UNSW SYDNEY Arts & Social Sciences

School of Education

EDST6780
Mathematics 2

Term 3 2020

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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 and Social Sciences

School of Education

EDST6780 Mathematics 2 (6 units of credit)
Term 3 2020

2. STAFF CONTACT DETAILS

Course Coordinators:	Sonia Byrnes and Zuhal Ghafauri
Availability:	Post your course enquiries on the course forum. Only use email for confidential communications. Email addresses will be made available via course Moodle page.

3. COURSE DETAILS

Course Name	Primary Mathematics Method 2
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_T3.html#EDST6780T3 8 synchronous sessions online: Thursdays 4-6pm starting 1 October

SUMMARY OF COURSE

This course introduces the continuum of mathematics learning K-6, with special emphasis on the transitions between Stages 1 and 2, 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

a) developmental stages
b) progress in numeracy
c) understanding and application of mathematical concepts
d) formative assessment.

THE MAIN WAYS IN WHICH THE COURSE HAS CHANGED SINCE LAST TIME AS A RESULT OF STUDENT FEEDBACK

- Additional asynchronous activities will be provided to complement the synchronous tutorials

STUDENT LEARNING OUTCOMES

Outcome		Assessments
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 NSW Board of Studies (2012) Mathematics K-10 syllabus and use it appropriately to select concepts, sequence and connect lessons and map progress	1, 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
7	Select, design and apply relevant ICT tools to support mathematical understanding and learning	1
8	Evaluate and appropriately use teaching resources such as calculators, games, hands-on materials and puzzles	1

AUSTRALIAN PROFESSIONAL STANDARDS FOR TEACHERS

Standard		Assessments
1.1.1	Demonstrate knowledge and understanding of physical, social and intellectual development and characteristics of students and how these may affect learning	1, 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	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
2.5.1	Know and understand literacy and numeracy teaching strategies and their application in teaching areas	1
2.6.1	Implement teaching strategies for using ICT to expand curriculum learning opportunities for students	1
3.3.1	Include a range of teaching strategies	1

3.4.1	Demonstrate knowledge of a range of resources including ICT that engage students in their learning	1
5.1.1	Demonstrate understanding of assessment strategies, including informal and formal, diagnostic, formative and summative approaches to assess student learning	2
5.3.1	Demonstrate understanding of assessment moderation and its application to support consistent and comparable judgements of student learning	2
5.4.1	Demonstrate the capacity to interpret student assessment data to evaluate student learning and modify teaching practice	2
6.3.1	Seek and apply constructive feedback from supervisors and teachers to improve teaching practices	1

NATIONAL PRIORITY AREA ELABORATIONS

Priority area		Assessments
A. Aboriginal and Torres Strait Islander Education	4, 8	1
B. Classroom Management	1, 2	1
C. Information and Communication Technologies	3-7,10	1
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 NSW Board of Studies (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. TEACHING STRATEGIES

Student-centred practical activities provide opportunities for critique and reflection on the importance, methodology and pedagogy for teaching mathematics and numeracy. Lectures demonstrate and explicitly model teaching strategies. A hands-on teaching environment 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

This unit of study involves a 10-module program. This is an ***indicative*** course schedule and reading list. Refer to Moodle for the most current schedule and reading list. Throughout the course, the content ***may*** change to be adapted to the students' learning needs and interests.

