EDED14355 *STEM Education and Engagement*
Term 1 - 2022

Profile information current as at 15/05/2024 12:35 am

All details in this unit profile for EDED14355 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

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 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 - 2022

- Bundaberg
- Mackay
- Mixed Mode
- 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: 45%
2. **Reflective Practice Assignment**
Weighting: 45%
3. **Peer assessment**
Weighting: 10%

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 feedback

Feedback
Assessment tasks

Recommendation
Assessment tasks to be more relevant to the course and the teaching of STEM.

Feedback from Student feedback

Feedback
Student support

Recommendation
Clearer guidelines for students during tutorials and assessment tasks.

Feedback from Student feedback

Feedback
Feedback

Recommendation
Assessment task marking guide to support markers' feedback on assessment tasks. .

Unit Learning Outcomes

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

1. Applies professional learning to develop knowledge and understanding of how students' learn the interconnectedness of Science, Technology, Engineering and Mathematics (STEM) disciplines
2. Selects appropriate STEM content and develops collaborative teaching strategies that apply and use Information and Communication Technology (ICTs) safely, responsibly and ethically through mathematical problem solving; scientific inquiry, engineering and/or technological design principles
3. Plan, structure and sequence challenging learning programs that utilise evidence-based research to develop innovative pedagogical practices in STEM
4. Differentiate the teaching of STEM content and its variations through teaching strategies that meet the needs of an inclusive and diverse range of students.

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 - 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							

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)
- MS Teams

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
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Schedule

Week 1 - 07 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
STEM and Project Based Learning	Familiarise yourself with the Australian Curriculum website and its STEM focus. Panizzon, D., et al. (2015). "Impending STEM shortages in Australia: Beware the 'smoke and mirrors'." Procedia-Social and Behavioral Sciences 167: 70-74.	Welcome and introduction to learning community group. Review Assessment tasks for the unit.

Week 2 - 14 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Science in STEM	From the eReading list Kelley, & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. International Journal of STEM Education, 3(1), 1–11. https://doi.org/10.1186/s40594-016-0046-z 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. Robyn M. Gillies. (2020). Dialogic Teaching during Cooperative Inquiry-Based Science: A Case Study of a Year 6 Classroom. Education Sciences, 10(11), p328.	Discussion in your Learning Community Group Begin planning AT1

Week 3 - 21 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
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.	Discussion in your Learning Community Group

Week 4 - 28 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
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.	Discussion in your Learning Community Group

Week 5 - 04 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic

Mathematics in STEM	Stacey, K. (2006). What is mathematical thinking and why is it important. In: Citeseer.	Discussion in your Learning Community Group

Vacation Week - 11 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 18 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic
Week 6 Dialogic Teaching and Reflective Practices	Kim, & Wilkinson, I. A. . (2019). What is dialogic teaching? Constructing, deconstructing, and reconstructing a pedagogy of classroom talk. Learning, Culture and Social Interaction, 21, 70–86. https://doi.org/10.1016/j.lcsi.2019.02.003 Pedro. (2005). Reflection in teacher education: exploring pre-service teachers' meanings of reflective practice. Reflective Practice, 6(1), 49–66. https://doi.org/10.1080/1462394042000326860	Submission of Assessment Task 1 AT1 due 11:45pm AEST Friday 22 April 2022 **Written Assessment** Due: Week 6 Friday (22 Apr 2022) 11:45 pm AEST

Week 7 - 25 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic
Constructivist Learning and Girls in STEM	From the eReading list Texley, & Ruud, R. M. (2017). Teaching STEM Literacy: A Constructivist Approach for Ages 3 to 8. Redleaf Press. Richards, J, (2006) Setting the Stage for Student Engagement, Kappa Delta Pi record. *42*,2 Little, & León de la Barra, B. A. (2009). Attracting girls to science, engineering and technology: an Australian perspective. European Journal of Engineering Education, 34(5), 439–445. https://doi.org/10.1080/03043790903137585	Discussion in your Learning Community Group

Week 8 - 02 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
STEM Pedagogies	Rosicka, C (2016). From concept to classroom: Translating STEM education research into practice. ACER	Discussion in your Learning Community Group

Week 9 - 09 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
STEM and Coding	From the eReading list Lloyd, & Chandra, V. (2020). Teaching coding and computational thinking in primary classrooms: perceptions of Australian preservice teachers. Curriculum Perspectives. https://doi.org/10.1007/s41297-020-00117-1	Discussion in your Learning Community Group

