ECH 232
Young Children's Mathematics, Science and Technology 1
S2 External 2013

Institute of Early Childhood

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**General Information**

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Convenor</td>
</tr>
<tr>
<td>Kate Highfield</td>
</tr>
<tr>
<td><a href="mailto:kate.highfield@mq.edu.au">kate.highfield@mq.edu.au</a></td>
</tr>
<tr>
<td>Contact via <a href="mailto:kate.highfield@mq.edu.au">kate.highfield@mq.edu.au</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECH113 or (12cp and admission to BTeach(ECH))</td>
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</table>

<table>
<thead>
<tr>
<th>Corequisites</th>
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<table>
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<tr>
<th>Co-badged status</th>
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<table>
<thead>
<tr>
<th>Unit description</th>
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<tbody>
<tr>
<td>This unit explores the theory and practice of mathematics, science and technology for young children. Mathematics, science and technology are presented as ways of acquiring and processing information about the world. Students gain an understanding of developmental stages in young children's learning of mathematics and science. Teaching and assessment strategies relevant for planning and implementing developmental programs are examined.</td>
</tr>
</tbody>
</table>

**Important Academic Dates**

Information about important academic dates including deadlines for withdrawing from units are available at [http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/](http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/)

**Learning Outcomes**

1. Demonstrate a fundamental understanding of the major theoretical developments in early childhood mathematics, science and technology education;
2. Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
3. Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology;
4. Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
5. Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology
6. Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;
7. Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

### Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>weekly quiz</td>
<td>24%</td>
<td>weekly</td>
</tr>
<tr>
<td>Planning for Mathematics</td>
<td>38%</td>
<td>12th Sep OR 6th Nov</td>
</tr>
<tr>
<td>Planning for Science</td>
<td>38%</td>
<td>12th Sep OR 6th Nov</td>
</tr>
</tbody>
</table>

#### weekly quiz
Due: weekly
Weighting: 24%

As students engage with each module of learning they will complete a short (maximum 5 question) quiz. Each quiz focusses on content related to the module including readings, resources and lectures. Two quizzes from each module will be marked.

This Assessment Task relates to the following Learning Outcomes:

- Demonstrate a fundamental understanding of the major theoretical developments in early childhood mathematics, science and technology education;
- Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology
- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology

### Planning for Mathematics
Due: 12th Sep OR 6th Nov
Weighting: 38%

Students are to design a set of six lesson plans for mathematics learning. Full details of strands addressed are presented in the unit outline on iLearn.
This Assessment Task relates to the following Learning Outcomes:

- Demonstrate a fundamental understanding of the major theoretical developments in early childhood mathematics, science and technology education;
- Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
- Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology
- Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology
- Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;
- Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

Planning for Science

Due: 12th Sep OR 6th Nov
Weighting: 38%

Students are to design a mini unit of work for science learning. Full details of strands addressed are presented in the unit outline on iLearn.

This Assessment Task relates to the following Learning Outcomes:

- Demonstrate a fundamental understanding of the major theoretical developments in early childhood mathematics, science and technology education;
- Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
- Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology
- Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
• Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology
• Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;
• Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

**Delivery and Resources**

**Delivery**

The unit is taught through a combination of online lectures, workshops and tutorials (and the external equivalent). The use of the web Discussion Board plays an integral part in the teaching and learning of all students.

All students are required to read the set weekly readings prior to the lectures each week.

All students are required to actively participate in discussions and hands on activities during tutorial sessions.

**Resources**

Internal and external students are required to purchase the following text from the University Co-op Bookshop or Cengage learning. This text will also be used in future Maths, Science and Technology subjects, so purchasing this will have be useful


Older versions of this text (2010 onwards are also appropriate)

**Technologies**

A range of technologies are used in this unit. The key requirement is for students to be able to access online resources, basic word processing software (eg word or pages) and basic presentation software (eg powerpoint, show me, keynote or explain everything).

**Change since last delivery of ECH232**

Since the last delivery of ECH232 (in 2012) this unit has changed in structure (online lectures, cyclic delivery of content) and assessment tasks. The online lectures and cyclic modules have facilitated greater engagement with expert staff and better sequencing of content. These changes necessitated alterations to assessment tasks.
# Unit Schedule

Students complete and introductory module then three modules for learning in mathematics, science and technology. The following planner presents an overview of this. Further details of topic and content are in the unit outline on iLearn.

