School of Education

EDST6779
Mathematics 1

Term 1 2021

Contents

IMPORTANT:
For student policies and procedures relating to assessment, attendance and student support, please see website, https://education.arts.unsw.edu.au/students/courses/course-outlines/

The School of Education acknowledges the Bedegal people as the traditional custodians of the lands upon which we learn and teach.

1. LOCATION

   Faculty of Arts, Design and Architecture
   School of Education
   EDST6779 Mathematics 1 (6 units of credit)
   Term 1 2021

2. STAFF CONTACT DETAILS

   Course Coordinator: Dr Laura Tuohilampi   l.tuohilampi@unsw.edu.au
   Location: Ground Floor, Morven Brown Building

3. COURSE DETAILS

Course Name	Mathematics 1
Credit Points	6 units of credit (uoc)
Workload	Includes 150 hours including class contact hours, readings, class preparation, assessment, follow up activities, etc.
Schedule	http://classutil.unsw.edu.au/EDST_T1.html#EDST6779T1

SUMMARY OF COURSE

This course introduces the continuum of mathematics learning K-6, with special emphasis on the transitions between NSW Education Standards Authority (NESA) Early Stage 1, Stage 1, Stages 2 and 3 and the transition into the Stage 4 syllabus. There will be a focus on number concepts prior to school entry, as well as the range of developmental understanding and student ability within most classes. The emphasis will be on pedagogical approaches and teaching strategies suitable for:
- developmental stages
- progress in numeracy
- understanding and application of mathematical concepts
- formative assessment.

AIMS OF THE COURSE

Successful completion of this course will prepare teachers for the teaching of mathematics by:
- demonstrating their knowledge, skills and understanding of the foundation concepts of quantity, measurement, spatial representation, generalisation, estimation and mathematical reasoning and problem solving
- examining the role and value of mathematics as a strand of STEM as well as its place in the broader school curriculum.

The course enables students to explore and gain understanding of the relationship between mathematics, numeracy and literacy. It will investigate the language of mathematical thinking and problem solving through the investigation ways of working with numbers and data (gathering, organising, representing processes and communicating results) with a direct emphasis of their application to real world situations relevant to the lives of primary age students.

THE MAIN WAYS IN WHICH THE COURSE HAS CHANGED SINCE LAST TIME AS A RESULT OF STUDENT FEEDBACK:
- The course has been adjusted for further online accessibility and engagement.
- The teaching pattern has been changed to 1 weekly asynchronous 1-hour lecture, and a 2-hour tutorial either face-to-face or online. The online version of the tutorial will include at least 1-hour synchronous engagement.

STUDENT LEARNING OUTCOMES

Outcome		Assessment/s
1	Demonstrate understanding of the range of home and community numeracy practices, including the impact of parental/carer attitudes and different cultural systems including Australian Indigenous communities	1
2	Demonstrate understanding of mathematical concepts underpinning development of mathematical knowledge, skills and understanding and communicate them clearly using appropriate terminology	1
3	Identify and explain the difference between mathematics and numeracy and demonstrate the importance of both aspects in student's lives to meet a range of social and cultural needs	1
4	Demonstrate a broad and critical understanding of the NESA Mathematics K-10 syllabus and use it appropriately to select concepts, sequence and connect lessons and map progress	2
5	Examine and apply a range of pedagogical skills suitable for different developmental stages and levels of understanding	1,2
6	Design and differentiate engaging teaching activities and materials to accommodate diverse student abilities (including gifted students)	1,2
7	Select, design and apply relevant ICT tools to support mathematical understanding and learning	1,2
8	Evaluate and appropriately use teaching resources such as calculators, games, hands-on materials and puzzles	1,2

AUSTRALIAN PROFESSIONAL STANDARDS FOR TEACHERS

Standard		Assessment/s
1.1.1	Demonstrate knowledge and understanding of physical, social and intellectual development and characteristics of students and how these may affect learning	2
1.2.1	Demonstrate knowledge and understanding of research into how students learn and the implications for teaching	1,2
1.3.1	Demonstrate knowledge of teaching strategies that are responsive to the learning strengths and needs of students from diverse linguistics, cultural, religious and socioeconomic backgrounds	1,2
1.4.1	Demonstrate broad knowledge and understanding of the impact of culture, cultural identity and linguistic background on the education of students from Aboriginal and Torres Strait Islander backgrounds	1
1.5.1	Demonstrate knowledge and understanding of strategies for differentiating teaching to meet the specific learning needs of students across the full range of abilities	1,2
2.1.1	Demonstrate knowledge and understanding of the concepts, substance and structure of the content and teaching strategies of the teaching area	1,2
2.2.1	Organise content into an effective learning and teaching sequence	1,2

