EDUC8250

Effective Instruction in Mathematics, Science and Technology

Session 1, Online-flexible 2022

Macquarie School of Education

Contents

General Information

Unit convenor and teaching staff
Unit Convenor and Lecturer
Rebecca Bull
r.bull@mq.edu.au
Contact via By email

Lecturer
Hye Eun Chu
hye-eun.chu@mq.edu.au

Lecturer
Matt Bower
matt.bower@mq.edu.au

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

Assessment Presentation and Submission Guidelines

Please follow these guidelines when you submit each assignment:

● Allow a left and right-hand margin of at least 2cm in all assignments.

● Please type all assignments using 12-point font and 1.5 spacing.

● All assessments must be submitted through Turnitin in .doc or .pdf format

● It is the responsibility of the student to ensure that all assessments are successfully submitted through Turnitin. ● Faculty assignment cover sheets are NOT required

Draft Submissions & Turnitin Originality Reports

● Students may use Turnitin's Originality Report as a learning tool to improve their academic writing if this option is made available in the unit.

● Students are strongly encouraged to upload a draft copy of each assessment to Turnitin at least one week prior to the due date to obtain an Originality Report.

● The Originality Report provides students with a similarity index that may indicate if plagiarism has occurred. Students will be able to make amendments to their drafts prior to their final submission on the due date.

● Generally, one Originality Report is generated every 24 hours up to the due date

Please note:

● Students should regularly save a copy of all assignments before submission.

● Students are responsible for checking that the correct file has been uploaded, that their submission has been successful, and that it has been submitted by the due date and time.

Assignment extensions and late penalties

● In general, there should be no need for extensions except through illness or misadventure that would be categorised as serious and unavoidable disruption according to the University definition of same, see: https://students.mq.edu.au/study/my-study-program/special-consideration

● Applications for extensions must be made via AskMQ according to the Special Consideration policy. Extensions can only be granted if they meet the Special 3 Considerations policy and are submitted via https://ask.mq.edu.au/. This will ensure consistency in the consideration of such requests is maintained.

● Late submissions: Unless a Special Consideration request has been submitted and approved, (a) a penalty for lateness will apply - 10/100 marks of credit (10% of the total assessment weighting) will be deducted per day for assignments submitted after the due date – and (b) no assignment will be accepted seven days (incl. weekends) after the original submission deadline. No late submissions will be accepted for timed assessment - e.g., quizzes, online tests. A zero result for the assignment will be recorded after the late submission period has ended if no task has been received.

● If a student is still permitted to submit on the basis of unavoidable disruption, an alternative topic may be set.

● Students should keep an electronic file of all assessments. Claims regarding "lost" assessments cannot be made if the file cannot be produced. It is also advisable to keep an electronic file of all drafts and the final submission on a USB untouched/unopened after submission. This can be used to demonstrate easily that the assessment has not been amended after the submission date.

Requesting a re-assessment of an assignment

If you have evidence that your task has been incorrectly assessed against the grade descriptors you can request a re-mark. To request a re-mark you need to contact the unit convenor within 7 days of the date of return of the assignment and provide a detailed assessment of your script against the task criteria. Evidence from your assignment must be provided to support your judgements. Note:

• Please do not request a re-mark for a Failed assessment as they are all double-marked as a part of the moderation process.

• The outcome of a re-mark may be a higher/lower or unchanged grade.

• Grades are standards referenced and effort is NOT a criterion.

Quiz Assessments

Online quizzes are an individual assessment task and MUST BE COMPLETED by each student individually. Similarities in responses between students will be checked and investigated for possible collusion.

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. 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.

Students will be awarded grades ranging from HD to F according to guidelines set out in the policy: https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/assessment-in-effect-from-session-2-2016

The following generic grade descriptors provide university-wide standards for awarding final grades:

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 on 10/04/2022
Science/Technology Problem Set	50%	No	23:59 on 05/06/2022

Mathematics Problem Set

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 25 hours
Due: **23:59 on 10/04/2022**
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 on 05/06/2022**
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
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[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

nformation 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, 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, 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 suport 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). 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). 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) 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 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 reforums, 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 expcted 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.