Module	**Session Topics and Content** *All verbs noted below represent what students need to do as a result of teaching and learning. The verbs indicate how the concepts in each strand relate to skills and strategies needed for the components of Working Mathematically.*
Week 1 Module 1a	**NSW K-10 Mathematics syllabus Stages 2 and 3: Using stage statements,** syllabus documents and **DoE numeracy continuum** to **design an effective scope and sequence.** Importance of applying skills of **Working Mathematically** and **ICT** as components of teaching, learning and assessment. **Writing and sharing learning intentions**: Balancing student-friendly language and mathematical terminology. Cyclical nature of learning and need for perseverance, efficiency and **making connections** (familiar to new, new to familiar, representation of concepts in different ways and selection of appropriate strategies). **Teacher/student dialogue** to prompt and encourage robust reasoning, explanations. Using assessment **diagnostically** to understand and guide learning for each student. **Differentiating programs** to cater for range of cognitive abilities, prior learning, learning styles, engagement, interests. Flexible pedagogical practices to support, challenge and extend students.
Week 1 Module 1b	**Connect mathematics to everyday life** using problem solving and investigation. Enhancing enjoyment by learning inside and outside the classroom. **Stages 2 and 3: Data.** Recognise categories/variables for data, pose questions for investigation, present data in different ways (tables/graphs), name and explain features included (title/symbols/*scale*/*key*). Represent change over time, evaluate reliable/misleading/*biased* information, justify choice of data presentation and describe/interpret results. **Stage 2 (Chance) and 3 (Probability).** Concept of *randomness*, apply reasoning to predict possible results using *frequency* and *likelihood*, communicate probability using fractions, decimals, ratios and percentages, consider difference between *expected* and *actual/tallied* results, understand and communicate significance of multiple *trials*, *fair* trial, *independent*/*dependent outcomes.* **Stages 2 and 3: Position.** Communicate direction using maps, *grid references*, *compass* directions, *scale*, *legend*, Google Earth, Google Maps.
Week 2 Module 2a	**Stages 2 and 3 (Whole number).** Fluently communicate 4-digit (Stage 2) and 6 (Stage 3) digit *numerals* (*integers*) in words/*digits*; arrange numerals to make *smallest*/*largest* number and explain reasoning; sequence in *ascending*/*descending* order; apply expanded notation to indicate place value. Count on/off decade using *place value*; explain role of zero in place value, *rounding* to nearest 1, 10, 100 or 1 000 and application of rounding (eg temperature, population); 400K abbreviation (money and computers). Contrast *prime* and *composite* numbers; explain *square*/*triangular* numbers using diagrams. Number sense and Numeracy continuum Stage 2-3 Fluently use mathematical symbols: =, +, -, x, ÷, >, <, a^2, explain symbols using multiple terms and set out algorithms. Interpret and communicate number sentences as scenarios with appropriate terminology.

Week 2 Module 2a	**Stages 2 and 3 Addition and subtraction:** add (*sum*, *increased by, plus* in Stage 3) and *subtract* (*decreased by*, *minus* in Stage 3) single-digit numbers and change/arrange sequence to aid fluency; apply partitioning to rewrite addition/subtraction; understand number line (including negative numbers) and demonstrate efficiency of jump/ compensation strategies, bridging decades. Understand addition/subtraction as *inverse operations*; apply concept to check answer. Compare, choose and explain reasoning for choice of most efficient strategy.
Week 3 Module 3	**Stages 2 and 3 Multiplication and division** **Estimate** to check operation and **explain** reasoning; check calculations using inverse operation (to 'undo') and/or calculator. **Apply division to understand factors**: highest, lowest, common and applying factors to solving problems. **Partitive** (sharing) versus **quotative** (grouping) processes. *Product* for *multiplied by*. *Per* (/) for '*divided by one named unit'.* **Arrays**: use *vertical* columns and *horizontal* rows to represent groups and single items *left over (remainder* in Stage 3). Understand concept of 'left over' when number cannot be grouped evenly. Transfer fractions/*decimals* to record *remainder*.
Week 4 Module 4	**Stages 2 and 3 Multiplication and division cont.** Understand grouping using round brackets/parentheses ( ), square brackets [ ] and braces { } in multi-operation number sentences. Apply priority of inner brackets over outer brackets; use brackets to indicate order of operations. **Money:** Apply understanding of addition/multiplication to vary number and combination of coins/notes to match same sum of money; calculate *change* and round to nearest 5c; apply simple operations to problems involving money and justify strategies/explain solution in real-world contexts. Interpret calculator display for money calculations (2.6 = $2.60). Calculate and interpret currency exchange rates. **Stages 2 and 3 division:** Ask and answer questions about patterns/arrays and apply to odd/even numbers; recognise final digit as critical for odd/even numbers and apply factorisation to identify odd/even numbers. Apply addition/subtraction to count on/back. Reason value of unknown quantity using equivalent number sentences and apply strategy of *substitution* to check. Calculate missing number in a numerical pattern and explain reasoning. Understand representation of number plane with *x-* (horizontal) and *y-axis* (vertical) and explain significance of sequence of *coordinates*.
Week 5 Module 5	**Stages 2 and 3 Fractions and decimals:** shade parts of a whole to represent *fractional part* and explain reasoning; interpret *numerator*/*denominator*, connect *fractions* and *mixed numbers* by arranging in ascending/descending sequence. Distinguish between *proper* and *improper* fractions and explain using *numerator* and *denominator.* Build/draw fraction walls to compare and simplify *equivalent* fractions. Create and interpret improper fractions to solve problems. Explain *equivalence* of fractions, decimals and percentages. Apply to calculate *discounts*. Understand cultural conventions for naming fractions/ writing decimals. Apply place value to compare numbers with unequal decimal places.
Week 6 Module 6	**Measurement and Geometry. Length**: Convert between km, m, cm and mm and use place value to interpret units; apply to understand and calculate *perimeter*, interpret intervals on scaled instruments. **Area:** Use cm^2 grid paper to calculate/estimate area and relate scaled diagrams to multiplication/division, understand why $1m^2$ may not represent a square, apply units (including *hectares*) to everyday situations and justify choice of unit, calculate area of a triangle using *base* and *perpendicular* height and justify formula by transforming triangles to rectangles. **Volume**: Represent cm^3/m^3, mL, L, kL and relate to everyday volumes

