
UNSW SYDNEY Arts & Social Sciences

# School of Education

# EDST6784: Science and Technology

# Term T2C 2020

## 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 and Social Sciences
School of Education
EDST6784 Science and Technology (6 units of credit)
Term 2C 2020

## 2. STAFF CONTACT DETAILS


| | |
|---|---|
| Course Convenor: | Alesha Bleakley |
| Email: | a.bleakley@unsw.edu.au |
| Course Convenor: | Cheryl Gajda |
| Email: | c.gajda@unsw.edu.au |
| Availability: | Post course enquiries on the course forum. Use email for confidential communications. |


## 3. COURSE DETAILS

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|---|---|
| **Course Name** | Science and Technology |
| **Credit Points** | 6 units of credit (uoc) |
| **Workload** | Includes 150 hours including class contact hours, readings, class preparation, assessment, follow up activities, etc. |
| **Schedule** | Online during Term 2 (T2C)<br>Starts 21 July 2020 |

SUMMARY OF THE COURSE

Through this course students will develop understanding of the Science and Technology K-6 syllabus. They will develop skills in curriculum planning, assessment and classroom management.

Students will engage in the selection, development and evaluation of stage appropriate activities and resources relevant to the teaching of Science and Technology K-6.

AIMS OF THE COURSE

The aim of the course is to develop an understanding of delivering science and technology across K-6. Students explore scientific and technological concepts and develop knowledge and understanding of the world; enabling them to inquire, plan, investigate and develop solutions to problems. Through the application of Working Scientifically, and Design and Production skills, students develop competence and confidence in planning relevant learning experiences which take into account the pedagogies of science and technology and the needs of diverse learners. Developing thinking skills and addressing the cross-curriculum priorities will be explored.

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

- The course has been redesigned for a completely online learning environment.

STUDENT LEARNING OUTCOMES

| Outcome | | Assessment/s |
|---|---|---|
| 1 | Demonstrate awareness and understanding of appropriate ways to harness children's natural curiosities and their sense of wonder, and develop interest and enthusiasm for science and technology. | 1, 2 |
| 2 | Demonstrate how the skills, knowledge and understanding of the syllabus relate across strands for all Stages. | 1, 2 |
| 3 | Demonstrate ability to critically examine and evaluate relevant research and pedagogies to enable primary-aged students to engage and learn the skills and concepts of science and technology effectively. | 1, 2 |
| 4 | Demonstrate understanding of scientific and technological concepts. | 1, 2 |
| 5 | Demonstrate an understanding of thinking skills and embedding the development of learning across the curriculum priorities into teaching and learning | 1, 2 |
| 6 | Demonstrate ability to apply design and production and working technologically skills. | 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 | 1, 2 |
| 1.2.1 | Demonstrate knowledge and understanding of research into how students learn and the implications for teaching | 1, 2 |
| 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 |
| 2.3.1 | Use curriculum, assessment and reporting knowledge to design learning sequences and lesson plans | 1 |
| 2.6.1 | Implement teaching strategies for using ICT to expand curriculum learning opportunities for students | 1, 2 |
| 3.2.1 | Plan lesson sequences using knowledge of student learning, content and effective teaching strategies | 1, 2 |
| 3.3.1 | Include a range of teaching strategies in teaching | 1, 2 |
| 3.5.1 | Demonstrate a range of verbal and non-verbal communication strategies to support student engagement | 2 |
| 3.6.1 | Demonstrate broad knowledge of strategies that can be used to evaluate teaching programs to improve student learning | 1 |

| | | |
|---|---|---|
| 4.2.1 | Demonstrate the capacity to organise classroom activities and provide clear directions | 2 |
| 4.5.1 | Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching | 1, 2 |
| 5.1.1 | Demonstrate understanding of assessment strategies, including informal and formal, diagnostic, formative and summative approaches, to assess student learning | 1,2 |
| 5.2.1 | Demonstrate an understanding of the purpose of providing timely and appropriate feedback to students about their learning | 2 |

