



# ECHE2320

## Mathematical and Scientific Thinking in the Early Years

Session 2, In person-scheduled-weekday, North Ryde 2024

*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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Contact via email

25 Wallys Walk Level 6 East B649

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

- 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 23:55. 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 clear marking scheme or 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.
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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 your course progression.

## 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](https://ask.mq.edu.au).

## Academic Integrity and Generative AI

In accordance with the Academic Integrity Policy a student must take responsibility, be proactive, take ownership and hold oneself responsible for ensuring all information and content, including citations and references in their assessment, have been generated and communicated in an ethical, honest and responsible manner. Failure to show responsibility by checking the accuracy and integrity of your own content, citations and references, or the submission of falsified content, is a breach of the Academic Integrity Policy.

## Asset

Completing the Annual Student Survey of Education for Teaching (ASSET) forms part of the assessment for this unit. The survey is in 5 parts and students will be awarded 1% for completion of each part (5% total). Your responses to the survey are confidential and none of your identified responses are shared with academic staff.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assessment Task 1A: Mathematical concepts and processes in storytelling</a>	15%	No	23:55 08/09/2024
<a href="#">Assessment Task 1B: Analyse two storybooks and design learning experiences</a>	30%	No	23:55 08/09/2024

Name	Weighting	Hurdle	Due
<a href="#">Assessment Task 2: Science in play-based learning</a>	40%	No	23:55 03/11/2024
<a href="#">Tutorial Participation</a>	10%	No	ongoing
<a href="#">ASSET survey</a>	5%	No	23:55 11/10/2024

## 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: **23:55 08/09/2024**

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: **23:55 08/09/2024**

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>: 39 hours

Due: **23:55 03/11/2024**

Weighting: **40%**

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.

## Tutorial Participation

Assessment Type **1**: Participatory task

Indicative Time on Task **2**: 1 hours

Due: **ongoing**

Weighting: **10%**

Each tutorial will have a compulsory participation task students will complete in class.

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.
- 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 **1**: Participatory task

Indicative Time on Task **2**: 1 hours

Due: **23:55 11/10/2024**

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.

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<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

### Required texts:

- McDonald, A. (2024). *Mathematics in Early Childhood Education*. Victoria: Oxford
- Campbell, C., Jobling, W., & Howitt, C. (2018). *Science in early childhood*. Cambridge

### 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 students enrolled in INFQ mode are especially 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.

Modified PowerPoint slides are available in iLearn. These are to guide students through the lecture, not offered as a replacement.

## 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.

Assistance is available from IT Helpdesk

Ph: 9850 4357 or 1800 67 4357

Email: [help.mq.edu.au](mailto:help.mq.edu.au).

On Campus: Ground floor at 18 Wally's Walk

### Structure

The unit structure can be found in the university timetable <https://timetables.mq.edu.au/2024/>. In the tutorial students will discuss issues and questions arising from the lectures and prescribed readings. They are expected to base their arguments/discussions on evidence from published research and other relevant material. There will be a supporting iLearn site for the unit providing additional readings, links and materials.

The weekly program for the course with the accompanying readings/ preparation is available on the unit iLearn site.

## Unit Schedule

Please see the unit iLearn site

## 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>)

[du.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](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

The following policies and procedures of the School of Education are applicable in this unit.

### Attendance for undergraduate units

See the university timetable for information about when classes begin in this unit. <https://timetables.mq.edu.au/2024/>

Activities completed during weekly tutorials (internal/DAY mode) 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** and the roll will be taken. Make up tasks may be given if attendance is missed to ensure all content is covered to meet accreditation requirements. This is dependent on Special Considerations application being approved.

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.

## Electronic Communication

It is the student's responsibility to check all electronic communication on a regular weekly basis. Communication may occur via:

- Official MQ Student Email Address
- The Dialogue function on iLearn
- Other iLearn communication functions

## Fail Rule

This unit is a part of a professional course listed on Schedules 2 and 3 of the Academic Progression Policy. This course has additional requirements that are applicable for the full duration of the course, including course-specific inherent requirements, Fitness to Practice requirements and other compulsory course requirements. It also has rigorous academic progression standards. Inability to meet these requirements may result in a withdrawal of offer of admission and/or permanent exclusion from the course in accordance with the General Coursework Rules.

## 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/](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:

Resilience: engaging strongly with intellectually challenging content relevant to teaching mathematics and science

Reflexive: development and focus on critical thinking skills that develop professional discernment when teaching mathematics and science

Research engaged: use research to discuss and justify approaches to teaching and learning mathematics and science

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Unit information based on version 2024.02 of the [Handbook](#)