2.3.1	Use curriculum, assessment and reporting knowledge to design learning sequences and lesson plans	1, 2
2.6.1	Implement teaching strategies for using ICT to expand curriculum learning opportunities for students	2
3.3.1	Include a range of teaching strategies	2
3.4.1	Demonstrate knowledge of a range of resources including ICT that engage students in their learning	2
5.1.1	Demonstrate understanding of assessment strategies, including informal and formal, diagnostic, formative and summative approaches to assess student learning	1
5.3.1	Demonstrate understanding of assessment moderation and its application to support consistent and comparable judgements of student learning	1
5.4.1	Demonstrate the capacity to interpret student assessment data to evaluate student learning and modify teaching practice	1
6.3.1	Seek and apply constructive feedback from supervisors and teachers to improve teaching practices	2

NATIONAL PRIORITY AREA ELABORATIONS

Priority area		Assessment/s
A. Aboriginal and Torres Strait Islander Education	4, 8	1, 2
B. Classroom Management	1, 2	2
C. Information and Communication Technologies	3-7,10	1, 2
D. Literacy and Numeracy	1-2, 6-19	1, 2
E. Students with Special Educational Needs	1-8	1, 2
F. Teaching Students from Non- English-Speaking Backgrounds	1-9	1, 2

4. RATIONALE FOR THE INCLUSION OF CONTENT AND TEACHING APPROACH

Students need to understand the scope and sequence of the NESA (2012) Mathematics K-10 syllabus and use it appropriately to select concepts, sequence and connect lessons and map progress. The course investigates pedagogy appropriate for the developmental stages of diverse students learning mathematics and numeracy. Students are required to develop their use of mathematical language to explain concepts at different levels and in appropriate ways. Developing appropriate use of ICT and concrete materials is also important to develop engaging lesson activities.

5. TEACHINGSTRATEGIES

Student-centred practical activities provide opportunities for critique and reflection on the importance, methodology and pedagogy for teaching mathematics and numeracy. Lectures and tutorials demonstrate and explicitly model teaching strategies. The course will allow students to model, collaborate and critique explicit strategies and resources within a supportive, reflective environment. On-line learning from readings on the Moodle website and selected websites and the use of a range of digital resources allow students to become confident is selecting, evaluating and using and demonstrating a range of ICT resources. Students will be able to discuss, question and critically respond to their own teaching experiences.

6. COURSE CONTENT AND STRUCTURE

Weeks	Topics and Content This is an *indicative* course schedule of topics. Refer to Moodle for the most current schedule order of topics. Throughout the course, the content *may* change to be adapted to the students' learning needs and interests.
Week 1	**Introduction and self-assessment** • Exploration of own numeracy levels, personal beliefs and attitudes to mathematics. • Affect and emotion in learning mathematics. • Strategies for self-improvement. • Introduction to the NSW K-10 Mathematics syllabus, Stages ES1-3 • Importance of explicit teaching, play, investigation, continuous assessment. • The role of the Numeracy Learning Progression (each topic needs to be taught with the Numeracy Progression referenced). • Influence of varied experiences prior to school entry. • Assessing early numeracy and mathematics experiences, e.g. Best Start/ Port Jackson Number Sense. Self-assessment of Numeracy (500-word written response): Identify and briefly describe your own numeracy learning experiences, your self-assessment of your numeracy levels and your self-efficacy in dealing with mathematical concepts. Provide three pieces of evidence to support your assessment of your levels of numeracy and suggest three ways to enhance those levels over the length of the program. *Upload your response to Moodle by the end of Week 1*.
Week 2	**Theories and approaches** Dominant theories and approaches to teaching and learning in mathematics: importance of working mathematically; articulating and demonstrating understanding. Strategies for selecting, organising, implementing, and evaluating effective learning experiences in K-6, including groups/workstations and hand-on, practical activities. Importance of working mathematically to explore/communicate understanding and reasoning; represent and solve problems; develop fluency of language and strategies. Continuous assessment for learning: • know what learners can already do • learning intentions • success criteria • feedback • peer assessment Approaches for effective mathematics teaching including questioning, observing and listening to students, peer discussion, and application of learning. Use of student portfolios (including e-portfolios) to evaluate misconceptions and application of strategies; cooperative learning; and investigation of experiences using concrete objects and representations.

