ECH 430
Teaching and Learning Science and Technology
S2 Day 2013

Institute of Early Childhood

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General Information

Unit convenor and teaching staff
Unit Convenor
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kate.highfield@mq.edu.au
Contact via kate.highfield@mq.edu.au

Credit points
3

Prerequisites
ECH335

Corequisites

Co-badged status

Unit description
This unit builds on the knowledge gained in ECH232, ECH335 and ECH431, further developing student's knowledge of the principles and practices of teaching and learning science and technology. Students explore a range of strategies for assessing children's scientific understandings, and use knowledge of curricula, resources and teaching strategies to design and implement lesson sequences to enhance the growth of children's scientific thinking. Students examine information and communication technology as a tool for learning and explore issues related to the use of technology in the classroom. The integration of science and technology into other learning areas and differentiating curriculums to meet the diverse needs of learners are also addressed.

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/

Learning Outcomes

1. Develop further understanding of the major theoretical and research directions and current resources in science education.

2. Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
3. Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.

4. Demonstrate research based knowledge of teaching and learning approaches to differentiating curriculum to meet the diverse needs of learners in the science classroom.

5. Demonstrate effective science teaching and learning strategies for meeting the needs of indigenous students.

6. Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
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</thead>
<tbody>
<tr>
<td>Assessment 1</td>
<td>30%</td>
<td>weekly</td>
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<tr>
<td>Assessment 2</td>
<td>35%</td>
<td>Week 8 classes or on campus.</td>
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<tr>
<td>Assessment 3</td>
<td>35%</td>
<td>In class or online in wk 12</td>
</tr>
</tbody>
</table>

Assessment 1

Due: weekly
Weighting: 30%

Each week students are required to read prescribed readings and then respond to an online provocations. Full detail of this assessment can be found in the unit outline on iLearn.

This Assessment Task relates to the following Learning Outcomes:

• Develop further understanding of the major theoretical and research directions and current resources in science education.

• Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.

• Demonstrate research based knowledge of teaching and learning approaches to differentiating curriculum to meet the diverse needs of learners in the science classroom.

• Demonstrate effective science teaching and learning strategies for meeting the needs of indigenous students.
Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment 2

Due: **Week 8 classes or on campus.**
Weighting: **35%**

This assignment requires students to investigate research about the role of science fairs in teaching and learning in science. Following this they are required to develop a science fair appropriate for school aged children. Further details of this task is available in the unit outline.

This Assessment Task relates to the following Learning Outcomes:

- Develop further understanding of the major theoretical and research directions and current resources in science education.
- Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
- Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
- Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment 3

Due: **In class or online in wk 12**
Weighting: **35%**

This task requires students to work as a group to plan an engaging term of science learning. Students will present this as a digital resource kit to engage students in a term of science. Further detail of this can be found in the unit outline on iLearn.

This Assessment Task relates to the following Learning Outcomes:

- Develop further understanding of the major theoretical and research directions and current resources in science education.
- Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
• Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
• Demonstrate research based knowledge of teaching and learning approaches to differentiating curriculum to meet the diverse needs of learners in the science classroom.
• Demonstrate effective science teaching and learning strategies for meeting the needs of indigenous students.
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**Delivery and Resources**

**Delivery**

The unit is taught as a combination of lectures, tutorials (or external equivalent) and collaborative group work. The use of web discussion boards plays an integral part in the learning and teaching for all students.

**Resources**

There are no set texts / resources for this unit as readings will be available via e-reserve and online journals.

**Technology**

This unit requires competent technology skills, including access to word processing software and online tools such as blogs and wikis.

**Changes since last offering**

This unit's readings and assessment tasks have changed since last offering.

**Unit Schedule**

The following unit schedule provides insight into the unit schedule. Further detail can be found in the unit outline on iLearn.

<table>
<thead>
<tr>
<th>Week beginning</th>
<th>Topic Area</th>
<th>Lecture and Tutorial Activities</th>
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</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td>Date</td>
<td>Description</td>
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</tr>
<tr>
<td>1</td>
<td>29/7/13</td>
<td>Unit introduction, assignments Science curriculum and change</td>
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<tr>
<td>2</td>
<td>5/8/13</td>
<td>Science – Learning in Depth, Rich investigations and Electricity</td>
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<tr>
<td>3</td>
<td>12/8/13</td>
<td>Science – Informal learning opportunities and Magnetism</td>
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<tr>
<td>4</td>
<td>19/8/13</td>
<td>Technology – multi-media and interactive tools</td>
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<tr>
<td>5</td>
<td>26/8/13</td>
<td>No classes for ECHP424 professional experience</td>
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<td>6</td>
<td>2/9/13</td>
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<td>7</td>
<td>9/9/13</td>
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<td></td>
<td>16/9/13</td>
<td>Mid Semester Break</td>
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<td></td>
<td>23/9/13</td>
<td>Mid Semester Break</td>
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<tr>
<td>Unit guide</td>
<td>ECH 430 Teaching and Learning Science and Technology</td>
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<tr>
<td><strong>8</strong></td>
<td>30/9/13</td>
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<tr>
<td><strong>Science Education in Aboriginal and Torres Strait Islander Communities multi-media and interactive tools</strong></td>
<td>No lectures</td>
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<td></td>
<td>Individual presentations in tutorials</td>
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<td></td>
<td>* Weekly posting due before Tuesday @ midnight*</td>
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<td></td>
<td>* Internal Assignment</td>
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<td></td>
<td>Two due in class</td>
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<tr>
<td><strong>9</strong></td>
<td>7/10/13</td>
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<tr>
<td><strong>Science – linking KLAs and science and Simple Machines &amp; Kitchen Chemistry</strong></td>
<td>Lecture and Tutorials</td>
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<td></td>
<td>* Weekly posting due before Tuesday @ midnight*</td>
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<tr>
<td><strong>10</strong></td>
<td>14/10/13</td>
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<tr>
<td><strong>Developing Content knowledge – the challenge for primary school teachers</strong></td>
<td>No Classes to facilitate group work</td>
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<td></td>
<td>* Weekly posting due before Tuesday @ midnight*</td>
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<tr>
<td><strong>11</strong></td>
<td>21/10/13</td>
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<tr>
<td><strong>Meeting the needs of diverse learners (part a)</strong></td>
<td>No Classes to facilitate group work</td>
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<tr>
<td></td>
<td>* Weekly posting due before Tuesday @ midnight*</td>
<td></td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>28/10/13</td>
<td></td>
</tr>
<tr>
<td><strong>Meeting the needs of diverse learners (part b)</strong></td>
<td>No lectures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group presentations in tutorials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Weekly posting due before Tuesday @ midnight*</td>
<td></td>
</tr>
</tbody>
</table>
Learning and Teaching Activities

