 255
8.20 Model Statistics (Teacher’s Practices) .................................. 255
8.21 Effect of Required Practices Variables on Attitude .................. 256
8.22 Effect of Student’s Practices Variables on Attitude ................. 257
8.23 Effect of Source Variables on Attitude ................................ 259
8.24 Model Statistics (Source) ................................................... 260
8.25 Significant Variables - Attitude ........................................... 261
8.26 Overall Model (Fixed Effects) (Attitude) .............................. 265
8.27 Overall Model (Variance Components) (Attitude) ................. 266
8.28 Variables Affecting Literacy and Attitude ............................ 271
List of Figures

8.1 Student-level Effects in the Overall Model (Literacy) . . . . . . . . . . 249
8.2 Student-level Effects in the Overall Model (Attitude) . . . . . . . . . . 267