| Week 3 | **Measurement and Geometry (MG) Early Stage 1 and Stage 1**

Application to school, community, and home. Importance of physical handling of objects.

Understand and apply:
- length [formal v informal units];
- area [surface = covering, compare by superimposing/super positioning shapes, count using cm^2 grids, boundary v area, tessellation];
- volume and capacity (complicated topic) [open 3D objects, predict, measure and record, exploring units and strategies, including *displacement*], mass [conservation, balance, logic of comparing two objects to common third object];
- time [sequence of day/night/parts of days/months/seasons, calendars, (formal v informal ways to indicate/compare time, analog/digital, identify quarter hours], compare/select shapes and objects [2D and 3D] using touch/properties;
- name/description, closed v open shapes, parallel lines edges, vertical = portrait, landscape = horizontal for ICT orientation, use 2D shapes for flip/slide/turn, clockwise v anti-clockwise].

Recognise Aboriginal and Torres Strait Islander usage and terminology may be based on other concepts: bodies, landmarks, etc. |
|---|---|
| Week 4 | **Early Stage 1 Number and Algebra (NA)**

Whole Numbers
- Importance of concrete materials and word problems to demonstrate mathematical processes.

Whole numbers 0-20
- Estimation, comparison, language, and purpose of money.
- Use real objects to collect, display and count. Compare size and quantity.

Exact v comparative language
- *equal to, same as, more, fewer* (using arrays and randomised groups)
- Subtraction and addition as taking away/ adding in real contexts.

(NA) Addition and Subtraction
- connected to count me in and the progressions.

Working mathematically in other cultures
- Use of abacus and Aboriginal and Torres Strait Islander spatial patterns.
- Representations of addition and subtraction using drawings, words, and numerals.

Assessing conceptual understanding using e.g.:
- Interviews
- "SENA" (DoE), and
- "LIEN" (AIS). |

Week 5	**Early Stage 1 (NA) Multiplication and division**
	• Demonstrate concept of '*group'*, *equal groups, unequal groups, lots of, share*.
	• Use conditional language: *If there are 9 toy cars in my collection and I am sharing them with two friends, how many cars do we get each?*
	Early Stage 1 (NA) Patterns and Algebra
	• Sort and classify objects in different ways and explain reasoning;
	• copy, continue and create repeated *patterns* (sounds, actions, shapes, objects);
	• identify and explain errors in *repeated* patterns using item attributes.
Week 6	**Early Stage 1: (NA) Fractions and decimals**
	• Use pictures/objects to show two *equal* parts are '*halves'* and *unequal* parts are not; need to '*combine'* to make a *whole* to be '*halves'*.
	• Concept of two '*whole'* objects of different sizes will have 'halves' of unequal size; more than one way to divide a *whole* into '*halves'*.
	Early Stage 1: (MG) Position
	Combine numbers, sequence and direction to describe/determine position in relation to a given starting point.
	Early Stage 1: Statistics and Probability (SP)
	• Data - collect information about themselves and their environment with teacher assistance. They use actual objects as data and group these objects into a data display.
Week 7	**Stage 1: Number and Algebra (NA) Whole numbers**
	• Count 0-100 forwards/backwards with increasing fluency and starting with different numbers.
	• Apply ordinal numbers (20th) to sequences.
	• *Round to* nearest 10 (explain different meaning from *round* shape or *around*).
	• Demonstrate *place value* using '*lots of'* 10s, 100s and ones.
	• *Estimate* size of groups using everyday objects. Group coins and notes differently for the same *total*.
	• Understand categories of *even* and *odd* numbers and count by 2s.
	(NA) Addition and subtraction
	• Use *number line* to count forwards and backwards and record as a *number sentence* to link concepts to real world.
	• Explain equivalence of number sentences and justify true/false for number sentences.
	• Articulate '*difference between'* numerically using concrete objects, number line and drawings. Add equal groups to *double,* then add left over digits for near doubles.
	• *Demonstrate how reversing* factors for addition keeps answer the same.
	• Explore different *strategies* to solve a number problem and explain reason for choosing the strategy.
Week 8	**Stage 1 (NA) Multiplication and division**
	• Demonstrate fluency for rhythmic *skip* counting by 2s, 5s and 10s.
	• Use equal groups to model *multiplication* and model division of collections as '*groups of'* equal *sets* with some *left over*.
	• Demonstrate division means '*sharing'*. Link multiplication by first dividing a collection and then recombining the groups.

