Curriculum Workshop:
Master of Science (Mathematics for Educators) – A Case Study

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1. Program objectives

2. Entry requirements
Outline

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3 Structure of program
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4. Financing

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5. Marketing issues

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1. Program objectives
2. Entry requirements
3. Structure of program
4. Financing
5. Marketing issues
6. Program reviews
“Begin with the end in mind.” – Stephen Covey
All teachers hold masters degrees. Primary school teachers major in education, while upper grade teachers concentrate their studies in a particular subject, e.g., mathematics, as well as didactics, consisting of pedagogical content knowledge specific to that subject. There are no alternative ways to receive a teachers diploma in Finland: the university degree constitutes a license to teach.
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Motivation

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Key notion

Professional Development (PD)
A strong mastery of mathematics will enable a mathematics teacher to teach better and to promote higher order thinking among mathematics learners.
Motivation

Education specialists in mathematics will also benefit from this programme because a good understanding of mathematics is essential for work such as design of contemporary and relevant curriculum, assessment of mathematics learning, and development of teaching resources.
The program name must match its objective.
The program is aimed to upgrade the content knowledge in mathematics for mathematics teachers.
Program title

Master of Science (Mathematics for Educators)
The Master of Science (Mathematics for Educators) (MSMAE, for short) programme is a coursework programme designed to provide rigorous training in advanced mathematics to mathematics teachers and other professionals.
This programme differentiates itself from others in that the acquisition of wide and in-depth knowledge in mathematics is emphasised along with its connection to mathematics teaching.
Entry requirements

Applicants should have either:

(a) a Bachelor or Science degree with honours in mathematics, or
go equivalent in a relevant discipline;

or

(b) a Bachelor or Science degree in mathematics, or equivalent in
at least one year of professional
doing in a relevant discipline.
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Entry requirements

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(a) a Bachelor or Science degree with honours in mathematics, or equivalent in a relevant discipline; or

(b) a Bachelor or Science degree in mathematics, or equivalent in a relevant discipline, and at least one year of professional working experience.
The programme may be completed in 4 years on a part-time basis, and 2 years on a full-time basis.
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**Note**

The reason for a part-time track is because this course is catered to teachers who have the work in the day, and can only attend evening classes. However, they are also some teachers/non-teachers who can take the course on the full-time basis because of special leave.
Levels of courses

There are 2 levels of courses.
Level 1 courses attempt to connect higher mathematics with school mathematics.
Level 1

<table>
<thead>
<tr>
<th>Course codes</th>
<th>Course titles</th>
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</thead>
<tbody>
<tr>
<td>MSM810</td>
<td>Advanced calculus and applications for educators</td>
</tr>
<tr>
<td>MSM811</td>
<td>Abstract algebra for educators</td>
</tr>
<tr>
<td>MSM812</td>
<td>Elements of mathematical analysis with applications in the teaching of calculus</td>
</tr>
<tr>
<td>MSM813</td>
<td>Number theory and teaching of arithmetic</td>
</tr>
<tr>
<td>MSM814</td>
<td>Statistical reasoning for educators</td>
</tr>
<tr>
<td>MSM815</td>
<td>Discrete mathematics and problem solving</td>
</tr>
<tr>
<td>MSM817</td>
<td>Computing and programming techniques</td>
</tr>
</tbody>
</table>
Level 2 courses will further develop expertise in a number of mathematical fields.
<table>
<thead>
<tr>
<th>Course codes</th>
<th>Course titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSM821</td>
<td>Real analysis</td>
</tr>
<tr>
<td>MSM822</td>
<td>Functional analysis</td>
</tr>
<tr>
<td>MSM823</td>
<td>Commutative and non-commutative algebra</td>
</tr>
<tr>
<td>MSM824</td>
<td>Topics in applied algebra</td>
</tr>
<tr>
<td>MSM825</td>
<td>Theory and applications of differential equations</td>
</tr>
<tr>
<td>MSM826</td>
<td>Advanced techniques in applied mathematics</td>
</tr>
<tr>
<td>MSM827</td>
<td>Statistical methods</td>
</tr>
</tbody>
</table>
### Course codes | Course titles
--- | ---
MSM828 | Topics in mathematica statistics
MSM829 | Directed graphs: theory, algorithms and applications
MSM830 | Vertex coloring and chromatic polynomials
MSM831 | Differential geometry
MSM832 | Topology
Apart from all the electives offered, there is a mandatory course all students have to take, i.e., the capstone course is

MSM800 Mathematical Inquiry
The core course, **Mathematical Inquiry**, provides the students with an excellent opportunity to examine current research in a chosen area of pure or applied mathematics.
Core course

For mathematical inquiry, a number of projects are proposed by different professors in a given semester. These projects will belong to one or some of the following categories:
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- read chapter(s) of a book or an entire book, and complete exercises;
- read journal papers on current research mathematics;
- write computer programs and simulations for mathematical or statistical modelling processes.
Core course

Near the end of the course, students will be assessed based on
Near the end of the course, students will be assessed based on their understanding of the materials they were assigned to read:

1. original work
2. improvement
3. alternative proofs
4. examples
Core course

Near the end of the course, students will be assessed based on
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- desk study:
  1. objectives
  2. background
  3. literature search
  4. references
Core course

Near the end of the course, students will be assessed based on:

1. Attitude
2. Effort
3. Enthusiasm
4. Independence
Core course

Near the end of the course, students will be assessed based on research initiative:

1. attitude
2. effort
3. enthusiasm
4. independence
Core course

Near the end of the course, students will be assessed based on
Core course

Near the end of the course, students will be assessed based on:

- report and presentation:
  1. correctness
  2. general flow
  3. overall structure
  4. clarity
In each semester, classes are run in the evening from 6 to 9 pm.
Course implementation

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- There are 4 to 5 courses running, about an equal number of Level 1 and Level 2 courses simultaneously in different days of the week.
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- There are 4 to 5 courses running, about an equal number of Level 1 and Level 2 courses simultaneously in different days of the week.
- There are 2 semesters in a year.
Course implementation

- Each lesson runs for 3 hours.
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- It is up to the professor’s discretion how the lectures and tutorials are distributed.
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- Usually, a course schedule is drawn up at the beginning of the course.
Assessment modes

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- quizzes
Assessment modes

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This preferred form of assessment leans closer to formative assessment than summative assessment.
Usually, we match the staff who is expert in an area to the topic taught.
An integral part of any academic programme is the fee system.
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<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (in SGD, inclusive of GST)</th>
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<tbody>
<tr>
<td>Tuition Fees</td>
<td>S$12,840</td>
</tr>
<tr>
<td>Miscellaneous Fees:</td>
<td></td>
</tr>
<tr>
<td>A 1-time fee payable on admission</td>
<td>S$321</td>
</tr>
<tr>
<td>Amenities fees</td>
<td>S$12.80</td>
</tr>
<tr>
<td>(paid annually by full-time students only)</td>
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</tr>
<tr>
<td>Group Hospitalisation and Surgical Insurance Scheme (GHSI)</td>
<td>S$79</td>
</tr>
<tr>
<td>(paid annually by full time Singapore, PR’s and international students)</td>
<td></td>
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</tbody>
</table>
For sustainability reasons, it is important to promote publicity of this course to the in-service teachers. This is usually done with formal advertisements on newspapers, roadshows to the Singapore schools explaining to the teachers why they need to upgrade their content knowledge in mathematics, website advertisements, etc.
Program review

At the end of 5 years, there is review process in place, which looks into some of the following issues:

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2. Staff and student feedback
3. Logistics issues
4. Assessment modes
5. Structure of the course