EDED14355 *STEM Education and Engagement*
Term 1 - 2021

Profile information current as at 15/05/2024 10:22 am

General Information

Overview

It is well recognised that future generations require strong educational foundations in order to navigate our changing world. The renewed national focus on Science, Technology, Engineering and Mathematics (STEM) in primary school education will ensure that young Australians become equipped with the necessary STEM skills and knowledge that they need to succeed in a changing world. STEM education refers collectively to the teaching of the disciplines of science, technology, engineering and mathematics and also to a cross-disciplinary approach to teaching that increases student interest in STEM related fields and improves students' problem solving and critical analysis skills. In this unit, you will build on the knowledge acquired in previous science, technology and mathematics units. You will apply problem based learning theory and pedagogical principles that underpin inquiry approaches and collaboration to design, conduct and evaluate first hand investigations in the science, technology, engineering or mathematics areas applicable to primary school classrooms. You will consolidate your knowledge in STEM disciplines and develop your pedagogical skills to increase student engagement and participation in STEM drawing upon the relevant Australian curriculum.

Details

Career Level: *Undergraduate*
Unit Level: *Level 4*
Credit Points: *6*
Student Contribution Band: *7*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

Prerequisites: EDCU12038 Teaching for Mathematical Proficiency EDCU12039 Digital and Design Technologies EDCU12040 Biological and Earth and Space Sciences EDCU13020 Mathematics Curriculum EDCU13017 Chemical and Physical Sciences Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2021

- Bundaberg
- Cairns
- Mackay City

- Online
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses

Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 50%
2. **Practical and Written Assessment**
Weighting: 50%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Student evaluation

Feedback
Assessment tasks are relevant, useful and practical.

Recommendation
Retain practical nature of the assessment tasks.

Feedback from Student evaluation

Feedback
Moodle layout was difficult to navigate.

Recommendation
New Moodle layout designed for 2021.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Design and conduct first hand investigations in science, technology, engineering or mathematics drawing upon the relevant Australian curriculum
2. Apply the principles of scientific inquiry to design STEM learning experiences
3. Evaluate examples of STEM projects and identify real world situations
4. Implement teaching strategies that are learner centered and can support learners including those with diverse educational needs.

Successful completion of this unit provides opportunities for students to engage with the Australian Professional Standards for Teachers (Graduate Career Stage) focus area of:

1.2 Understand how students learn
1.5 Differentiate teaching to meet the specific needs of students across the full range of abilities
2.1 Content and teaching strategies of the teaching area
2.2 Content selection and organisation
2.6 Information and Communication Technology (ICTs)
3.1 Establish challenging learning goals
3.2 Plan, structure and sequence learning programs
3.3 Use teaching strategies
3.4 Select and use resources
4.4 Maintain student safety
4.5 Use ICT safely, responsibly and ethically
6.4 Apply professional learning and improve student learning

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level ◦ Introductory Level • Intermediate Level • Graduate Level ◦ Professional Level ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Written Assessment - 50%	•	•	•	•
2 - Practical and Written Assessment - 50%	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Communication			•	•

Graduate Attributes	Learning Outcomes			
	1	2	3	4
2 - Problem Solving	•	•	•	
3 - Critical Thinking	•	•	•	
4 - Information Literacy		•	•	
5 - Team Work				
6 - Information Technology Competence	•	•	•	
7 - Cross Cultural Competence		•		•
8 - Ethical practice	•			•
9 - Social Innovation				
10 - Aboriginal and Torres Strait Islander Cultures				

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 50%		•	•	•				•		
2 - Practical and Written Assessment - 50%	•	•	•		•	•	•	•		

Textbooks and Resources

Textbooks

There are no required textbooks.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: American Psychological Association 7th Edition (APA 7th edition)
For further information, see the Assessment Tasks.