<table>
<thead>
<tr>
<th>Week</th>
<th>(week beginning)</th>
<th>Tutorial Group A (Monday 11am starting in X5B041)</th>
<th>Tutorial Group B (Monday 11am starting in X5B045)</th>
<th>Tutorial Group C (Monday 11am starting in X5B251)</th>
<th>Tutorial Group D (Monday 2pm starting in X5B041)</th>
<th>Tutorial Group E (Monday 2pm starting in X5B045)</th>
<th>Tutorial Group F (Monday 2pm starting in X5B251)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29/7/13</td>
<td>Introduction to the unit (online content only). NO TUTORIAL CLASSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5/8/13</td>
<td>Mathematics Topic 1 (Jane Frazer – X5B 041)</td>
<td>Science Topic 1 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 1 (Kate Highfield – X5B 251)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12/8/13</td>
<td>Mathematics Topic 2 (Jane Frazer – X5B 041)</td>
<td>Science Topic 2 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 2 (Kate Highfield – X5B 251)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

External On Campus Day 1 – Sunday 18th August (Science & Tech)

[http://unitguides.mq.edu.au/unit_offerings/13587/unit_guide/print](http://unitguides.mq.edu.au/unit_offerings/13587/unit_guide/print)
<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Subject 1</th>
<th>Subject 2</th>
<th>Subject 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>19/8/13</td>
<td>Mathematics Topic 3 (Jane Frazer – X5B 041)</td>
<td>Science Topic 3 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 3 (Jessica Brown – X5B 251)</td>
</tr>
<tr>
<td>5</td>
<td>26/8/13</td>
<td>Science Topic 1 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 3 (Jessica Brown – X5B 251)</td>
<td>Mathematics Topic 1 (Jane Frazer – X5B 041)</td>
</tr>
<tr>
<td>6</td>
<td>2/9/13</td>
<td>Science Topic 2 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 1 (Kate Highfield – X5B 251)</td>
<td>Mathematics Topic 2 (Jane Frazer – X5B 041)</td>
</tr>
<tr>
<td>7</td>
<td>9/9/13</td>
<td>Study week to finalise assignment 2/3 (No classes or online content)</td>
<td>Assignment 2/3 due before Thursday 12th September</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>groups A, C, D &amp; F = mathematics planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>groups B, E &amp; Externals = science planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mid Semester Break</td>
</tr>
<tr>
<td>8</td>
<td>30/9/13</td>
<td>Science Topic 3 (Camilla Gordon – X5B 045)</td>
<td>ICT Topic 2 (Kate Highfield – X5B 251)</td>
<td>Mathematics Topic 3 (Jane Frazer – X5B 041)</td>
</tr>
</tbody>
</table>
## Learning and Teaching Activities

### online lectures

Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>7/10/13</td>
<td>Monday Public Holiday – no classes</td>
</tr>
<tr>
<td>10</td>
<td>14/10/13</td>
<td>ICT Topic 1 (Kate Highfield – X5B 251) Mathematics Topic 1 (Jane Frazer – X5B 041) Science Topic 1 (Camilla Gordon – X5B 045)</td>
</tr>
<tr>
<td>11</td>
<td>21/10/13</td>
<td>ICT Topic 2 (Kate Highfield – X5B 251) Mathematics Topic 2 (Jane Frazer – X5B 041) Science Topic 2 (Camilla Gordon – X5B 045)</td>
</tr>
<tr>
<td>12</td>
<td>28/10/13</td>
<td>ICT Topic 3 (Jessica Brown – X5B 251) Mathematics Topic 3 (Jane Frazer – X5B 041) Science Topic 3 (Camilla Gordon – X5B 045)</td>
</tr>
<tr>
<td>13</td>
<td>4/11/13</td>
<td>Study week to finalise assignment 2/3 (No classes or online content)</td>
</tr>
</tbody>
</table>

