



# ECHE2320

## Mathematical and Scientific Thinking in the Early Years

Session 2, In person-scheduled-infrequent, North Ryde 2022

*Macquarie School of Education*

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#### **Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff

Convenor, Lecturer, Tutor

Laurinda Lomas

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Room 272, 29 Wally's Walk

By appointment

Tutor

Rebecca Bull

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By appointment

Credit points

10

Prerequisites

ECH113 or ECHE1130 or (40cp at 1000 level or above) and admission to BTeach(ECS)

Corequisites

Co-badged status

Unit description

This unit explores mathematical and scientific thinking, teaching and learning in early childhood education (birth to five years). Key mathematical and scientific concepts and processes will be investigated and considered in terms of theory, research, pedagogical practice and play-based learning. Students will gain in-depth understandings of how mathematics and science underpin ways of acquiring and processing information about the world, now and in the future.

## 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:** Demonstrate a fundamental understanding of the major theoretical

developments, central concepts, modes of enquiry, pedagogical practice and inclusion of relevant technologies in early childhood mathematics and science.

**ULO2:** Develop skills in designing, implementing and evaluating learning experience sequences using knowledge from the National Quality Frameworks and other curriculum requirements of the Education Act.

**ULO3:** Begin to evaluate mathematics and science learning resources in light of their experience as a teacher of young children.

**ULO4:** Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science.

**ULO5:** Develop an understanding of different learning approaches to teaching and learning and the need for pedagogical approaches that are socially and culturally relevant, including use of technology.

## General Assessment Information

### General Assessment Information

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.

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

### **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 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 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.
- 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.

**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.

<b>Grade</b>	<b>Descriptor</b>
<b>HD</b> (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.
<b>D</b> (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.
<b>Cr</b> (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.
<b>P</b> (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
<b>F</b> (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.m>

[q.edu.au](http://q.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
<a href="#">Assessment Task 1A: Mathematical concepts and processes in storytelling</a>	15%	No	12/09/22 at 23:55
<a href="#">Assessment Task 1B: Analyse two storybooks and design learning experiences</a>	30%	No	12/09/22 at 23:55
<a href="#">Assessment Task 2: Science in play-based learning</a>	50%	No	07/11/22 at 23:55
<a href="#">ASSET survey</a>	5%	No	09/09/22 at 23:55

### Assessment Task 1A: Mathematical concepts and processes in storytelling

Assessment Type <sup>1</sup>: Essay

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **12/09/22 at 23:55**

Weighting: **15%**

Explain and justify how storybooks can support mathematical thinking and learning in young children (1000 words).

On successful completion you will be able to:

- Demonstrate a fundamental understanding of the major theoretical developments, central concepts, modes of enquiry, pedagogical practice and inclusion of relevant technologies in early childhood mathematics and science.
- Develop skills in designing, implementing and evaluating learning experience sequences using knowledge from the National Quality Frameworks and other curriculum

requirements of the Education Act.

- Begin to evaluate mathematics and science learning resources in light of their experience as a teacher of young children.
- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science.
- Develop an understanding of different learning approaches to teaching and learning and the need for pedagogical approaches that are socially and culturally relevant, including use of technology.

## Assessment Task 1B: Analyse two storybooks and design learning experiences

Assessment Type <sup>1</sup>: Programming Task

Indicative Time on Task <sup>2</sup>: 30 hours

Due: **12/09/22 at 23:55**

Weighting: **30%**

Analyse two storybooks for mathematical concepts and processes and develop two experiences for each book (1500 words).

On successful completion you will be able to:

- Demonstrate a fundamental understanding of the major theoretical developments, central concepts, modes of enquiry, pedagogical practice and inclusion of relevant technologies in early childhood mathematics and science.
- Develop skills in designing, implementing and evaluating learning experience sequences using knowledge from the National Quality Frameworks and other curriculum requirements of the Education Act.
- Begin to evaluate mathematics and science learning resources in light of their experience as a teacher of young children.
- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science.
- Develop an understanding of different learning approaches to teaching and learning and the need for pedagogical approaches that are socially and culturally relevant, including use of technology.

## Assessment Task 2: Science in play-based learning

Assessment Type <sup>1</sup>: Programming Task

Indicative Time on Task <sup>2</sup>: 40 hours

Due: **07/11/22 at 23:55**

Weighting: **50%**

Develop a mind map from a provocation and design learning experiences based on scientific concepts and processes (2500 words).

On successful completion you will be able to:

- Demonstrate a fundamental understanding of the major theoretical developments, central concepts, modes of enquiry, pedagogical practice and inclusion of relevant technologies in early childhood mathematics and science.
- Develop skills in designing, implementing and evaluating learning experience sequences using knowledge from the National Quality Frameworks and other curriculum requirements of the Education Act.
- Begin to evaluate mathematics and science learning resources in light of their experience as a teacher of young children.
- Demonstrate research-based knowledge of the models of pedagogy for teaching and assessing mathematics and science.
- Develop an understanding of different learning approaches to teaching and learning and the need for pedagogical approaches that are socially and culturally relevant, including use of technology.

## ASSET survey

Assessment Type <sup>1</sup>: Participatory task

Indicative Time on Task <sup>2</sup>: 1 hours

Due: **09/09/22 at 23:55**

Weighting: **5%**

A survey related to student experience.

