



# EDTE433

## Science in the Secondary School I

S1 Day 2018

*Department of Educational Studies*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff Hye Eun Chu <a href="mailto:hye-eun.chu@mq.edu.au">hye-eun.chu@mq.edu.au</a>
Credit points 3
Prerequisites TEP388
Corequisites TEP401
Co-badged status
Unit description This unit builds on TEP388 and introduces students to modern approaches for the teaching and learning of Science in secondary schools. Curricula, resources and instructional strategies appropriate to teaching Science are examined, with particular attention to Years 7-10 and Senior Science. It is linked to the school experience gained in TEP401.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- UO5 a working knowledge of the relevant science syllabus documents from both the BOSTES (NSW) and National Curriculum (ACARA);

UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents

UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;

UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#"><u>Reflective practice</u></a>	40%	No	Week 7
<a href="#"><u>Investigating learners' views</u></a>	50%	No	Week 13
<a href="#"><u>On-going assessment</u></a>	10%	No	all weeks

### Reflective practice

Due: **Week 7**

Weighting: **40%**

The aim of the assignment is to give you the opportunity to develop your expertise in inquiry-based, student-centered science teaching by using this approach in one lesson of your choice and engaging in reflection on this lesson. Suggested time is 28 hours (total 1600-2000 words).

On successful completion you will be able to:

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- UO5 a working knowledge of the relevant science syllabus documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- UO7 to think critically about their use of information and communication technologies

- (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## Investigating learners' views

Due: **Week 13**

Weighting: **50%**

The aim of this assignment is to provide you with the opportunity to develop research skills for diagnosing and solving problems in the classroom (See GC3 in the Graduate Capabilities section). Suggested time is 30 hours. This does not include the time spent at school because this is part of your TEP401 requirements.

On successful completion you will be able to:

- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO5 a working knowledge of the relevant science syllabus documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## On-going assessment

Due: **all weeks**

Weighting: **10%**

Consistently contributes to group activities and discussion including online environments; consistently responds very thoughtfully to other students' comments

On successful completion you will be able to:

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## **Delivery and Resources**

### **About this unit**

This is a three-credit point workshop-based unit (1hour lecture and 2hours tutorials). The areas of study in EDTE433 include the history and philosophy of science, the use of scientific language, writing/reading in science, classroom management, ICT for learning about science, group work and discussion, assessment, along with children's ideas about science and how these might differ from those presently held by members of the scientific community. Work will continue on lesson planning and implementation according to the prerequisite units. In each workshop session, detailed strategies for the teaching and learning of each of the prescribed focus areas, contexts and domains of the current NSW Stage 4/5 science syllabus will be presented and discussed in terms of their effectiveness. This will then be linked together with the Stage 6 science syllabus documents and discussion of the National Curriculum for science as appropriate.

Many of the workshop strategies are hands-on so that students are able to gain a practical knowledge of activities that can be used in science classrooms at the junior secondary level. The workshops are organized to model a school classroom, where effective learning and teaching takes place including the use of laptops. Each workshop provides a choice of activities usually negotiated by the students in small groups. The lecturer's role is to provide guidance where necessary and highlight important issues in the overall theme of the workshop along with current, relevant science education research. Students are expected to participate in all workshops as individuals, in small groups, and as a whole class.

### **Recommended Readings:**

#### ***Required Texts***

Students must have access to the following syllabus document:

NSW Education Standards Authority (2017). *Science K-10 Syllabus*. Sydney: NESA. <http://syllabus.nesa.nsw.edu.au/science/>

### **Recommended Texts**

Alsop, S. & Hicks, K. (2001). *Teaching science – A handbook for primary and secondary teachers*. London: Kogan Page.

Arthur-Kelly, M., Lyons, G., Butterfield, N.D., & Gordon, C. (2006). *Classroom management*. Melbourne: Thomson.

Bell, R. L., Gess-Newsome, J., & Luft, J. (2008). *Technology in the secondary science classroom*. Arlington: NSTA Press.

Bybee, R. Powell, J., & Trowbridge, L. (2008). *Teaching secondary school science. Strategies for developing scientific literacy*. Upper Saddle River: Merrill Prentice Hall.

Chiappetta, E., & Koballa, T. (2010). *Science instruction in the middle and secondary schools*. Upper Saddle River: Merrill Prentice Hall.

Harrison, A., & Coll, R. (Eds.) (2008). *Using analogies in middle and secondary science classrooms*. Thousand Oaks: Corwin Press.

Hassard, J., & Dias, M. (2009). *The art of teaching science: Inquiry and innovation in middle school and high school*. New York: Routledge.

Liversidge, T., Cochrane, M. Kerfoot, B., & Thomas, J. (2009). *Teaching science: Developing as a reflective secondary teacher*. London: SAGE.

Monk, M., & Osborne, J. (2000). *Good practice in science teaching - what research has to say*. Buckingham: Open University Press.

Mortimer, E. F., & Scott, P. (2003). *Meaning making in secondary science classrooms*. Maidenhead: Open University Press.

Ratcliffe, M., & Grace, M. (2003). *Science education for citizenship: Teaching socio-scientific issues*. Maidenhead: Open University Press.

Skamp, K. (Ed.) (2012). *Teaching primary science constructively* (4th ed.). Melbourne: Thomson.

Venville, G., & Dawson, V. (Eds.). (2012). *The art of teaching science: For middle and secondary school*. Sydney: Allen & Unwin.

Wellington, J. (2006). *Secondary education the key concepts*. London: Routledge.

Wellington, J., & Osborne, J. (2001). *Language and literacy in science education*. Buckingham: Open University Press.

Xiufeng Lui. (2010). *Essentials of science classroom assessment*. London: SAGE.

## **Science education journals in Macquarie University library**

Please note: Many of these journals are available electronically from the library.

Teaching Science (The Journal of the Australian Science Teachers Association)

International Journal of Science Education

Journal of Biology Education

Journal of Chemical Education

Journal of Research in Science Education

Research in Science Education

School Science and Mathematics

School Science Review

Science Education

Studies in Science Education

### **Keywords which might assist in your ERIC search**

**Science:** activities, curriculum, instruction programs, experiments, biology, physics, chemistry, environmental studies/science, geology, real science, authentic science

**Secondary School:** high school, elementary, secondary, ESL, Indigenous

**Teachers:** science teachers, beginning teachers, student teachers, mentors, exemplary teachers

**Teaching Methods:** quality teaching, diagnostic assessment, and teaching, multi-media, technology, gender, group work, concept maps, computer, Internet, ICT, formative assessment, integrative approach in Science, STEM/STEAM approaches, Education for Sustainable Development in Science, inquiry-based teaching

**Learning Strategies:** children's science, alternative frameworks, conceptual change, misconceptions, constructivism, ESL, ICT, problem-solving, controversial issues, discovery/inquiry learning, group work, individual instruction.

### **Relevant websites**

Australian Curriculum and Assessment: [<http://www.acara.edu.au>]

Australian Institute for Teaching and School Leadership: [<http://www.aitsl.edu.au>]

NSW Education Standards Authority: [<http://educationstandards.nsw.edu.au/wps/portal/nesa/home>]

NSW Department of Education: [<http://www.dec.nsw.gov.au>]

NSW Teachers Federation – Future Teachers: [<http://futureteachers.org.au/>]

NSW Independent Education Union: [<http://www.ieu.asn.au/>]

NSW Association of Independent Schools: [<https://www.aisnsw.edu.au/Pages/default.aspx>]

## **Policies and Procedures**

Macquarie University policies and procedures are accessible from **Policy Central** (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr>)



a). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)



## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### 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

- U07 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- U08 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

### Assessment tasks

- Reflective practice
- On-going assessment

### 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

- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);

## Assessment task

- Investigating learners' views

## 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

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## Assessment tasks

- Investigating learners' views
- On-going assessment

## 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

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- UO5 a working knowledge of the relevant science syllabus documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## Assessment tasks

- Reflective practice
- Investigating learners' views
- On-going assessment

## 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

- UO1 a knowledge of the changing policy context of secondary schooling in NSW (NESA, BOSTES) and Australia (ACARA) with specific reference to science
- UO2 the ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401)
- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO4 the ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- UO5 a working knowledge of the relevant science syllabus documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

## Assessment tasks

- Reflective practice

- Investigating learners' views
- On-going assessment

## 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

- UO6 the ability to interpret research findings both in science and science education and relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents
- UO7 to think critically about their use of information and communication technologies (ICT) to enhance the quality of learning and teaching to engage students with science;
- UO8 a developing understanding of key elements of pedagogy including: the strategies needed to cater for the diversity of learners (including specific equity groups), actively engaging students in learning, classroom management, beginning and ending lessons, integrating a focus on literacy, developing and selecting resources, questioning, and assessment and evaluation.

### Assessment tasks

- Investigating learners' views
- On-going assessment

## 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

- UO3 a developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- UO6 the ability to interpret research findings both in science and science education and

relate these where appropriate to adolescent's understandings in science, their lives and to current syllabus documents

## **Assessment tasks**

- Reflective practice
- On-going assessment