School of Education

EDUC3157: History, Nature and Practice of Science

Callaghan
Semester 1 - 2024

COURSE OUTLINE

OVERVIEW

Course Description

This course takes an interdisciplinary approach to examining contemporary understandings and practices in the sciences by exploring the histories, philosophical underpinnings and social processes that have shaped them. It will investigate the different ways in which the sciences have been described and practiced during key periods in human history with reference to the prevailing social, cultural, and technological contexts of the time. It will explore the interplay between these contexts, the conceptions of knowledge and the nature of reality, and the dominant scientific practices of these key historical moments.

Assumed Knowledge

Completion of a minimum of 40 units of Science study.

Contact Hours

Callaghan
Lecture
Face to Face On Campus
2 hour(s) per Week for Full Term

Tutorial
Face to Face On Campus
2 hour(s) per Week for Full Term

Unit Weighting

20

Workload

Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Dr Bob Burgess
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Consultation: contact by email
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Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

School of Education
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SYLLABUS

Course Content

This course will cover the following topics:

- historical and contemporary science practices in Indigenous, pre-industrial, industrial and post-industrial societies
- the origins of contemporary science research methods
- the historical connections between science and technology.

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Identify the historical, philosophical and social contexts that have informed the emergence of modern science and its methods.

2. Evaluate the interrelationship between technological breakthroughs and scientific discovery.

3. Evaluate their own level of scientific knowledge across multiple disciplines and identify areas of focus.

4. Relate the scientific method to the teaching of science in a high school setting.

5. Create course materials about pivotal events in the development of a particular science discipline.

Course Materials

Lecture Materials:
This course is supported by resources organised within the EDUC3157 Canvas site.

Useful websites:
Australian Curriculum (ACARA) https://www.australiancurriculum.edu.au/

NSW Education Standards Authority (NESA)
https://educationstandards.nsw.edu.au/wps/portal/nesa/home

NSW Department of Education
https://education.nsw.gov.au/

Australian Institute for Teach. & Sch. Leadership (AITSL)
https://www.aitsl.edu.au/

The Association of Independent Schools of NSW
https://www.aisnsw.edu.au/

Catholic Schools NSW
http://www.csnsw.catholic.edu.au/

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	20 Feb	Introduction to course	The new Science Syllabus: Going from a syllabus to a lesson sequence	
2	27 Feb	What is science? Towards a pattern for scientific work	Syllabus unpacking… Where is the Nature of Science?	
3	6 Mar	NSW PFAs & Oz Science as a Human Endeavour	Assessment in NSW, Unpacking Stage 6 assessment requirements.	Content knowledge test and reflection
4	13 Mar	Technology and 'science' in traditional societies	Integrating cultural knowledge into Science education	
5	20 Mar	The rise of modern science to the Newtonian synthesis	Newton's Laws. Models of the Solar System, Seasons Etc. An actual to-scale model of the solar system	
6	27 Mar	Plate Tectonics: a more recent synthesis	Teaching plate techtonics; Simulations and hands on experiments	
7	3 Apr	Human Anatomy: Societal and Religious Influences	Dissections: How to live. Butchers Paper and other Anatomy activities.	10 Minute Presentation
Mid Term Break				
Mid Term Break				
8	24 Apr	Technology to science to technology: the microscope	Using microscope advice. Teaching diseases. Different types of pathogens.	
9	1 May	Genetics: Location, ideology, gender and social control	Punnet Squares, Compare genetics, Genetics of Harry Potter, Adaptations and Evolution. Simulation Activities	Sequence of Experiments
10	8 May	Chemistry comes of age	Reaction Types, Electron orbitals in office chairs, or with counters	
11	15 May	The age of electricity	Build an electric motor, Phet Simulations. What does voltage actually mean?	
12	22 May	The environmental revolution	Discussion of the place of controversial issues. Different stakeholder discussions.	
13	29 May	AITSL Standards: Perspectives for Science	Recapitulation and consolidation. Why science?	Common Misconceptions Analysis
Examination Period				
Examination Period				

ASSESSMENTS

This course has four assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Content knowledge test and reflection (20%)	Week 3: Friday 11:59pm	Individual	20%	2, 3
2	Presentation (20%)	Week 7 Friday 11:59pm	Individual	20%	1, 2, 5
3	Sequence of Experiments (30%)	Week 9 Friday 11:59pm	Individual	30%	1, 2, 4, 5
4	Common Misconceptions Analysis (30%)	Week 13 Friday 11:59pm	Individual	30%	3, 4, 5

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Syllabus Analysis (20%)

