EDED14355 *STEM Education and Engagement*
Term 1 - 2019

Profile information current as at 16/05/2024 06:52 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 - 2019

- Bundaberg
- Mackay
- Noosa
- 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 Unit evaluations

Feedback
Assessment task 1 and alignment to the assessment rubric

Recommendation
Review and provide clearer instructions for assessment task 1 to align with the rubric

Feedback from Self-reflection

Feedback
Review of resources

Recommendation
Due to the nature of STEM, resources will be reviewed to maintain their authenticity.

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

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			•	•
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 6th Edition (APA 6th edition)
For further information, see the Assessment Tasks.

Teaching Contacts

Desley Pidgeon Unit Coordinator
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Schedule

Week 1 - 11 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
STEM Literature	Corlu, M. S., Capraro, R. M., & Capraro, M. M. (2014). Introducing STEM education: Implications for educating our teachers in the age of innovation. *Education and Science*, *39*(171), 74-85. Thomas, B., & Watters, J. J. (2015). Perspectives on Australian, Indian and Malaysian approaches to STEM education. *International Journal of Educational Development*, *45*, 42-53.	

Week 2 - 18 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Inquiry approaches including PBL	Thomas, B., & Watters, J. J. (2015). Perspectives on Australian, Indian and Malaysian approaches to STEM education. *International Journal of Educational Development*, *45*, 42-53. Alberta Department of Education. (2004) *Focus on Inquiry: A Teacher's Guide to Implementing Inquiry-based*. Alberta, Canada: Alberta Learning.	

Week 3 - 25 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic

Research design and first-hand investigations	Bubnick, L., Enneking, K., & Egbers, J. (2016). Designing Healthy Ice Pops. *Science and Children*, *54*(1), 70 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 (Online)*, *40*(6), 134..	

Week 4 - 01 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Science, technology and mathematics reviewed	Coad, L. (2016). The M in STEM what is it really?. *Australian Mathematics Teacher, The*, *72*(2), 3. McColgan, M., Colesante, R., & Andrade, A. (2018). Pre-Service Teachers Learn to Teach with Serious Games. *Journal of STEM Education*, *19*(2).	

Week 5 - 08 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Engineering principles	Christine Redman (2017) Would increasing engineering literacies enable untapped opportunities for STEM education?, Theory Into Practice, 56:4, 318-326, Chen, Y., & Faulkner, G. (2014). Robotics education in primary schools: A Tasmanian case. In *25th Annual Conference of the Australasian Association for Engineering Education: Engineering the Knowledge Economy: Collaboration, Engagement & Employability* (p. 21). School of Engineering & Advanced Technology, Massey University.	

Vacation Week - 15 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 22 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
STEM Lesson Design	Hunter, J. (2017). Principal outlooks in STEM in some Australian primary schools: Views, concerns and possible solutions. *Access*, *31*(2), 30.	Assignment 1 due Thursday Written Assessment Due: Week 6 Thursday (25 Apr 2019) 11:45 pm AEST **Wrtitten Assessment** Due: Week 6 Thursday (25 Apr 2019) 11:45 pm AEST

Week 7 - 29 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Project design for engagement activities	Kwek, S. H. (2011). Innovation in the classroom: Design thinking for 21st century learning. *Retrieved September*, *20*, 2015. Richards, J. (2006). Setting the stage for student engagement. *Kappa Delta Pi Record*, *42*(2), 92-94.	

Week 8 - 06 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
STEM experts and collaboration	Bissaker, K. (2014). Transforming STEM education in an innovative Australian school: The role of teachers' and academics' professional partnerships. *Theory into Practice*, *53*(1), 55-63. Pecen, R. R., Humston, J. L., & Yildiz, F. (2012). Promoting STEM to Young Students by Renewable Energy Applications. *Journal of STEM Education: Innovations & Research*, *13*(3).	

Week 9 - 13 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Evaluation of STEM projects	Blackley, S., Sheffield, R., Maynard, N., Koul, R., & Walker, R. (2017). Makerspace and reflective practice: Advancing pre-service teachers in STEM education. *Australian Journal of Teacher Education (Online)*, *42*(3), 22.Hirshon, B., Summers, L., Moeller, B., & Martin, W. (2016). SPECIAL REPORT-The KC EMPOWER Project&58; Designing More Accessible STEM Learning Activities. *K-12 STEM Education*, *2*(1), 1-49.	

Week 10 - 20 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Differentiation and learner-centred approaches	Caldwell, L., Garcia, R., & Cagle, N. (2018). K-12 Diversity Pathway Programs in the E-STEM Fields: A Review of Existing Programs and Summary of Unmet Needs. *Journal of STEM Education: Innovations and Research*, *19*(4). Ellis, J. (2016). From STEM to STEAM. *Science Education News*, *65*(3), 14. English, L. D. (2017). Advancing elementary and middle school STEM education. *International Journal of Science and Mathematics Education*, *15*(1), 5-24.	