NATIONAL PRIORITY AREA ELABORATIONS

| Priority area | | Assessment/s |
|---|---|---|
| A. Aboriginal and Torres Strait Islander Education | 1, 5, 8 | 1, 2 |
| B. Classroom Management | 1, 4, 5 | 1, 2 |
| C. Information and Communication Technologies | 1-7, 8, 9,10, 12 | 1, 2 |
| D. Literacy and Numeracy | 1-19 | 1, 2 |

## 4. RATIONALE FOR THE INCLUSION OF CONTENT AND TEACHING APPROACH

The course structure allows students to explore and understand the content and organisation of the NSW Science and Technology K- 6 syllabus. Students will develop and demonstrate the skills they need to plan programs, lessons and activities suitable for different stages of learning.

## 5. TEACHING STRATEGIES

The course will run online with collaborative discussions based on the required readings for each week.

## 6. COURSE CONTENT AND STRUCTURE

| Module | Topics/Readings |
|---|---|
| 1 | **Introduction to the structure and organisation of the *Science and Technology K-6* Syllabus**<br>Unpacking the integration of pedagogical approaches of Science and Technology. Overview of inquiry questions and focus questions.<br>**Required Reading:**<br>NESA (2017) *Guide New K-6 Science and Technology Syllabus.* Sydney: NESA https://www.educationstandards.nsw.edu.au/wps/wcm/connect/dac0b1f9-b943-486b-96fb-6ed6c44cadee/guide-science-and-technology-k-6-new-syllabus.pdf?MOD=AJPERES&CVID=<br><br>NESA (2017) *Science and Technology K-6 Syllabus.* Sydney: NESA. Accessed April 2, 2019 at https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-and-technology-k-6-new-syllabus<br><br>Brown, R. A., & Brown, J. W. (2010). What is Technology Education? A Review of the "Official Curriculum". *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 83*(2), 49-53. doi:10.1080/00098650903505449 |
| 2 | **Physical World**<br>Deep dive into the Physical World strand. Look at the continuum of learning. Unpack the use of inquiry and focus questions to frame learning.<br>**Required Reading:**<br>Preston, C. M. (2019). Effect of a diagram on primary students' understanding about electric circuits. *Research in Science Education, 49*(5), 1433-1456.<br><br>King, D., & English, L. D. (2016). Engineering design in the primary school: applying stem concepts to build an optical instrument. *International Journal of Science Education, 38*(18), 2762-2794. doi:10.1080/09500693.2016.1262567 |
| 3 | **Material World**<br>Deep dive into the Material World strand. Look at the continuum of learning. Unpack the use of inquiry and focus questions to frame learning.<br>**Required Reading:**<br>Skamp, K. (2011). Teaching chemistry in primary science: what does the research suggest? *Teaching Science., 57*(4), 37–43.<br><br>Hudson, P., English, L., Dawes, L., King, D., & Baker, S. (2015). Exploring Links between Pedagogical Knowledge Practices and Student Outcomes in STEM Education for Primary Schools. *Australian Journal of Teacher Education, 40*(6). http://dx.doi.org/10.14221/ajte.2015v40n6.8 |
| 4 | **Earth and Space**<br>Deep dive into the Earth and Space strand. Look at the continuum of learning. Unpack the use of inquiry questions to frame learning.<br>**Required Reading:**<br>Thornburgh, B., Tretter, T., & Duckwall, M. (2015). SEEING THE SOLAR SYSTEM THROUGH TWO PERSPECTIVES: Primary students explore Earth and space science by modeling and observing patterns. *Science and Children, 53*(4), 42-51.<br><br>Aktamis, Hilal, Esin Acar and Gul Coban, 'A Summer Camp Experience of Primary Student: Let's Learn Astronomy, Explore the Space Summer Camp' (2015). *Asia - Pacific Forum on* |

