



EDUC8250

Effective Instruction in Mathematics, Science and Technology

Session 1, Online-flexible 2023

Macquarie School of Education

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General Information

Unit convenor and teaching staff

Unit Convenor and Lecturer

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Contact via By email

Lecturer

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Lecturer

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Credit points

10

Prerequisites

Admission to MSpecEd or GradDipSpecEd or MInc&SpecEd or GradDipInc&SpecEd or GradCertLearnDiffSuppTeach

Corequisites

Co-badged status

Unit description

The aim of this unit is to examine how students with diverse needs can be supported in their participation in Mathematics, Science, and Technology. It will explore a full range of teaching methodologies, including teacher-directed explicit instruction as well as student-centered and inquiry-driven approaches. The unit focuses on the functional needs of the learner and will draw on knowledge gained in other units to consider how differentiated instruction is applied to best support the strengths and needs of individual learners. It will develop understanding regarding how to adapt pedagogy, resources, assessment tasks and classroom environments to ensure that every student has equitable opportunities to engage in Mathematics, Science and Technology learning experiences. There will also be a strong focus on the use of digital technologies to support learning in all areas.

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:

ULO1: apply advanced discipline knowledge and scholarly understanding to evaluate student learning of mathematics, science and technology concepts

ULO2: draw on domain knowledge to critically reflect on your own professional knowledge and practice

ULO3: apply domain knowledge to examine and critically evaluate theories and research that underpin practice in the fields of mathematics, science and technology instruction

ULO4: develop appropriate assessment, monitoring and adaptation / intervention strategies to meet the needs of diverse learners

ULO5: synthesize concepts effectively through written and oral communication

General Assessment Information

- Students should be aware of and apply the University policy on academic honesty (see: <https://policies.mq.edu.au/document/view.php?id=3>)
- Unless a Special Consideration (see: <https://students.mq.edu.au/study/assessment-exams/special-consideration>) request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a mark of, 0 (zero) will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical issue.
- This late penalty will apply to non-timed sensitive assessment (incl essays, reports, posters, portfolios, journals, recordings etc). Late submission of time sensitive tasks (such as tests/exams, performance assessments/presentations, scheduled practical assessments/labs etc) will only be addressed by the unit convenor in a Special consideration application. Special Consideration outcome may result in a new question or topic.
- Please format assessments using 12-point font and 1.5 spacing.
- All assessments are submitted electronically. Turnitin plagiarism detection software is used to check all written assessments.
- Students can use Turnitin's Originality Report as a learning tool to improve their academic writing if this option is made available in the unit.
- Students should carefully check that they submit the correct file for an assessment as no re-submissions will be accepted after the due date and time, including instances where

students upload an incorrect file in error.

- Word limits are strictly applied. Work above the word limit will not be marked.
- All assessments are marked using a rubric.
- Marking of all assessments is moderated by the Unit Convenor.
- Applications for extensions must be made via AskMQ (<https://ask.mq.edu.au/>).
- It is **not the responsibility** of unit staff to contact students who have failed to submit assessments. If you have any missing items of assessment, it is your responsibility to make contact with the unit convenor.

University policy on grading

Criteria for awarding grades for assessment tasks

Assignments will be awarded grades ranging from HD to F according to guidelines set out in the University's Grading Policy. For Professional Experience units the PE Report is marked as satisfactory or unsatisfactory and the Teaching Performance Assessment (in final PE units) is marked as not meets, meets or exceeds. The following descriptive criteria are included for your information.

Descriptive Criteria for awarding grades in the unit

In order to meet the unit outcomes and successfully pass this unit, students must make a genuine attempt at all assessment tasks. Where any submitted assessment task is considered to be unsatisfactory in this regard, the highest possible final grade that can be awarded for the unit will be 45.

Grade	Descriptor
HD (High Distinction)	Provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem-solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application as appropriate to the discipline.
D (Distinction)	Provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
Cr (Credit)	Provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the discipline.
P (Pass)	Provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; routine argumentation with acceptable justification; communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes
F (Fail)	Does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

Note: If you fail a unit with a professional experience component, the fail grade will be on your transcript irrespective of the timing of the placement.

Withdrawing from this unit

If you are considering withdrawing from this unit, please seek academic advice via <https://ask.mq.edu.au> before doing so as this unit may be a co-requisite or prerequisite for units in the following sessions and may impact on your progression through the degree.

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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Mathematics Problem Set	50%	No	23:59 09/04/2023
Science/Technology Problem Set	50%	No	23:59 04/06/2023

Mathematics Problem Set

Assessment Type ¹: Problem set

Indicative Time on Task ²: 25 hours

Due: **23:59 09/04/2023**

Weighting: **50%**

Students will be provided with a task (or a set of tasks) designed to develop and apply their knowledge of effective instruction in Mathematics. For example, this may be conducting web and literature searches to find suitable tasks to assess different areas of mathematics, a case study where the student is asked to identify suitable methods of assessment and to explain an instructional approach or intervention that could be used to support the learning of the student, or a lesson plan where the student is asked to recommend adaptations to instruction, resources, and assessments to accommodate diverse learners.

On successful completion you will be able to:

- apply advanced discipline knowledge and scholarly understanding to evaluate student learning of mathematics, science and technology concepts
- draw on domain knowledge to critically reflect on your own professional knowledge and

practice

- apply domain knowledge to examine and critically evaluate theories and research that underpin practice in the fields of mathematics, science and technology instruction
- develop appropriate assessment, monitoring and adaptation / intervention strategies to meet the needs of diverse learners
- synthesize concepts effectively through written and oral communication

Science/Technology Problem Set

Assessment Type ¹: Problem set

Indicative Time on Task ²: 25 hours

Due: **23:59 04/06/2023**

Weighting: **50%**

Students will be provided with a task (or a set of tasks) designed to develop and apply their knowledge of effective instruction in Science and/or Technology. For example, this may be conducting web and literature searches to find suitable tasks to assess different areas of science and technology learning, a case study where the student is asked to identify suitable methods of assessment and to explain an instructional approach or intervention that could be used to support the learning of the student, or a lesson plan where the student is asked to recommend adaptations to instruction, resources, and assessments to accommodate diverse learners.