Assignment 2/3 due before Wednesday 6\(^{th}\) November

- Groups A, C, D & F = science planning
- Groups B, E & Externals = mathematics planning
tutorials
Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts

weekly quiz tasks
Students will complete a weekly quiz on completion of the online component (readings and lectures) for each learning module (in Mathematics, Science and Technology)

Assessment tasks
Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module

Online discussion and resources
Students will have access to online discussion forums and resources for use in each module of this subject.

module readings
Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Policies and Procedures
Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://www.mq.edu.au/policy/docs/academic_honesty/policy.html
Special Consideration Policy http://www.mq.edu.au/policy/docs/special_consideration/policy.html

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Support
Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at: http://students.mq.edu.au/support/
Graduate Capabilities

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

**Learning outcomes**

- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology
- Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

**Assessment tasks**

- Planning for Mathematics
- Planning for Science
Learning and teaching activities

• Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)
• Students will complete a weekly quiz on completion of the online component (readings and lectures) for each learning module (in Mathematics, Science and Technology)
• Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
• Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

• Demonstrate a fundamental understanding of the major theoretical developments in early childhood mathematics, science and technology education;
• Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
• Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology
• Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
• Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology

Assessment tasks

• weekly quiz
• Planning for Mathematics
• Planning for Science
Learning and teaching activities

• Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)
• Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts
• Students will complete a weekly quiz on completion of the online component (readings and lectures) for each learning module (in Mathematics, Science and Technology)
• Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
• Students will have access to online discussion forums and resources for use in each module of this subject.
• Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

• Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
• Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
• Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;
• Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

Assessment tasks

• weekly quiz
• Planning for Mathematics
• Planning for Science

**Learning and teaching activities**

• Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)

• Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts

• Students will complete a weekly quiz on completion of the online component (readings and lectures) for each learning module (in Mathematics, Science and Technology)

• Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module

• Students will have access to online discussion forums and resources for use in each module of this subject.

**Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

**Learning outcomes**

• Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology

• Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;

**Assessment tasks**

• Planning for Mathematics

• Planning for Science

**Learning and teaching activities**

• Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts

• Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Creative and Innovative
Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes
- Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
- Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;

Assessment tasks
- Planning for Mathematics
- Planning for Science

Learning and teaching activities
- Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts
- Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
- Students will have access to online discussion forums and resources for use in each module of this subject.

Effective Communication
We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:
Learning outcomes

• Develop skills in designing, implementing and evaluating lesson sequences using knowledge of the NSW Curriculum Framework, NSW syllabuses and other curriculum requirements of the Education Act;
• Demonstrate relevant knowledge of the central concepts, modes of enquiry and structure in the discipline of mathematics and science & technology
• Begin to evaluate mathematics, science and technology resources in light of their experience as a teacher of young children;
• Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;

Assessment tasks

• weekly quiz
• Planning for Mathematics
• Planning for Science

Learning and teaching activities

• Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts
• Students will complete a weekly quiz on completion of the online component (readings and lectures) for each learning module (in Mathematics, Science and Technology)
• Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
• Students will have access to online discussion forums and resources for use in each module of this subject.

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Assessment task

• Planning for Science
Learning and teaching activity

- Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)
- Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
- Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science & technology
- Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

Assessment tasks

- Planning for Mathematics
- Planning for Science

Learning and teaching activities

- Students will view a series of short online lectures for each module of learning (in Mathematics, Science and Technology)
- Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
- Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.
This graduate capability is supported by:

**Learning outcomes**

- Develop skills in integrating information and communication technologies (ICT) within effective teaching and learning strategies to expand opportunities for students in mathematics and science learning;
- Explore, adapt and shape understandings and skills and demonstrate safe, responsible and legal use of ICT in planning and teaching.

**Assessment tasks**

- Planning for Mathematics
- Planning for Science

**Learning and teaching activities**

- Students will participate in weekly tutorials (or external equivalent) to complete "hands on tasks" as would be seen in 0-5 and school contexts
- Students will complete two main assessment tasks: planning for learning in maths and planning for learning in science to exemplify their learning for each module
- Students will have access to online discussion forums and resources for use in each module of this subject.
- Within each module students are expected to read a range of texts and research literature to support their understanding of theory and pedagogy.