Synthesising the Literature Concerning Math-Anxiety to Inform a Project on Pre-service Teacher Retention Rates

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Rationale

Numeracy is being able to apply maths in the context of the real world (i.e. to life)

Consists of:

• *formal* ideas related to *numeration* and *place value*, and

• *informal* ideas that we call *number sense*.
What is **number sense**?

Some examples…

- How do you know which bus to catch to get to university on time for your lecture?

- How do you know if you have enough money to pay for your lunch?

- How do you know approximately how much groceries to buy for 1 week for 2 people?

- Which is better 1/2 of an apple or 2/3 of an apple? 1/2 of a million dollars or 3/5 ?

- If you are looking for house No. 145 in a street, and No. 2 is on the left hand side near you, what do you know?
What is **numeration**?

- Numeration is the **formal** understanding of number and number notation, specifically related to naming, writing, reading, interpreting and processing numbers…

**NB.** Numeration is the content and processes *taught* in mathematics lessons.
Mental Computation (numeration skills)

To calculate mentally children need:

• to understand the concept of the operations in order to organise their thinking, and

• to know their basic number facts and strategies in order to process information (especially dealing with larger numbers).
Mental computation develops from:

- Number sense activities **every day**
- Knowledge of **number facts**
- Exploring a range of useful mental strategies
• For primary teachers, being numerate is a **CORE ability** they need to possess.

• They are the people who initially have to teach Numeracy to students.
The need

- Approximately 30% of last year’s USQ Education primary pre-service students were maths challenged (survey result EDX1280, July 2012).
- This lack could affect course progression and/or retention rates.
- It must affect the quality of the teachers USQ sends out to schools, even if partially rectified.

Why might they not be able to?
- lack of prior maths understanding
- suffering from maths anxiety
EDX1280 Quiz Question

*Do you currently have the mathematics content knowledge required to teach effectively?*

Do you know what $5 \div 0$ equals?

Is the answer:

1. 5
2. 0
3. something else

*Not sure?*

Year 3 children across Australia are expected to know this and be able to explain the correct answer.
Update literature review

• One aspect of my thesis
  – maths anxiety & pre-service teachers
    - 1960s to current (STILL THERE)
• Extend to current work on anxiety / Numeracy levels & retention rates
<table>
<thead>
<tr>
<th>NEGATIVE ATTITUDES</th>
<th>Key ideas</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative attitudes towards mathematics may impede pre-service teachers’ ability to engage in mathematical content and pedagogical subjects designed to improve their mathematical understandings.</td>
<td>Improvement in attitudes towards mathematics may improve retention and progress.</td>
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<tr>
<td></td>
<td>… linked poor attitudes in her own pre-service teachers with math anxiety …</td>
<td>Importance of building up the self-confidence of students.</td>
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<tr>
<td>TEACHER BELIEF</td>
<td>… teachers' beliefs about their ability to bring about outcomes in their classrooms, and their confidence in teaching in general, play a central role in their abilities to effectively serve their students.</td>
<td>Promotion of efficacy will positively impact competence of teachers and hence the outcomes of their teaching.</td>
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<td>FEMALE PROBLEM</td>
<td>… puts the gender relationship at the forefront of the picture whilst also making the point that most teachers of this level … are female</td>
<td>Reinforces the notion that, in primary school, this is mainly a female problem</td>
</tr>
<tr>
<td>ANXIETY ISSUES</td>
<td>By ignoring the powerful role that anxiety plays in mathematical situations, we are overlooking an important piece of the equation …</td>
<td>Demonstrates the need for action.</td>
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</tbody>
</table>
University educators need to ask:

• “Do all our students have this self-belief?
• If not, why not and what are we going to do about it?”
The Project

• Research questions

• Method
  – Initial data / surveys
  – Process results
  – Interview at-risk students / Offer intervention help
  – Review success

• End play
Research questions

(1) What is the relationship between high Anxiety / poor Numeracy levels and Retention rates?

(2) Are there clearly defined groups of at-risk students?

(3) Are at-risk students accessing targeted math help effectively?
Initial surveys

• Look for any correlation between pass rates and retention rates for previous students
• Survey current and future students about their anxiety and/or Numeracy levels
• Check results for low SES and Indigenous students
• Extension to other courses?
Process results

• Investigate the first 2 research questions
  – Any anxiety / retention relationship?
  – Any clear at-risk groupings?

• Preliminary answer to 3rd research question
  – Are students accessing help available?
  – Does this fit into any specific groupings?

• Repeat with future data (as required)
Interview at-risk students

• Contact any at-risk students and request an interview (Target low SES and Indigenous students initially)
• Discuss results and expand on answers
• Offer targeted maths help
  1. *Help with what is currently available*
     - self-help on-line tutorials (on StudyDesk)
     - access to courses specifically designed to remedy maths deficiencies (formal 1 unit course options)
     - individual Student Support services
  2. *Specific extra items*
     - individual maths tutoring by project staff / helpers
     - other tailored response
End play

• Include access in future courses
• Advertise access for previous students
• Report to stakeholders
• Publish results
Review success

- Post-intervention survey
- ???
Thank you for coming!
Thank you for helping me!

Enjoy the rest of the conference.