On successful completion you will be able to:

- apply advanced discipline knowledge and scholarly understanding to evaluate student learning of mathematics, science and technology concepts
- draw on domain knowledge to critically reflect on your own professional knowledge and practice
- apply domain knowledge to examine and critically evaluate theories and research that underpin practice in the fields of mathematics, science and technology instruction
- develop appropriate assessment, monitoring and adaptation / intervention strategies to meet the needs of diverse learners
- synthesize concepts effectively through written and oral communication

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Required and recommended texts

Stein, M., Kinder, D., Rolf, K., Silbert, J., & Carnine, D. W. (2018). Direct instruction mathematics (5th ed.). Pearson.

Additional reading

Additional reading will be provided each week. These should all be directly available from the library or will be made available on the unit iLearn site.

Unit delivery and communication

This unit has a full web presence through iLearn.

Students will need regular access to a computer and the Internet to complete this unit.

Regular (preferably daily) access to iLearn is compulsory for all students. Important assessment information will be posted here, as will other relevant unit notices and materials

Various activities and materials for discussion and critical reflection are included and students are encouraged to use this web component. Weekly lectures are available on the web through the ECHO360 lecture component, or will be posted as a PowerPoint presentation or some alternative video format.

Access and technical assistance

Information for students about access to the online component of this unit is available at <https://ilearn.mq.edu.au/login/index.php>. You will need to enter your student username and password.

Please do NOT contact the Unit Convenor regarding iLearn technical help.

No extensions will be given for any technical issues. Allow enough time for your submissions.

Assistance is available from IT Helpdesk ph: 1800 67 4357, or log a request at help.mq.edu.au. OneHelp is the online IT support service for both students and staff.

This unit requires students to use several ICT and software skills:

- Internet access: The iLearn site contains materials for this unit; it is also required for the online submission of all Assessment Tasks, and for the use of Turnitin submission for ALL tasks.
- Word processing, visual representations, and document formatting: You are required to use an appropriate form of software to present your assignments.

- Uploading of assessment tasks to iLearn.

Unit Schedule

The unit is split broadly into 2 blocks - mathematics in week 1 to 7 and technology and science in weeks 8 to 13. Each week the lecturer will provide content presentation(s), recommended readings and other activities that further develop or allow you to apply your new knowledge. You will also be offered the opportunity to attend a regular virtual meeting with staff members - this will be an opportunity to reflect on your learning, consider how your new knowledge might impact your practice, ask questions, and meet your fellow classmates, The lecturers have been chosen for their expertise in the relevant content domain, not because they all teach in the same way - please be tolerant of differences in teaching style between staff members!!

Week and staff member	Topic
1 Rebecca	General introduction to the course; evidence based practice; engagement of students with diverse needs in maths, science, and technology
2 Rebecca	Mathematics 1: Introduction to maths difficulties / dyscalculia; introduction to explicit instruction
3 Rebecca	Mathematics 2: Number Sense: Symbol Identification, Counting, and Place Value
4 Rebecca	Mathematics 3: Addition and subtraction
5 Rebecca	Mathematics 4: Multiplication and Division
6 Rebecca	Mathematics 5: Problem Solving
7 Rebecca	Completion of Mathematics Problem Set assignment
8 Matt	Technology 1: Teaching USING Technologies
9 Matt	Science 2: Teaching OF Technologies
10 Hye Eun	Science 1: Scientific Literacy; Differentiated programming
11 Hye Eun	Science 2: Inquiry based and explicit instruction approaches to support the learning of science
12 Hye Eun	Science 3: Learning resources, classroom environment, and digital technology adaptations to support diverse learners.
13 Matt/Hye Eun	Completion of Science & Technology Problem Set assessment

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

Student Code of Conduct

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

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

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

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit 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.

5Rs Framework

The 5Rs Framework, developed by the School of Education at Macquarie University, is embedded throughout your teacher education course. Your use of the 5Rs Framework will help you develop the capabilities that will make your teaching career sustainable and fulfilling. In this unit, you will learn using the 5Rs framework in the following important ways:

Resilient: Many students lack confidence in their own ability to teach maths, science, and technology and many indicate (in their online introductions) that they expect to find the course

challenging and much of the content new to them. Students are encouraged to support each other and to share experiences, on the understanding that there is no judgment from staff or peers. Many students attend weekly (non-compulsory) meetings which act more as a support group than an academic group.

Reflexive: All students reflect on their current teaching practices and consider adaptations to pedagogy and assessment that supports a range of diverse student abilities. During discussions students verbalise this reflexive thinking, and some describe changes they are going to implement in their practice.

Responsive: During weekly tutorials and/or discussion forums, students are expected to be responsive to the ideas of peers and providing meaningful and supportive feedback. In reflecting on their own practice, they are also expected to think about and demonstrate how they would be responsive to the needs of students with diverse abilities.

Ready to Learn: Many students taking this course have limited exposure to teaching maths, science, and technology, or are expanding their skill set to become special education teachers. In taking this unit they have identified their own learning needs for their context and are pursuing that learning to achieve the best outcomes for all students.

Research engaged: The importance of research based practice and making evidence based decisions for teaching instruction is embedded in all topics of the unit. Each week students are exposed to a research studies which present evidence for a particular pedagogical approach. Students are asked to critically evaluate research evidence as part of their assignments.