	Stage 1 (NA) Patterns and Algebra • use objects to represent counting patterns; • describe repeated patterns as one, two or three patterns and relate to adding on by three; • odd and even numbers.
Week 9	**Stage 1 (NA) Fractions** • Apply halves, quarters and eighths to divide wholes. • Explain fraction notation for 'whole divided into … parts'. • Compare different fractional parts: vertical, horizontal or area. Combine fractions to make a whole. Explore equivalence of fractions. **Stage 1 (MG) Position** • Use left/right from perspective of a person facing them. • Give/follow simple directions using a diagram. • Link to addition (forward) and subtraction (backwards). **Stage 1 (SP) Chance** • Use everyday model language to describe *chance* for events which are certain, likely, possible etc. Arrange words using opposites. **Stage 1 (SP) Data** • Use symbols for objects (including *tally* marks), recording displays of data, interpreting/explaining data displays using comparative/ superlative language.
Week 10	**Course wrap-up and revision** • Revisiting the issue of diverse learners in mathematics. • Recording progress and identifying conceptual gaps. • Language of mathematics: Different ways of saying the same idea; moving from everyday language to more mathematical language, words used differently in non-mathematical contexts. • Changing word problems to number sentences and inventing scenario to match a number sentence. Drawing word problems and number sentences. • Supporting students in the transition to Stage 2. Reflection (500-word written response): Describe three ways in which you would assess the impact of your teaching in this KLA on your future students. If you have a specialisation in this KLA (e.g., a major in your undergraduate degree), describe how you could build on your advanced knowledge/skills to make improvements in student achievement in this KLA in your current school. If you do not have a specialisation in this KLA, identify three areas of your disciplinary knowledge /skills that require further development, and what strategies you will use to achieve that. *Post your response to Moodle by the end of the Week 10.*

7. RESOURCES

Required Readings

- NSW Mathematics K-10 syllabus (2012)
  http://syllabus.bostes.nsw.edu.au/mathematics/mathematics-k10/

- National Numeracy Learning Progression (adapted for NSW Syllabus May 2018)
  NSW Education Standards Authority (NESA)

  http://educationstandards.nsw.edu.au/wps/wcm/connect/7a7c08ac-8c7b-43db-934b-4a71f46a790e/national-numeracy-learning-progression.pdf?MOD=AJPERES&CVID=

- Mathematics K-10 syllabus (2012)
  https://syllabus.nesa.nsw.edu.au/assets/mathematicsk10/downloads/mathematicsk10_full.pdf