Week 11 - 27 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
STEM variations	Bargerhuff, M. E. (2013). Meeting the needs of students with disabilities in a stem school. *American Secondary Education*, *41*(3), 3 .Doyle, K. (2019). The languages and literacies of the STEAM content areas. *Literacy Learning: The Middle Years*, *27*(1), 38.	

Week 12 - 03 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic

		Assessment 2 due Thursday Practical and Written Assessment Due: Week 12 Thursday (6 June 2019) 11:45 pm AEST **Practical and Written assessment** Due: Week 12 Thursday (6 June 2019) 11:45 pm AEST
Unit Review	Holmlund, T. D., Lesseig, K., & Slavit, D. (2018). Making sense of "STEM education" in K-12 contexts. *International Journal of STEM education*, *5*(1), 32.	
Review/Exam Week - 10 Jun 2019		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Exam Week - 17 Jun 2019		
Module/Topic	**Chapter**	**Events and Submissions/Topic**

Assessment Tasks

1 Wrtitten Assessment

Assessment Type
Written Assessment

Task Description
This assessment task requires you to plan and conduct a first-hand investigation in the science, technology, engineering and/or mathematics area. The investigation involves carrying out your own experiment to collect your own data. The investigation must follow an action research design and include background (literature review), methodology, data collection, data analysis and conclusion linking to real-world situations. Further information about the assessment including ideas for investigations is provided on the Moodle site.

Assessment Due Date
Week 6 Thursday (25 Apr 2019) 11:45 pm AEST

Return Date to Students
Week 8 Friday (10 May 2019)
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
Deep knowledge and understanding of chosen problem through the use of background research.
Clear, logical and coherent methodology design.
Appropriate data collection techniques explained and employed.
Extensive data analysis presented.
Comprehensive conclusion linking to real-world situations.
Cohesive writing consistent with academic conventions. Extensive use of relevant and credible sources for
explanation of concepts.
Australian Professional Standards for Teachers (Graduate Career Stage) demonstrated:
1.2 Understand how students learn
2.6 Information and Communication Technology (ICTs)
3.1 Establish challenging learning goals
6.2 Engage in professional learning and improve practice

Referencing Style

- American Psychological Association 6th Edition (APA 6th 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 Practical and Written assessment

Assessment Type
Practical and Written Assessment

Task Description
This assessment task requires the selection of content and pedagogies using explicit links to the Australian Curriculum (Science or Mathematics). You are required to develop a STEM event for learner engagement, utilising learner-centeredness and hands-on approaches. You must justify your selection of content and pedagogies using explicit links to the Australian Curriculum (Science or Mathematics).
As part of the process of designing your planned STEM event, you are required to select another real world STEM project and evaluate this project in terms of how it addresses both the content and pedagogies of the Australian Curriculum (Science or Mathematics).
Your planned STEM event will be designed for learners from diverse backgrounds for a one hour session. The learning experience that you design as part of your event must reflect real world application. The one hour time slot can be broken down into shorter 10 - 15 minute "stations" if you choose. Your STEM event, for example, could be a session conducted in your school hall during science week where the learners might investigate buoyancy by designing, building and testing a boat using aluminium foil.
Apply the principles of inquiry learning to design STEM learning experiences that support and enhance student-centred, authentic and problem-based learning. 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 (explicitly linked to the Australian Curriculum: Science or Mathematics), expert contacts, real-world applications, a budget, sample student consent forms, detailed schedule and resources needed.
Examples of past STEM events and ideas are available on the Moodle site. This task can be individual or in pairs or groups of up to three.

Assessment Due Date
Week 12 Thursday (6 June 2019) 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

Justify the selection of content and pedagogies using explicit links to the Australian Curriculum (Science of Mathematics)
Design first hand STEM experiences drawing upon the relevant Australian curriculum (Science of Mathematics)
Apply the principles of scientific inquiry to design STEM learning experiences for children from diverse backgrounds showing your design for differentiatio
Evaluate an example of a real world STEM project in terms of how it addresses the Australian Curriculum (Science or Mathematics)

Articulate the real world application for your planned learning experience
Plan for the implementation that uses teaching strategies that are learner centered and can support learners including those with diverse educational needs.
Appropriate use of ICTs is evidenced in your online format consistent with academic conventions.
Australian Professional Standards for Teachers (Graduate Career Stage) demonstrated:
1.2 Understand how students learn
1.5 Differentiate teaching to meet the specific needs of students across the full range of abilities
1.6 Strategies to support full participation of students with disability
2.6 Information and Communication Technology (ICTs)
3.1 Establish challenging learning goals
3.6 Evaluate and improve teaching programs
4.1 Support student participation
6.2 Engage in professional learning and improve practice
6.3 Engage with colleagues and improve practice

Referencing Style

- American Psychological Association 6th Edition (APA 6th edition)

Submission
Online Group

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?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem