Discrete mathematics and project based learning

Dr Elena Prieto
Decrease in interest in mathematics

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

- No maths
- General
- 2 Unit
- Ext 1
- Ext 2

• There are four senior secondary subjects for Mathematics as part of the Australian Curriculum:

  – Essential Mathematics
  – General Mathematics
  – Mathematical Methods
  – Specialist Mathematics
<table>
<thead>
<tr>
<th>General Mathematics</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
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</thead>
<tbody>
<tr>
<td>Consumer arithmetic</td>
<td>Univariate data analysis and the statistical investigation process</td>
<td>Bivariate data analysis</td>
<td>Time series analysis</td>
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<tr>
<td>Algebra and matrices</td>
<td>Applications of trigonometry</td>
<td>Growth and decay in sequences</td>
<td>Loans, investments and annuities</td>
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<tr>
<td>Shape and measurement</td>
<td>Linear equations and their graphs</td>
<td>Graphs and networks</td>
<td>Networks and decision mathematics</td>
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<tr>
<td>Unit 1</td>
<td>Unit 2</td>
<td>Unit 3</td>
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<tr>
<td>Specialist Mathematics</td>
<td>Combinatorics</td>
<td>Trigonometry</td>
<td>Integration and applications of integration</td>
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<td>Vectors in the plane</td>
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<td>Matrices</td>
<td>Rates of change and differential equations</td>
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<td>Geometry</td>
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<td>Real and complex numbers</td>
<td>Statistical inference</td>
<td></td>
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<td></td>
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<td>Sketching graphs</td>
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‘Graphs and networks’ introduces students to the language of graphs and the ways in which graphs, represented as a collection of points and interconnecting lines, can be used to model and analyse everyday situations such as a rail or social network.
‘Networks and decision mathematics’ uses networks to model and aid decision making in practical situations.
‘Combinatorics’ provides techniques that are useful in many areas of mathematics including probability and algebra. All these topics develop students’ ability to construct mathematical arguments.
Is this going to be implemented?

- “Graph theory is disconnected from other topics and does not belong in a school course”

- “The senior mathematics subjects do not represent an appropriate scope of learning for students. There is too much emphasis on graph theory, networks and statistics at the expense of other areas, such as calculus and geometry”
Is this going to be implemented?

• “The Specialist Mathematics content needs further consideration in terms of balance, as it appears to over-represent discrete Mathematics”

• “I would like to see the removal of graph theory and statistics, a reduction in the study of matrices and vectors, and the inclusion of more calculus.”
How could we help teachers change their minds?

Some resources for primary school children to learn about discrete mathematics
Science and Engineering Challenge
Science and Engineering Challenge
Any more ideas?

Professional Development for teachers!
Any more ideas?

Professional Development for teachers!
ETM ST

- Government currently trying to address issues of recruitment, training, and retention of mathematics teachers which involves
  - mathematical scientists,
  - education academics,
  - in-service teachers, and
  - tertiary mathematical science and teaching students
Our proposal

- Outreach
- Exemplar courses / Professional Development
- Pathways
- Practicums
- Outreach
- Exemplar courses / Professional Development
- Pathways
- Practicums

Year 10 Enrichment Programme

CARMA Young Mathematicians

Maths Hunter
“Closely linked mathematics and education courses, created to meet the AITSL standards and centred on mathematical rounds, will become exemplar courses for in-service and pre-service teachers.

These courses - based on existing highly rated courses and delivered by academics from both mathematics and education fields - will challenge preconceived notions of mathematics and its teaching, modelling best practice and focussing upon showing the discipline as a human endeavour that is useful, creative, practical and dynamic.”
"We will publicise pathways into teaching for mathematical science students, whereby exemplar courses using mathematical rounds will be credited both towards the undergraduate mathematical science degree and a postgraduate teaching qualification."
“In addition to the exemplar courses, traditional ‘practicums’ for pre-service teachers will systematically utilise mathematical rounds incorporating mathematical scientists and in-service teachers, facilitating an ongoing cycle of sustained professional conversations and bringing to classrooms a dynamic vision of mathematics and its teaching and learning.”
Exemplar Courses  Pathways  Practicums

Mathematical rounds
Mathematical rounds

- are akin to medical rounds
- will ‘explore’ teaching occurring in
  - schools,
  - the University exemplar courses, and
- prominent mathematical scientists engaged in teaching and/or public communication of mathematical sciences
Mathematical rounds will enable

- **pre-service teachers** to experience a working model of evaluating and improving their professional work,
- **in-service teachers** to be involved in a cutting edge professional development based on authentic discipline knowledge,
- **mathematical science students** to be exposed to a pathway into the teaching profession as well as a deep understanding of what it means to be a mathematician,
- **academics** to collaboratively develop and improve curriculum for teacher education.
Now Kath!