- NSW DET (2003) *Quality Teaching in NSW Public Schools,* Sydney, NSW

Further Readings

- Boaler, J. (2010). *The elephant in the classroom: Helping children learn and love maths.* London: Souvenir Press Limited.
- Bobis, J. (2012). Mathematics for Children – Challenging children to think mathematically (4th ed).Pearson
- De Klerk, J. & Marasco, A. (2013). *Pearson Illustrated Maths Dictionary* (5th ed) Pearson
- Gibbons, P. (2002). *Scaffolding language, scaffolding learning: Teaching second language learners in the mainstream classroom.* Portsmouth: Heinemann.
- Harrison, N. & Sellwood, J. (2016). *Learning and Teaching in Aboriginal and Torres Strait Islander Education* (3rd ed). Melbourne: Oxford.
- Haylock, D. & Manning, R. (2014). *Mathematics Explained for Primary Teachers* (5th ed). London: Sage
- Jackson, E. (2015). *Reflective Primary Mathematics* London: Sage
- Jorgenson, R. & Dole, S. (2012). *Teaching Mathematics in Primary Schools* (2nd ed.). Sydney: Allen & Unwin
- Macdonald, A. with Rafferty, J. (2015). *Investigating Mathematics, Science and Technology in Early Childhood.* Melbourne: OUP
- Siemen, D. et al (2015). Teaching Mathematics: Foundations to Middle Years. Melbourne: OUP
- MeTRC (Mathematics eText Research Centre) (2012). What roles does vocabulary play in learning mathematics? University of Oregon http://metrc.uoregon.edu/index.php/what-roles-does-vocabulary-play-in-learning-mathematics.html
- Murray, M. (2004). *Teaching mathematics vocabulary in context: windows, doors, and secret passageways.* Portsmouth NH: Heinemann.
- Reys, R.E. et al (2012). *Helping Children Learn Mathematics* (8th ed). Milton, Queensland: Wiley
- Watson, A., Jones, K., & Pratt, D. (2013). *Key ideas in teaching mathematics: Research-based guidance for ages 9-19.* Oxford: Oxford University Press

8. ASSESSMENT

Assessment Task	Length	Weight	Student Learning Outcomes Assessed	Australian Professional Standards Assessed	National Priority Area Elaborations Assessed	Due Date
Assessment 1 Lesson Plan: Assessing and Extending Understanding of Measurement and Geometry	c. 1800 words	40%	1-3,5-8	1.2.1, 1.3.1, 1.4.1, 1.5.1, 2.1.1, 2.2.1, 2.3.1, 5.1.1, 5.3.1, 5.4.1	A4 B1-2 C3-7 D9-19 E1-8 F1-9	Friday 26th March by 5pm
Assessment 2 Portfolio: Mathematics Resources with Student Work Samples	c. 4000 words	60%	4-8	1.1.1, 1.2.1, 1.3.1, 1.5.1, 2.1.1, 2.2.1, 2.3.1, 2.6.1, 3.3.1, 3.4.1, 6.3.1	A4,8 B1-2 C3,10 D1-2,6-8,13-14 E6 F6	Friday 23rd April by 5pm

Submission of assessments

Students are required to follow their lecturer's instructions when submitting their work for assessment. All assessment will be submitted online via Moodle by 5pm. Students are also required to keep all drafts, original data and other evidence of the authenticity of the work for at least one year after examination. If an assessment is mislaid the student is responsible for providing a further copy. Please see the Student Policies and Procedures for information regarding submission, extensions, special consideration, late penalties and hurdle requirements etc. https://education.arts.unsw.edu.au/students/courses/course-outlines/

Assessment Details

Assessment 1: Lesson Plan – Assessing and Extending Understanding of Measurement and Geometry

Part 1: Interview a student*
   A. Interview a student in **Stage 1** to assess their understanding of size, shapes and dimensions.
   B. Design some hands-on activities which require students to demonstrate and articulate an understanding of **capacity**.
   C. Write a report outlining what the student already understands and can already do.

*An alternative will be provided in the event that you do not have access to a Stage 1 student in your INSTEP school.

Part 2: Lesson Plan**
   A. Identify the next steps for moving the student forward in their learning
   B. Design a lesson plan (approx. 50 minutes) that would extend the student's understanding of measurement and geometry.

**In addition, you will have the opportunity during your tutorial to teach a 10-minute excerpt of your lesson plan and receive peer feedback. You will also be encouraged to try out your lesson plan at your INSTEP placement (e.g., with a small group of Stage 1 students, if possible).

Assessment 2: Portfolio - Maths Resources with Student Work Samples

Part 1: Resources (c. 2000 words)

   A. Gather and/or develop **four** hands-on resources for assessing and teaching syllabus outcomes expected at the **end of early stage 1 and stage 1** addressing at least three content areas of the **Number and Algebra** strand.
   B. Gather and/or develop **two** hands-on resources for assessing and teaching syllabus outcomes expected at the **end of early stage 1 and stage 1** addressing at least two content areas of the **Measurement** strand.

For each resource, you need to provide
   • a rationale explaining why the resource is appropriate for the Stage and how it will support learning
   • statement(s) of learning intention(s) for the task
   • a list of concrete resources needed
   • appropriate strategies for the skills and strategies for **Working Mathematically**

Optional – try the **six** hands-on resources with an individual or small group of students!