Assessment Type Written Assignment
Purpose Students will reflect on their own level of content knowledge across the Science 7-10 syllabus.
Description Student will complete an online, multiple choice examination. After reviewing their results, they will write a reflection of their scientific knowledge.
Weighting 20%
Length 1,000 words (indicative) plus completion of the test.
Due Date Week 3: Friday 11:59pm
Submission Method Online - students are to submit via Turnitin
Assessment Criteria Students will be marked according to the following criteria:
1 Identification of areas of strength within the 7-10 Science syllabus.
2 Identification of areas of weakness within the 7-10 Science syllabus.
3 Demonstration of understanding of the structure and content of the NSW 7-10 Science syllabus (2026)
4 Synthesis of results to correctly identify areas for personal development.
Return Method Online
Feedback Provided Online - Feedback will be provided within 3 weeks of the assignment being submitted..

Assessment 2 - Presentation (20%)

Assessment Type Presentation
Purpose Presentation of student current understanding of their chosen 'History and Nature of Science' issue from an area of science outside their specialty (as identified by Assessment 1).
Description A 10-minute tutorial presentation, supported by a summary sheet for other tutorial participants. An embedded peer feedback exercise is included.
Weighting 20%
Length 1,000 words (indicative)
Due Date Week 7 Friday 11:59pm
Submission Method Online- Students will submit a video of them giving their presentation.
Online submission (via Turnitin) due Week 7 Friday 11:59pm
Assessment Criteria Students will be marked according to the following criteria:
1 Presentation (10-minutes) of a pivotal issue or event within science that surfaces in a NESA syllabus.
2 Development of a summary sheet for other tutorial participants including references to support classroom treatment of the chosen issue or event.
3 Participation and provision of peer feedback.
4 Correct academic literacy and writing conventions.
Return Method Online
Feedback Provided Online - feedback will be provided within 3 weeks of the assignment being submitted.

Assessment 3 – Sequence of Experiments (30%)

Assessment Type	Proposal / Plan
Purpose	Students will gain understanding of an area of scientific knowledge by developing a sequence of experiments and activities that demonstrate the development of ideas in the area.
Description	A fully documented sequence of experiments (at least three) that help demonstrate the link between evidence and the development of understanding in the area of science covered in Assessment 2. This should include all resources required to reproduce the experiments (the experiments themselves do not have to be performed) as well as a short essay (~1000 words, not including references) linking the experiments to the appropriate development of ideas.
Weighting	30%
Length	2,500 words (indicative)
Due Date	Week 9 Friday 11:59pm
Submission Method	Online - students are to submit via Turnitin
Assessment Criteria	1 Development of experiments including instructions that are clear, coherent, and easily understood and reproducible with high-school levels of equipment. 2 Experiments build naturally and progressively on each other, building a progression of ideas. 3 Experiments are clearly and appropriately linked to the historical development of the chosen area of scientific knowledge. 4 Correct academic literacy and writing conventions including use of scholarly and professional literature.
Return Method	Online
Feedback Provided	Online - Feedback will be provided within 3 weeks of the assignment being submitted.

Assessment 4 – Analysis of Misconceptions (30%)

Assessment Type	Essay
Purpose	Students will develop their ability to identify common misconceptions in scientific education, as well as develop strategies to appropriately explain these to students, including supporting evidence.
Description	An essay that investigates the branch of scientific knowledge covered in Assessment 2 and 3, and outlines some of the misconceptions or misunderstandings that are commonly associated with it. This includes misconceptions that may be more rare among adults, but can be more common among children, including teens or younger. The analysis includes an investigation into where these misconceptions may come from, what the most recent scientific consensus is on that knowledge, and what evidence or arguments could be used to explain to someone of that consensus. This should include, if possible, evidence that is apparent or testable to a person without sophisticated equipment.
Weighting	30%
Length	2,500 words (indicative)
Due Date	Week 13 Friday 11:59pm
Submission Method	Online – students are to submit via Turnitin
Assessment Criteria	Students will be marked according to the following criteria: 1 Development of a comprehensive list of the most common and pervasive misconceptions corresponding to an aspect of scientific knowledge. 2 Well developed arguments for the current scientific consensus, including physical evidence or experimental results that support that consensus. 3 Persuasive arguments as to the incorrect nature of the misconception. This includes, where possible, experimental evidence that could be achieved without sophisticated scientific equipment. 4 Correct academic literacy and writing conventions including use of scholarly and professional literature.
Return Method	Online
Feedback Provided	Online - feedback will be provided within 3 weeks of the assignment being submitted.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. Please see the Student Academic Integrity Policy for more information.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or

	4. the course has a compulsory attendance requirement. Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure
Important Policy Information	The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures that support a safe and respectful environment at the University.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.