Week 10 - 16 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
STEM Resources	Hill, Lynch, K., Gonzalez, K. E., & Pollard, C. (2020). Professional development that improves STEM outcomes. Phi Delta Kappan, 101(5), 50–56. https://doi.org/10.1177/0031721720903829	Discussion in your Learning Community Group

Week 11 - 23 May 2022

Module/Topic	Chapter	Events and Submissions/Topic

STEM, STEAM and other Variations	Froschauer. (2016). STEAM: Beyond the Acronym.(Editor's Note). Science and Children, 53(6), 5.	Discussion in your Learning Community Group
Week 12 - 30 May 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Reflections on STEM	No reading assigned for this week.	Discussion in your Learning Community Group **Reflective Practice Assessment** Due: Week 12 Friday (3 June 2022) 11:45 pm AEST **Learning Community Group Peer Evaluation** Due: Week 12 Friday (3 June 2022) 11:45 pm AEST
Review/Exam Week - 06 Jun 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**
Exam Week - 13 Jun 2022		
Module/Topic	**Chapter**	**Events and Submissions/Topic**

Assessment Tasks

1 Written Assessment

Assessment Type
Written Assessment

Task Description
You are to write, in academic style, a research article, on STEM teaching and learning in the primary school. The written task comprises of the following sections:
1. Introduction - What is STEM and why it is important?
2. Self-reflection on personal disposition STEM disciplines;
3. Literature review of the STEM disciplines in teaching of STEM;
4. Integrating the STEM disciplines in a problem-based learning project;
5. Develop a STEM problem based learning project;
6. Conclusion - Reflection of personal professional learning from this research experience

Through evidence of wider reading referenced in the article, you are expected to produce a coherent and structured narrative in a manuscript that demonstrates:

- an understanding of the STEM disciplines;
- the interrelationship of the STEM disciplines;
- knowledge of problem-based learning in STEM;
- developing 21st century skills through STEM education; and,
- ability to create an integrated STEM problem based learning project.

Assessment Due Date
Week 6 Friday (22 Apr 2022) 11:45 pm AEST
Submit task as a single word document

Return Date to Students
Week 9 Friday (13 May 2022)
The task will be returned with tracked changes and the criteria sheet.

Weighting
45%

Assessment Criteria
In this assessment you will be assessed on how you:

- Demonstrate knowledge and understanding of Science, Technology, Engineering and Mathematics (STEM) disciplines.
- Use self-reflection as a professional learning tool.
- Give evidence of wider reading of pedagogical practices in STEM.
- Create an integrative STEM problem based learning project.
- Develop a STEM collaborative teaching strategies.
- Write a clear and coherent narrative with attention to spelling, punctuation and grammar, in an academic style using APA7 format and referencing procedures.

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
No submission method provided.

Submission Instructions
Submit as one word document file

Learning Outcomes Assessed

- Applies professional learning to develop knowledge and understanding of how students' learn the interconnectedness of Science, Technology, Engineering and Mathematics (STEM) disciplines
- Selects appropriate STEM content and develops collaborative teaching strategies that apply and use Information and Communication Technology (ICTs) safely, responsibly and ethically through mathematical problem solving; scientific inquiry, engineering and/or technological design principles
- Plan, structure and sequence challenging learning programs that utilise evidence-based research to develop innovative pedagogical practices in STEM
- Differentiate the teaching of STEM content and its variations through teaching strategies that meet the needs of an inclusive and diverse range of students.

2 Reflective Practice Assessment

Assessment Type
Reflective Practice Assignment

Task Description

You will work in Learning Community Groups with 4 or 5 peers, you will be assigned to your Learning Community Group at the start of the term. The group unanimously chooses one STEM topic that all will report on from the topics below. You will present a 5-minute professional learning report to your group. Your report needs to address STEM education components of: interconnectedness of STEM disciplines, collaborative teaching strategies, innovative pedagogical practices, differing needs of a diverse and inclusive range of students.

Topics
A Problem based learning STEM project.
An integrative STEM project.
A girls and STEM project.
A constructivist learning STEM project.

The presentation given is a professional learning experience and should demonstrate your knowledge and understanding of the topic through the assessment criteria.

All Learning Community Group members critique each other's report and give feedback to the presenting student. A feedback proforma is completed by each Learning Community Group member and given to each presenter after the

presentation. As the presenter, you will also review the recording of your presentation and complete a self-reflection, using the same feedback proforma. The presentation is recorded and a link to the recording is included in the written component (the link will be in the appendices),the appendices will also contain each Learning Community Group member's completed proforma. The presentation recording and each proforma completed with feedback are not marked.