	(tea/tablespoon, cup, Olympic swimming pool), submerge objects and interpret change in water level, explain reasoning for volume of rectangular prisms. **Mass**: Apply kg, tonnes (T) to everyday objects, compare gross/net, compute weights using different scales, **Time**: explain equivalent units of measurement including revolution/orbit and relate to natural world; express and interpret ways to represent time (including dates/timelines/timetables), infer significance of time zones and daylight saving, **2D and 3D space**: Recognise categories and properties of *polygons*, *rigidity*, reflection/translation and *symmetrical* rotation of common shapes, apply length of sides and size of angles to draw shapes, draw 2D *nets* and construct related 3D shapes, construct models, explain logic for parallel faces, understand representation of 3D objects in 2D, relate top/*apex* and explain *cross-section*.
Week 7 Module 7	**Introduction of Angles:** Understand, explain and compare types of angles using alignment/measurement, explain properties of right angles, concept of *degrees* and *quadrants* of a circle, measuring with *protractor*, adjacent/opposite angles. Apply to 2D and 3D shapes and justify properties by building models and creating cross-sections. **Using Stage 4 Stage Statements to help students look forward to Stage 4**: Identify as a mathematician, develop confidence and fluency, investigate, generalize and extend, interpret, compare and apply what has already been learned.
Week 8 Module 8	**Supporting diverse learners in mathematics.** Teachers will be recording progress and analyse work samples to identify conceptual gaps. Importance of oral language and games to explain/explore reasoning; role of patterns and diagrams for visualisation; importance of mental strategies and estimation; reword using simplified language when needed. **Support for students with special Educational needs:** Explain symbols in words, relate concepts to life experiences/needs, repeat skills to develop fluency and confidence, follow scaffolding, connect new concepts to prior learning, seek additional assistance, practise to develop confidence, explain reasoning using everyday language. **Language of mathematics**. Use noun forms for terminology: *addition, subtraction, estimation, strategy; total; groups of* (rather than *lots of*), *product*, *intersection* and note when mathematical usage differs from everyday usage (eg *key*). Understand and explain equivalence of terminology when applicable. ***Post 500-word Reflection***