Teaching Contacts

Mark Gronow Unit Coordinator
m.gronow@cqu.edu.au

Schedule

Week 1 - 08 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
What is STEM?	eReading List - Week 1 What is STEM Panizzon, D., et al. (2015). "Impending STEM shortages in Australia: Beware the 'smoke and mirrors'." Procedia-Social and Behavioral Sciences 167: 70-74. Kurup, P. M., et al. (2019). "Building future primary teachers' capacity in STEM: based on a platform of beliefs, understandings and intentions." International Journal of STEM Education 6(1): 1-14.	

Week 2 - 15 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Science in STEM	eReading List - Week 2 - Science in STEM Mohammed, R., et al. (2019). "Using immersive and modelling environments to build scientific capacity in primary preservice teacher education." Journal of Computers in Education 6(4): 451-481.	

Week 3 - 22 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic

Technology in STEM	eReading list - Week 3 - Technology in STEM Kennedy, J., et al. (2018). "Australian enrolment trends in technology and engineering: putting the T and E back into school STEM." International Journal of Technology and Design Education 28(2): 553-571. Younie, S., et al. (2014). Teaching and Learning with ICT in the Primary School, Routledge.	

Week 4 | - 29 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Engineering in STEM	eReading list - Week 4 - Engineering in STEM King, D. and L. D. English (2016). "Engineering design in the primary school: Applying STEM concepts to build an optical instrument." International Journal of Science Education 38(18): 2762-2794. Redman, C. (2017). "Would increasing engineering literacies enable untapped opportunities for STEM education?" Theory Into Practice 56(4): 318-326.	

Week 5 - 05 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic
Mathematics in STEM	eReading list - Week 5 - Mathematics in STEM Loong, E. Y.-K. and S. Herbert (2018). "Primary school teachers' use of digital technology in mathematics: The complexities." Mathematics Education Research Journal 30(4): 475-498.	

Vacation Week - 12 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 19 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic

Inquiry Based Learning	eReading list - Week 6 - Inquiry Based Learning Hall, A. and D. Miro (2016). "A study of student engagement in project-based learning across multiple approaches to STEM education programs." School Science and Mathematics 116(6): 310-319. Newhouse, C. P. (2017). "STEM the boredom: Engage students in the Australian curriculum using ICT with problem-based learning and assessment." Journal of Science Education and Technology 26(1): 44-57.	**Written Investigation** Due: Week 6 Friday (23 Apr 2021) 11:45 pm AEST

Week 7 - 26 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic
Conducting a STEM research project	eReading list - Week 7 - Conducting a STEM research project Newman, J. L., et al. (2015). "Science in action: How middle school students are changing their world through STEM service-learning projects." Theory Into Practice 54(1): 47-54. English, L. D. (2019). "Learning while designing in a fourth-grade integrated STEM problem." International Journal of Technology and Design Education 29(5): 1011-1032.	

Week 8 - 03 May 2021

Module/Topic	Chapter	Events and Submissions/Topic

STEM integration projects	eReading list - Week 8 - STEM integration projects English, L. D. (2016). "STEM education K-12: Perspectives on integration." International Journal of STEM Education 3(1): 1-8. Margot, K. C. and T. Kettler (2019). "Teachers' perception of STEM integration and education: a systematic literature review." International Journal of STEM Education 6(1): 1-1 Ryu, M., et al. (2019). "Preservice teachers' experiences of STEM integration: Challenges and implications for integrated STEM teacher preparation." International Journal of Technology and Design Education	

Week 9 | - 10 May 2021

Module/Topic	Chapter	Events and Submissions/Topic
STEM and coding	eReading list - Week 9 - STEM and coding Burrett, K. (2015). "Robotics and coding inspiring future learning." Scan: The Journal for Educators 34(4): 33-38. Ray, B. B., et al. (2020). "Perceptions of non-STEM discipline teachers on coding as a teaching and learning tool: what are the possibilities?" Journal of Digital Learning in Teacher Education 36(1): 19-31. Price, C. B. and R. M. Price-Mohr (2018). "Stories children write while coding: a cross-disciplinary approach for the primary classroom." Cambridge Journal of Education 48(6): 735-747.	

