



# EDTE433

## Science in the Secondary School I

S1 Day 2017

*Department of Educational Studies*

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## General Information

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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:

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

6 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;

7 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;

8 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
<u>Websites for science teaching</u>	10%	No	17 March
<u>Reflexive Practice</u>	40%	No	19 MAY
<u>Investigating learners' views</u>	40%	No	9 June
<u>Engagement</u>	10%	No	on-going assessment

### Websites for science teaching

Due: **17 March**

Weighting: **10%**

The aim of this assignment is for you to critique a science website for the specific purpose of science teaching. The assignment will assist you in the further selection of websites for science learning/teaching at a junior secondary school. Teachers often use the following websites either for Stage 4/5 or for a specific science subject in Stage 6. Suggested time for this assignment is 6 hours.

On successful completion you will be able to:

- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- 6 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;

- 7 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;
- 8 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.

## Reflexive Practice

Due: **19 MAY**

Weighting: **40%**

The aim of the assignment is to give you the opportunity to develop your expertise in inquiry-based, student-centred science teaching by using this approach in one lesson of your choice during your professional practice (TEP401), and engaging in reflection on this lesson. Suggested time is 24 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:

- 1 A knowledge of the changing policy context of secondary schooling in NSW (BOSTES, NSWDET) and Australia (ACARA) with specific reference to science;
- 4 The ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- 6 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;

## Investigating learners' views

Due: **9 June**

Weighting: **40%**

The aim of this assignment is to provide you with the opportunity to develop research skills for diagnosing and solving problems in the classroom. 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:

- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);

- 6 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;
- 8 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.

## Engagement

Due: **on-going assessment**

Weighting: **10%**

The aim of this on-going assessment is to assess consistent contribution in a very significant way to group activities and discussion including on-line environments.

On successful completion you will be able to:

- 1 A knowledge of the changing policy context of secondary schooling in NSW (BOSTES, NSWDET) and Australia (ACARA) with specific reference to science;
- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 4 The ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- 6 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;

## Delivery and Resources

**EDTE 433 has two main components:**

Mini-lectures that focus on specific issues related to science learning and teaching in school (e.g. Language/literacy of science, purpose of practical work), and also on how students conceptualise science concepts, programming, and assessment.

Lab and ICT-based activities that integrate the mini-lectures with practical/ICT opportunities available to high school students in schools. You will trial and assess the suitability of suggested

activities in each workshop.

#### Relationship with EDTE 434 Science in the Secondary School II

EDTE 434 focuses on the teaching of specialist science and further develops some of the themes from EDTE 433. Two specialist science workshops must be done to fulfil the requirements of EDTE 434 – biology, chemistry, earth and environmental science and physics. The choice is dependent upon your previous academic science studies.

#### Relationship of TEP401: Professional Experience in Secondary School I

The work done in EDTE 433 complements and supports your work in school with your Supervising Teacher (ST). These experienced classroom teachers provide professional advice and report to the School of Education about your developing expertise as a science teacher. University supervising lecturers will visit you at school once per semester, observe you in the classroom, consult with your ST and speak with you both during the visit. Information about the Professional Experience program can be found at: [http://www.educ.mq.edu.au/professional\\_experience/](http://www.educ.mq.edu.au/professional_experience/)

#### **Required Texts**

Students must have access to the following syllabus document:

Board of Studies Teaching & Educational Standards. (2012). Science K-10 Syllabus. Sydney: BOSTES. <http://syllabus.bos.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. (2004). The art of teaching science. Sydney: Allen & Unwin.

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

### **Key words 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 teaching, multi-media, technology, gender, group work, concept maps, computer, Internet, ICT

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

## Relevant websites

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

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

Board of Studies, Teaching & Educational Standards: [<http://www.boardofstudies.nsw.edu.au>]

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

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html)

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student\\_conduct/](https://students.mq.edu.au/support/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://studentsupport.mq.edu.au>



[dents.mq.edu.au/support/](https://unitguides.mq.edu.au/support/)

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](https://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](https://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

- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 6 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;
- 7 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;

- 8 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**

- Reflexive Practice
- Engagement

## **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**

- 6 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;
- 7 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;

## **Assessment tasks**

- Websites for science teaching
- Reflexive Practice
- Investigating learners' views
- Engagement

## **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 outcome

- 6 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;

## 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

- 1 A knowledge of the changing policy context of secondary schooling in NSW (BOSTES, NSWDET) and Australia (ACARA) with specific reference to science;
- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 4 The ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- 6 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;
- 7 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;
- 8 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

- Websites for science teaching
- Reflexive Practice
- Investigating learners' views
- Engagement

## 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

- 1 A knowledge of the changing policy context of secondary schooling in NSW (BOSTES, NSWDET) and Australia (ACARA) with specific reference to science;
- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 4 The ability to reflect on and critique one's own professional practice with due regard to the input provided by experienced science teacher(s);
- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- 6 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;
- 7 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;
- 8 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

- Websites for science teaching
- Reflexive Practice
- Investigating learners' views
- Engagement

## 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

- 2 The ability to plan and present sequential lessons based on evidence collected during the professional experience (TEP401);
- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 5 A working knowledge of the relevant syllabus science documents from both the BOSTES (NSW) and National Curriculum (ACARA);
- 6 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;
- 7 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;
- 8 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

- Reflexive Practice
- Investigating learners' views
- Engagement

## 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

- 3 A developing knowledge of both formal and informal assessment procedures in current use in secondary science classrooms;
- 6 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;
- 7 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;
- 8 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

- Websites for science teaching
- Reflexive Practice
- Engagement

## 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

- 6 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;

- 7 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;
- 8 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.

## 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 outcome**

- 6 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;