Part 2: Student Work Samples (c. 2000 words)

   A. Select **six** samples of student work (see Moodle):
      • four samples for Number/Algebra <u>and</u>
      • two samples for Measurement for Early Stage 1 and Stage 1

   B. Annotate the samples to demonstrate evidence of student thinking. Analyse what the evidence is pointing to in terms of extending, consolidating or re-teaching. Consider the language and symbols the student has used, the way the response is set out and any 'traffic light' indicator or self-reflection statement showing the student's own level of confidence.

   C. What written feedback would you use to help move the student's learning forward?

UNSW SCHOOL OF EDUCATION
FEEDBACK SHEET
EDST6779 MATHEMATICS 1

Student Name: Student No.:

Assessment Task 1: **Lesson plan**

SPECIFIC CRITERIA	(-)				(+)
Understanding of the question or issue and the key concepts involved • Outline what the student already understands and can already do in relation to Measurement. • Include hands-on activities which require students to demonstrate and articulate an understanding of **capacity.**					
Depth of analysis and/or critique in response to the task • Design of a lesson plan that clearly indicates next steps for student learning					
Familiarity with and relevance of professional and/or research literature used to support response • Appropriate research references to support responses. • Sound range of research references.					
Structure and organisation of response • Appropriate nature of structural organisation. • Logical and coherent structure. • Clear presentation of ideas to enhance readability.					
Presentation of response according to appropriate academic and linguistic conventions • Clarity, consistency and appropriateness of conventions for quoting, paraphrasing, attributing sources and information and listing references (APA style) • Clarity and appropriateness of sentence structure, vocabulary use, spelling, punctuation and word length					

GENERAL COMMENTS/RECOMMENDATIONS FOR NEXT TIME

Lecturer: **Date:**
Recommended: **/20**   **(FL PS CR DN HD)**   **Weighting: 40%**

NB: The ticks in the various boxes are designed to provide feedback to students; they are not given equal weight in determining the recommended grade. Depending on the nature of the assessment task, lecturers may also contextualize and/or amend these specific criteria. **The recommended grade is tentative only, subject to standardisation processes and approval by the School of Education Learning and Teaching Committee.**

Student Name: Student No.:

Assessment Task 2: **Portfolio**

SPECIFIC CRITERIA	(-)--------------------------➤(+)				

Understanding of the question or issue and the key concepts involved
PART 1
   • Include **four** hands-on resources for assessing and teaching syllabus outcomes expected at the **end of early stage 1 and stage 1** addressing at least three content areas of the **Number and Algebra** strand.
   • Include **two** hands-on resources for assessing and teaching syllabus outcomes expected at the **end of early stage 1 and stage 1** addressing at least two content areas of the **Measurement** strand.
   • A rationale explaining why each of the **six** resources are appropriate for the Stage and how it will support learning.
   • Include statements of learning intentions for the tasks.
   • Include a list of concrete resources needed.
PART 2
   • Include 6 samples of student work: **four** for Number/Algebra and **two** samples for Measurement for Early Stage 1 and Stage 1.					

Depth of analysis and/or critique in response to the task
PART 1
   • Integrate appropriate strategies for the skills and strategies for **Working Mathematically** within the **six** hands-on resources.
PART 2
   • Annotate the work samples to demonstrate evidence of student thinking.
   • Analyse what the evidence is pointing to in terms of extending, consolidating or re-teaching.
   • Detail written feedback you would use to help move the student's learning forward.					

Familiarity with and relevance of professional and/or research literature used to support response
   • Appropriate research references to support responses
   • Sound range of research references.					

Structure and organisation of response
   • Appropriate nature of structural organisation.
   • Logical and coherent structure.
   • Clear presentation of ideas to enhance readability					

Presentation of response according to appropriate academic and linguistic conventions
   • Clarity, consistency and appropriateness of conventions for quoting, paraphrasing, attributing sources and information and listing references (APA style)
   • Clarity and appropriateness of sentence structure, vocabulary use, spelling, punctuation and word length					

GENERAL COMMENTS/RECOMMENDATIONS FOR NEXT TIME

Lecturer: **Date:**

Recommended: **/20**   **(FL   PS   CR   DN   HD)**   **Weighting: 60%**