Week 10 - 17 May 2021

Module/Topic	Chapter	Events and Submissions/Topic

STEM resources	eReading list - Week 10 - STEM resources Robicelli, A. (2013). *These kids' cooking lessons make delicisous sense of math, science and history*. The Washington Post.	

Week 11 - 24 May 2021

Module/Topic	Chapter	Events and Submissions/Topic
STEM, STEAM and other variations	eReading list - Week 10 - STEM, STEAM and other variations Froschauer, L. (2016). "STEAM: Beyond the acronym." Science and Children 53(6): 5.	

Week 12 - 31 May 2021

Module/Topic	Chapter	Events and Submissions/Topic
Reflections on STEM	eReading list - Week 10 - Reflections on STEM Watt, H. M., et al. (2017). "Mathematics—A critical filter for STEM-related career choices? A longitudinal examination among Australian and US adolescents." Sex Roles 77(3): 254-271.	**Designing a STEM event** Due: Week 12 Monday (31 May 2021) 11:45 pm AEST

Review/Exam Week - 07 Jun 2021

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 14 Jun 2021

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Written Investigation

Assessment Type
Written Assessment

Task Description
This assessment task requires you to plan a first-hand investigation in the science, technology, engineering and/or mathematics (STEM) area and conduct your own experiment. You will need to choose and investigate a problem or question, follow a scientific inquiry or a technology design process to solve the problem or answer the question.

You will need to complete this as a written assignment in sections, the suggested headings for each section are given:

Background: research / literature / investigate solutions, include Australian Curriculum links;
Design: methodology for science, design drawings and proposal for technology;
Results: analysis of data for science, actual product and testing for technology;
Analysis: results of data collected for science, modifications and re-design for technology; and,
Conclusion: evaluate impacts and link to real-world situations.

Your submission

Submit your response to this task in the form of a written of approximately 1500 words using the following structure:

- Title page including: your name, student number, unit number and name, word count;
- Contents page: numbered section headings with links to each section;
- List of references; and,
- Appendices (if required).

Submit your response online, on this moodle page, as one document. Do not attach multiple files. Name your file as: "Your surname, First name initial, underscore, student number, underscore, EDED14355AT1"
e.g. SmithJ_12345678_EDED14355AT1

Assessment Due Date

Week 6 Friday (23 Apr 2021) 11:45 pm AEST

Return Date to Students

Week 9 Friday (14 May 2021)
Feedback on this assessment response will be provided in sufficient time to allow for academic support and advice as necessary to inform students' responses to the next task.

Weighting

50%

Assessment Criteria

In this assessment you will be assessed on how well you:
1. Demonstrate a deep knowledge and understanding of chosen problem through evidence based research;
2. Produce a clear, logical and coherent methodology design;
3. Choose, explain and employ data collection techniques;
4. Present an extensive data analysis;
5. Use extensive, relevant and credible sources for explaining concepts;
6. Provide a comprehensive conclusion linked to real-world situations; and,
7. Cohesive writing consistent with academic conventions and use of APA7 referencing style.

Australian Professional Standards for Teachers demonstrated:
1.2 Understand how students learn;
2.6 Information and Communication Technology (ICTs);
3.1 Establish challenging learning goals; and,
6.2 Engage in professional learning and improve practice.

Referencing Style

- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Learning Outcomes Assessed

- Design and conduct first hand investigations in science, technology, engineering or mathematics drawing upon the relevant Australian curriculum
- Apply the principles of scientific inquiry to design STEM learning experiences
- Evaluate examples of STEM projects and identify real world situations
- Implement teaching strategies that are learner centered and can support learners including those with diverse educational needs.