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|---|---|
| | *Science Learning and Teaching 16* (1) https://www.eduhk.hk/apfslt/v16_issue1/aktamis/index.htm |
| 5 | **Living World**<br>Deep dive into the Living World strand. Look at the continuum of learning. Unpack the use of inquiry questions to frame learning.<br>**Required Reading:**<br>Vikström, A. (2008). What is Intended, What is Realized, and What is Learned? Teaching and Learning Biology in the Primary School Classroom. *Journal of Science Teacher Education, 19*(3), 211-233. doi:10.1007/s10972-008-9090-y<br>Mat, J., Emma, W., Richard, K., Debra, S., & Judy, O. (2012). Realizing a Holistic Approach to Food through School Gardens and Growing Activities. *Children, Youth and Environments, 22*(1), 75-98. doi:10.7721/chilyoutenvi.22.1.0075 |
| 6 | **Digital Technologies**<br>Deep dive into the Digital Technologies strand. Look at the continuum of learning. Unpack the use of focus questions to frame learning.<br>**Required Reading:**<br>Buitrago Flórez, F., Casallas, R., Hernández, M., Reyes, A., Restrepo, S., & Danies, G. (2017). Changing a Generation's Way of Thinking: Teaching Computational Thinking Through Programming. *Review of Educational Research, 87*(4), 834-860. doi:10.3102/0034654317710096<br>Leonard, J., Mitchell, M., Barnes-Johnson, J., Unertl, A., Outka-Hill, J., Robinson, R., & Hester-Croff, C. (2017). Preparing Teachers to Engage Rural Students in Computational Thinking Through Robotics, Game Design, and Culturally Responsive Teaching. *Journal of Teacher Education, 69*(4), 386-407. doi:10.1177/0022487117732317 |
| 7 | **Working Scientifically, and Design and Production – The skills continuum**<br>Contextualising learning and conducting practical activities safely. Learning through doing.<br>**Required Reading:**<br>Murphy, C., Smith, G., & Broderick, N. (2019). A Starting Point: Provide Children Opportunities to Engage with Scientific Inquiry and Nature of Science. *Research in Science Education*. doi:10.1007/s11165-019-9825-0<br>English, L. D. (2018). Learning while designing in a fourth-grade integrated STEM problem. *International Journal of Technology and Design Education*. doi:10.1007/s10798-018-9482-z |
| 8 | **Engaging with real world problems, developing informed solutions and thinking skills**<br>The importance of engaging with real world problems when learning about science and technology and how to use context knowledge to develop informed design solutions.<br>**Required Reading:**<br>Fox-Turnbull, W. (2018). Assisting teachers' understanding of student learning in technology. *International Journal of Technology and Design Education*. doi:10.1007/s10798-018-9484-x<br>Wing, J. M. (2006). Computational thinking. *Commun. ACM, 49*(3), 33–35. doi:10.1145/1118178.1118215 |

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|---|---|
| 9 | **Planning for the continuum of learning and assessment**<br>The importance of the continuum of learning in science and technology and how to plan for effective assessment.<br>**Required Reading:**<br>Strimel, G. J., Kim, E., Grubbs, M. E., & Huffman, T. J. (2019). A meta-synthesis of primary and secondary student design cognition research. *International Journal of Technology and Design Education*. doi:10.1007/s10798-019-09505-9<br>Loughland, T., & Kilpatrick, L. (2015). Formative Assessment in Primary Science. *Education 3-13, 43*(2), 128-141. doi:10.1080/03004279.2013.767850 |
| 10 | **Continuing the development of science and technology knowledge and teaching practices**<br>Course evaluation |

## 7. RESOURCES

***Required Readings see schedule above and Leganto on Moodle***

## 8. ASSESSMENT

| Assessment Task | Length | Weight | Learning Outcomes Assessed | Australian Professional Standards Assessed | National Elaborations Assessed | Due Date |
|---|---|---|---|---|---|---|
| Assessment 1<br>Inquiry and Focus Questions | 2000 words | 40% | 1, 2, 3, 4, 5 | 1.1, 1.2, 2.3, 3.6 | A1,5,8; B1,4; C1-12; D1-19 | 24 August 5pm |
| Assessment 2<br>Design and Production | 3000 words (equiv) | 60% | 1, 2, 4, 6 | 1.5, 2.6, 4.5 | A1,5,8; B1,4; C1-12; D1-19 | 28 September 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: Inquiry and focus questions (40%)**