7. RESOURCES

Required Readings

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

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

***Additional required readings will be available via Moodle**

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., Warren, E., Clark, J., Brady, K., Beswick, K. & Faragher, R. (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: Assessing understanding of a topic and lesson plan	2000 words (equiv)	40%	1-8	1.1.1, 1.2.1, 1.3.1, 1.4.1, 2.1.1, 2.5.1, 2.6.1, 3.3.1, 3.4.1, 6.3.1	A4, A8; B1-2; C3-7, C10; D1-2, D6-19; E1-8; F1-9	Monday 19 October by 5pm
Assessment 2: Annotation and analysis of student work samples	3000 words (equiv)	60%	4-5	1.1.1, 1.2.1, 1.3.1, 1.5.1, 5.1.1, 5.3.1, 5.4.1	D1-2, D6-19; E1-8; F1-9	Friday 20 November 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: Assessing understanding of a topic of your choice that has been covered so far in this course, and lesson plan

1. Interview* a student in Stage 2 or 3 by doing 1-2 quality and appropriate hands-on activities that would require the student to demonstrate and articulate their ability to work mathematically. The goal of the interview is to use both prepared questions/prompts and activities to assess their understanding of an aspect of concept chosen.
2. Write a report outlining what the student already understands and can already do.
3. Design a lesson plan for the next step to move the student forward in their learning.
4. Briefly indicate suggestions on how you would follow-up the lesson.
5. Include a reflection (examples to be provided in class)

Assessment 2: Annotation and analysis of student work samples

1. Select samples* of Stages 2 or 3 student work. Be sure to include at least one sample for each of the following strands (total of 3-6 samples):
   - Measurement/Geometry (1-2 samples)
   - Number/Algebra – fractions, decimals, and percentages (1-2 samples)
   - Probability/Statistics (1-2 samples)
2. Annotate and analyse
   - Annotate the samples to demonstrate evidence of student thinking.
   - Analyse what the evidence is pointing to in terms of extending, consolidating or reteaching. 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.
3. Feedback. Provide written feedback for the student which indicates strengths and areas for improvement. Suggest a strategy that will guide the student in his/her learning (If the task was used summatively you can still use it for formative purposes.)
   Consider:
   - What written feedback would you use to guide your discussion with the student in order to help move the student's learning forward?
   - What would you do next to progress, extend thinking, or re-teach the student?
4. Reporting. Include a few lines that could be included in a more formal report comment to parents. Provide enough detail to indicate to parents/carers which aspect of the student's performance you are commenting on.

*Please see Moodle for additional details (including instructions on how to complete these assessment tasks if an INSTEP placement has not been available).

UNSW SCHOOL OF EDUCATION
FEEDBACK SHEET
EDST6780 MATHEMATICS 2

Student Name: Student No.:

Assessment Task 1: **Assessing understanding of a topic and lesson plan**

SPECIFIC CRITERIA	(-) ——————➤ (+)				
Understanding of the question or issue and the key concepts involved • Student's understanding of an aspect of the chosen concept has been assessed. • Appropriate hands-on activities selected that allow students to demonstrate ability to work mathematically.					
Depth of analysis and/or critique in response to the task • Report discusses student's strengths and understanding demonstrated in assessed area • Lesson plan addresses where to next for the student • Indication of what a follow up lesson could cover					
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 • Use of lesson plan template					
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 (e.g., includes lesson plan)					
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.**

UNSW SCHOOL OF EDUCATION
FEEDBACK SHEET
EDST6780 MATHEMATICS 2

Student Name: Student No.:

Assessment Task 2: **Annotation and analysis of student work samples**

SPECIFIC CRITERIA	(-) ➤ (+)				
Understanding of the question or issue and the key concepts involved • Clearly and appropriately annotated work samples from each of the 3 strands					
Depth of analysis and/or critique in response to the task • Clear evidence of student thinking and ongoing learning needs demonstrated in teacher analysis of work samples • Consideration given to different aspects of student's response including language, symbols, strategies used and solution • Feedback is clear and appropriate to student's needs					
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 (3000 words equivalent)					
GENERAL COMMENTS/RECOMMENDATIONS FOR NEXT TIME					

Lecturer: **Date:**

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

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.**