On successful completion you will be able to:

- Demonstrate a fundamental understanding of the major theoretical developments, central concepts, modes of enquiry, pedagogical practice and inclusion of relevant technologies in early childhood mathematics and science.



<sup>1</sup> 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.

<sup>2</sup> 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

### Information about the unit iLearn site

**This unit has a full web presence through *iLearn*.**

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

Weekly access to iLearn is compulsory for all students. Important assessment information will be posted here, as will other relevant unit notices and materials, including a reading template and guide to lecture note taking to assist your studies.

Various activities and materials for discussion and critical reflection are included and external students especially are encouraged to use this web component. Electronic links and suggested references will be included in the Resources section. Please check the iLearn unit regularly.

Weekly lectures are available on the web through the ECHO360 lecture component. You must listen to all lectures if you do not attend these 'live'.

### 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](http://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**.

### Structure

**Frequent attendance**

The unit comprises a 12 x 1 hour lecture plus 12 x 2 hour tutorials per week. In the workshop students will discuss issues and questions arising from the lectures and prescribed readings and undertake a variety of hands-on activities. Prescribed readings are listed on iLearn as part of the schedule. Lectures will be available through iLearn from the following website link: <http://ilearn.mq.edu.au>

Students are required to participate in small group activities, whole class discussion, to read the weekly material in advance, and to complete brief tasks either as individuals or in pairs. The weekly program for the course with the accompanying readings/ preparation is available on the iLearn site.

### **Infrequent attendance**

Infrequent mode lectures are the same as for frequent mode. Workshops will be scheduled in 'blocks' during 2 on campus days (OCD) as follows:

- First OCD in Week 35 on Saturday August 27
- Second OCD in week 40 on Saturday October 1

## **Unit Schedule**

Please see iLearn for details.

## **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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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](#).

## School of Education Procedures

In addition, the following policies and procedures of the School of Education are applicable in this unit.

### Fitness to Practice

Fitness to Practice Academic Senate has approved the development of a Fitness to Practice (FTP) procedure to provide further clarity to students enrolled in practical, clinical and professional programs who have not met the requirements of the General Coursework Rules. It establishes how the University will manage the progression of students enrolled in practical, clinical or professional (PCP) programs or units listed on Schedule 3 of the Academic Progression Policy, with embedded placements and/or registration, accreditation or other mandated requirements.

The Procedure is governed by General Coursework Rules, and the Academic Progression Policy and is supported by the Inherent Requirements Framework. It provides the process to identify, notify, intervene, support, monitor and exclude when required, those students who are not meeting the FTP requirements of their program. FTP is the demonstration of professional competence, acceptable professional behaviour, freedom from impairment and compliance with program specific requirements needed for a student to practice properly and safely throughout their practical, clinical or professional program. Students must ensure they meet Inherent Requirements before enrolling in their program; that they have the physical, cognitive, communication and behavioural capacity to complete the program. Students with a disability or chronic health condition may have reasonable adjustments made. Students must also demonstrate that they are fit to practice and demonstrate the capabilities and professional behaviours required of that profession.

### Attendance for undergraduate units

See the university timetable for information about when classes begin in this unit. <https://timetables.mq.edu.au/>

Activities completed during weekly tutorials (internal) or on campus days (external) are essential for building the core knowledge and/or skills required to demonstrate the learning outcomes of this unit [and to meet the AITSL Graduate Teacher Standards and/or ACECQA requirements]. **Attendance at all tutorials or on campus days (OCD) is expected and the roll will be taken.**

Students are required to attend the tutorial in which they are enrolled. Any changes to tutorial enrolments must be completed officially through e-student. Please do not contact the unit convenor requesting a change.

### **Unit Expectations**

- Students are expected to read weekly readings before completing tasks and attending tutorials
- Students are expected to listen to weekly lectures before completing tasks and attending tutorials

Note: It is not the responsibility of unit staff to contact students who have failed to submit assignments. If you have any missing items of assessment, it is your responsibility to make contact with the unit convenor.

## **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/](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.

## Changes from Previous Offering

Changes to the offering is going to be is that assessment tasks are too lengthy and have been updated with word counts in iLearn

## 5Rs Framework

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:** Content and assessment builds students confidence through identifying personal attitudes towards maths and science and challenging pre-existing math and science identities (Assessments 1 and 2)..

**Reflexive:** Strong understanding of theory to underpin pedagogy. Understanding intergenerational maths anxiety and low maths self-efficacy to address own beliefs/ self-belief and to build positive dispositions in children. Building passion, interest and enthusiasm for maths and science and developing strategies for supporting that response/ disposition/ experience for children and families as well (Assessment 1 and 2)

**Responsive:** Understanding family perspectives on maths and science and creating teaching and learning content that creates connections between children, families, educators and teachers (Assessments 1 and 2)

Ready to Learn: Reinforcing the teacher's role as co-learner – learning alongside children on maths and science content (Assessments 1 and 2).

Research Engaged: Drawing on research publications and research undertaken with previous cohorts to explain maths identity (Assessments 1 and 2).

## Changes since First Published

Date	Description
20/07/2022	Rebecca Bull added as a tutor