1. Develop 5 inquiry or focus questions (1 per strand of the syllabus)
2. Develop you own skills of Working Scientifically, and Design and Production by addressing one of your questions each week through a scientific investigation or designing a solution to a problem for the first 5 weeks of the course.
3. Choose concepts from the syllabus that you do not feel confident in.
4. Post images of you addressing your inquiry question or focus question along with a 200-word reflection of your learning during this investigation each week in the designated forum on Moodle.
5. Your reflection may examine your previous and current understanding of the scientific or technological concept, the nature of the investigation and its feasibility (including safety and ensuring it is stage appropriate) as a classroom activity for 25 students.
6. Submit a 2000-word critical synthesis that draws together the five reflections using the appropriate literature.

**Assessment 2: Design and Production (60%)**

1. Using the headings of design and production skills (p. 27 syllabus) you are to go through the process of designing, producing a solution to the problem you have identified and documenting the process of development.
2. You are to use your skills of working scientifically throughout the design and production process and document at least 3 experiments (different from assignment 1) that help you develop your understanding enabling you to develop an informed design solution.
3. Identify how you have integrated thinking skills and what learning across the curriculum priorities you have addressed.
4. You are to submit a comprehensive design and production portfolio and photographs, videos or a file (depending on what you design and produce) of your final product.
5. The design solution is to showcase your production skills.

**UNSW SCHOOL OF EDUCATION**
**FEEDBACK SHEET**
**EDST6784 Science and Technology**

Student Name: Student Number:
Assessment Task: 1 Inquiry and Focus Questions

| **SPECIFIC CRITERIA** | (-) ➤ (+) | | | | |
|---|---|---|---|---|---|
| **Understanding of the question or issue and the key concepts involved**<br>• Inquiry and focus questions are clear and provide a good basis for investigation | | | | | |
| **Depth of analysis and/or critique in response to the task**<br>• Uses evidence of learning and the literature covered in the course to conduct a critical analysis that presents both points and counterpoints. | | | | | |
| **Familiarity with and relevance of professional and/or research literature used to support response**<br>• Appropriate research references to support responses<br>• Sound range of research references | | | | | |
| **Structure and organisation of response**<br>• Appropriate nature of structural organisation<br>• Logical and coherent structure<br>• Clear presentation of ideas to enhance readability | | | | | |
| **Presentation of response according to appropriate academic and linguistic conventions**<br>• Clarity, consistency and appropriateness of conventions for quoting, paraphrasing, attributing sources and information and listing references (APA style)<br>• 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.**

**UNSW SCHOOL OF EDUCATION**
**FEEDBACK SHEET**
**EDST6784 Science and Technology**

Student Name: Student Number:
Assessment Task: 2 Design and Production

| **SPECIFIC CRITERIA** | (-) ➤ (+) | | | | |
|---|---|---|---|---|---|
| **Understanding of the question or issue and the key concepts involved**<br>• Design and Production folio is comprehensive | | | | | |
| **Depth of analysis and/or critique in response to the task**<br>• Use of literature and the syllabus to justify the choice of investigation activities<br>• Uses learning from investigation activities to inform design solutions<br>• Develops an informed design solution | | | | | |
| **Familiarity with and relevance of professional and/or research literature used to support response**<br>• Appropriate research references to support responses<br>• Sound range of research references | | | | | |
| **Structure and organisation of response**<br>• Appropriate nature of structural organisation<br>• Logical and coherent structure<br>• Clear presentation of ideas to enhance readability<br>• Accurate annotations of the graduate standards | | | | | |
| **Presentation of response according to appropriate academic and linguistic conventions**<br>• Clarity, consistency and appropriateness of conventions for quoting, paraphrasing, attributing sources and information and listing references (APA style)<br>• 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%**

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.**