The written component of this assessment will consist of a written reflective practice asssessment to be submitted as two parts:

Part A:
Using academic style of writing, you will write a written report of the topic in your presentation, critiquing the research evidence that framed your understanding, discussion in the Learning Community Group chats and your final report.

Part B:
Using the completed feedback proformas, you will write a self-reflection critique of your presentation based on the feedback provided from your Learning Community Group members and your personal self-reflection. This is a critique, not a repeat of the feedback.

Assessment Due Date
Week 12 Friday (3 June 2022) 11:45 pm AEST
Submission as one word document with written component, include appendices of a link to the recording of the report given to the Learning Community Group and peer-feedback proformas.

Return Date to Students

The task will be returned with tracked changes and the criteria sheet.

Weighting
45%

Assessment Criteria
In this assessment you will be assessed on how you:

- Demonstrate knowledge and understanding of the interconnectedness of Science, Technology, Engineering and Mathematics (STEM) disciplines.
- Select STEM content and develop collaborative teaching strategies.
- Exhibit wider reading of evidence-based research to develop innovative pedagogical practices in STEM.
- Differentiate the teaching of STEM content to meet the needs of an inclusive and diverse range of students.
- Use reflective practices as a professional learning tool to critique, reflect and evaluate understanding of STEM knowledge and pedagogy.

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.
3.1 Establish challenging learning goals.
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 7th Edition (APA 7th edition)

Submission
No submission method provided.

Submission Instructions
Submit as one word document file.

Learning Outcomes Assessed

- Applies professional learning to develop knowledge and understanding of how students' learn the interconnectedness of Science, Technology, Engineering and Mathematics (STEM) disciplines
- Selects appropriate STEM content and develops collaborative teaching strategies that apply and use Information

and Communication Technology (ICTs) safely, responsibly and ethically through mathematical problem solving; scientific inquiry, engineering and/or technological design principles
- Plan, structure and sequence challenging learning programs that utilise evidence-based research to develop innovative pedagogical practices in STEM
- Differentiate the teaching of STEM content and its variations through teaching strategies that meet the needs of an inclusive and diverse range of students.

3 Learning Community Group Peer Evaluation

Assessment Type
Peer assessment

Task Description
At the beginning of the term, you will be allocated to a MS TEAMS Learning Community Group for collegial support, content and assessment discussions. These Learning Community Group are randomly formed across the course participants, **students do not form their own groups**.
At the end of week 5, you give evaluate each Learning Community Group member on their involvement in Learning Community Group discussions. **This is not assessed**, but highlights the importance of involvement in a the Learning Community Groups. Learning Community Groups exist as part of the Assessment Task 2 process.
Assessment Task 3 is assessed, in your Learning Community Group Peer Evaluation, you will evaluate each Learning Community Group member's involvement in Learning Community Group discussions. You will give each of your Learning Community Group colleagues a mark between 0 - 5, based on ten criteria questions given in the Feedback Fruits assessment activity. These criteria questions involve quality of involvement and commitment to the Learning Community Group.

Assessment Due Date
Week 12 Friday (3 June 2022) 11:45 pm AEST
Submission completed on Feedback Fruits activity

Return Date to Students

Weighting
10%

Assessment Criteria
Students respond to ten criteria questions:

1. Was regular in attending Learning Community Group meetings.
2. Completed assigned tasks from Moodle or the Learning Community Group.
3. Contributed positively to Learning Community Group discussions.
4. Completed shared work on time or made alternative arrangements.
5. Helped others with their work when needed.
6. Did work accurately and completely,
7. Contributed their fair share of the work.
8. Worked well with other Learning Community Group members.
9. Overall was a valuable member of the Learning Community Group.
10. Gave productive feedback in Assessment Task 2.

Australian Professional Standards for Teachers demonstrated:
6.2 Engage in professional learning and improve practice
6.3 Engage with colleagues and improve practice

Referencing Style

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

Submission
No submission method provided.

Learning Outcomes Assessed

- Applies professional learning to develop knowledge and understanding of how students' learn the interconnectedness of Science, Technology, Engineering and Mathematics (STEM) disciplines
- Selects appropriate STEM content and develops collaborative teaching strategies that apply and use Information and Communication Technology (ICTs) safely, responsibly and ethically through mathematical problem solving; scientific inquiry, engineering and/or technological design principles

- Plan, structure and sequence challenging learning programs that utilise evidence-based research to develop innovative pedagogical practices in STEM
- Differentiate the teaching of STEM content and its variations through teaching strategies that meet the needs of an inclusive and diverse range of students.

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