Graduate Attributes

- Problem Solving
- Critical Thinking
- Information Literacy
- Ethical practice

2 Designing a STEM event

Assessment Type
Practical and Written Assessment

Task Description
This assessment task requires you to develop a STEM event for learner engagement, utilising learner-centeredness and hands-on approaches.
You are required to select and justify content and pedagogies that have explicit links to the Australian Curriculum.
As part of the process of designing your planned STEM event, you are required to select a theme for this STEM event based on a real-world application.
Your planned STEM event will be designed for learners from diverse backgrounds for a one-hour session. The one-hour time slot can be broken down into shorter 10 - 15 minute "stations" if you choose. This assessment task requires you to develop a package for a STEM event of one hour only, you will NOT be required to implement the event.
You will be required to evaluate your project in terms of:
1. Applying the principles of scientific inquiry and/or technology design processes to develop STEM learning experiences that support and enhance student-centred, authentic and problem-based learning for learners of diverse backgrounds
2. How learner engagement is transformed by the use of hands-on approaches utilising learner-centeredness and is applied across a diverse backgrounds.
3. How it addresses the content and pedagogies you have chosen from the links to the Australian Curriculum.
4. How collaboration with STEM experts in their fields can help develop your STEM event.

The planned STEM event details need to be presented as a portfolio in an online format such as a Weebly, Wix, Wiki or Webpage with links to the event activity details, teacher resources explaining the STEM content, with links to the Australian Curriculum. You will also need to include, where necessary: expert contacts, real-world applications, a budget, sample student consent forms, detailed schedule and resources needed.

Your submission

Submit your response to this task in the form of an online portfolio of approximately 2500

words using the following structure:
• Title page including: your name, student number, unit number and name, word count;
• Contents page: numbered sections with links to the STEM learning experiences, explanation of you design process, problem-based leaning, Australian Curriculum, learner engagement and diversity of learners;
• List of references; and,
• Appendices (if required).

Submit your response online, on this moodle page, as one document. Do not attach multiple files. Name your file as: "Your surname, First name initial, underscore, student number, underscore, EDED14355AT2"
e.g. SmithJ_12345678_EDED14355AT2

Assessment Due Date
Week 12 Monday (31 May 2021) 11:45 pm AEST
Return Date to Students

Feedback on the final assessment task will be provided following moderation and prior to the date of certification of grades for the term.
Weighting
50%
Assessment Criteria
In this assessment you will be assess on how well you:
1. Justify the selection of content and pedagogies using explicit links to the Australian Curriculum;
2. Design first hand STEM learning experiences drawing upon the relevant Australian Curriculum;
3. Apply the principles of scientific inquiry and/or technology design processes to develop STEM learning experiences;
4. Demonstrate that your STEM learning experiences cater for children from diverse backgrounds;
5. Evaluate the STEM event in terms it's real-world application and how it addresses the Australian Curriculum;
6. Articulate the real-world application for your planned learning experience;
7. Plan for the implementation that uses teaching strategies that are learner centered and can support learners including those with diverse educational needs; and,
8. Appropriate use of ICTs is evidenced in your online format consistent with academic conventions.

Australian Professional Standards for Teachers demonstrated:
1.2 Understand how students learn;
1.5 Differentiate teaching to meet the specific needs of students across the full range of abilities;
2.6 Information and Communication Technology (ICTs);
3.1 Establish challenging learning goal;

3.6 Evaluate and improve teaching programs;
4.1 Support student participation; and,
6.2 Engage in professional learning and improve practice.

Referencing Style

- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Learning Outcomes Assessed

- Design and conduct first hand investigations in science, technology, engineering or mathematics drawing upon the relevant Australian curriculum
- Apply the principles of scientific inquiry to design STEM learning experiences
- Evaluate examples of STEM projects and identify real world situations
- Implement teaching strategies that are learner centered and can support learners including those with diverse educational needs.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Team Work
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity,

and potential penalties.

What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?

For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?