

Advancing the STEM Agenda

June 3-4, 2013 Grand Valley State University

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

Presenter: Dr Nicholas Flegg

Literature Update: Ms Kamariah Mohamed

Project Co-researcher: A/Prof Karen Trimmer

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 $\frac{1}{2}$ of an apple or $\frac{2}{3}$ of an apple? $\frac{1}{2}$ of a million dollars or $\frac{3}{5}$?
- 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:

```
graph TD; A[Mental computation develops from:] --> B[Number sense activities every day]; A --> C[Exploring a range of useful mental strategies]; A --> D[Knowledge of number facts];
```

Number sense activities every day

Exploring a range of useful mental strategies

Knowledge of number facts

- 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

	Key ideas	Conclusions
NEGATIVE ATTITUDES	Negative attitudes towards mathematics may impede pre-service teachers' ability to engage in mathematical content and pedagogical subjects designed to improve their mathematical understandings.	Improvement in attitudes towards mathematics may improve retention and progress.
	... linked poor attitudes in her own pre-service teachers with math anxiety ...	Importance of building up the self-confidence of students.
TEACHER BELIEF	... 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.	Promotion of efficacy will positively impact competence of teachers and hence the outcomes of their teaching.
FEMALE PROBLEM	... puts the gender relationship at the forefront of the picture whilst also making the point that most teachers of this level ... are female	Reinforces the notion that, in primary school, this is mainly a female problem
ANXIETY ISSUES	By ignoring the powerful role that anxiety plays in mathematical situations, we are overlooking an important piece of the equation ...	Demonstrates the need for action.

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.