Weekly readings
Each week students are required to read a collection of set readings to develop their theoretical, conceptual and pedagogic understandings.

Weekly online discussion
Each week students engage in a series of discussions online - responding to online provocations, readings and lecture content

Workshops
Each week students participate in hands on workshops (or external equivalent) to explore essential pedagogic and practical tasks in science learning

Assessment tasks
Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit

Online lectures
Each week students will be engaging with online lecture content to deliver key conceptual and theoretical knowledge in science learning

Student Presentation and Group work
Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

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
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

• Develop further understanding of the major theoretical and research directions and current resources in science education.
• Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
• Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
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• Demonstrate effective science teaching and learning strategies for meeting the needs of indigenous students.
• Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks

• Assessment 1
• Assessment 2
• Assessment 3

Learning and teaching activities

• Each week students are required to read a collection of set readings to develop their theoretical, conceptual and pedagogic understandings.
• Each week students engage in a series of discussions online - responding to online provocations, readings and lecture content
• Each week students participate in hands on workshops (or external equivalent) to explore essential pedagogic and practical tasks in science learning
• Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
• Each week students will be engaging with online lecture content to deliver key conceptual and theoretical knowledge in science learning
• Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection
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**

- Develop further understanding of the major theoretical and research directions and current resources in science education.
- Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
- Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
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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

• Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
• Demonstrate research based knowledge of teaching and learning approaches to differentiating curriculum to meet the diverse needs of learners in the science classroom.
• Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks

• Assessment 1
• Assessment 2
• Assessment 3

Learning and teaching activities

• Each week students are required to read a collection of set readings to develop their theoretical, conceptual and pedagogic understandings.
• Each week students engage in a series of discussions online - responding to online provocations, readings and lecture content
Each week students participate in hands on workshops (or external equivalent) to explore essential pedagogic and practical tasks in science learning

Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit

Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

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

• Develop further understanding of the major theoretical and research directions and current resources in science education.
• Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
• Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
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• Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks

• Assessment 2
• Assessment 3

Learning and teaching activities

• Each week students are required to read a collection of set readings to develop their theoretical, conceptual and pedagogic understandings.
Unit guide ECH 430 Teaching and Learning Science and Technology

- Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
- Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

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

- Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
- Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks

- Assessment 2
- Assessment 3

Learning and teaching activities

- Each week students participate in hands on workshops (or external equivalent) to explore essential pedagogic and practical tasks in science learning
- Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
- Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

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**

- Design lesson sequences and units of work that enhance the growth of children’s scientific thinking, reflects current issues in research and integrates other curriculum areas.
- Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

**Assessment tasks**

- Assessment 1
- Assessment 2
- Assessment 3

**Learning and teaching activities**

- Each week students engage in a series of discussions online - responding to online provocations, readings and lecture content
- Each week students participate in hands on workshops (or external equivalent) to explore essential pedagogic and practical tasks in science learning
- Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
- Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

**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:

**Learning outcomes**

- Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks
- Assessment 1
- Assessment 3

Learning and teaching activities
- Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
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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 knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
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- Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks
- Assessment 1
- Assessment 3
Learning and teaching activities

- Students complete a range of assessment tasks relating to theoretical and practical elements covered in this unit
- Each week students will be engaging with online lecture content to deliver key conceptual and theoretical knowledge in science learning
- Students will actively engage in student presentations throughout semester, including group and individual work. This is to promote opportunity for peer review and student reflection

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 further understanding of the major theoretical and research directions and current resources in science education.
- Demonstrate knowledge of scientific concepts, processes and resources related to the made environment in the contexts of physical phenomena, information & communication and products & services.
- Demonstrate research based knowledge of teaching and learning approaches to differentiating curriculum to meet the diverse needs of learners in the science classroom.
- Integrate information and communication technologies (ICT) and critical evaluation of resources within effective teaching and learning strategies to expand opportunities for professional learning and scientific thinking.

Assessment tasks

- Assessment 2
- Assessment 3

Learning and teaching activities

- Each week students are required to read a collection of set readings to develop their theoretical, conceptual and pedagogic understandings.
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