UNIT OUTLINE FOR EDM132.9 Revitalising Science and Mathematics Teaching in Schools

Name of Unit 1 (Unit Code 1)
Revitalising Science and Mathematics Teaching in Schools (EDM132.9)

SECTION 1 – GENERAL INFORMATION

Administrative details

Associated higher education awards	Duration	Level	Unit Coordinator
Master of Education	One semester	Advanced	Dr Francis Ben

Core or elective unit

Indicate if the unit is a

☐ core unit

☒ elective unit

☐ other (please specify below):

Unit weighting

Using the table below, indicate the credit point weighting of this unit and the credit point total for the course of study (for example, 10 credit points for the unit and 320 credit points for the course of study).

Unit credit points	Total course credit points
12 credit points	96 credit points

Student workload

Using the table below, indicate the expected student workload per week for this unit.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
5	15	18

For those students requiring additional English language support, how many additional hours per week is it expected that they will undertake?

Additional English language support: __0___ hours per week

Pre-requisites and co-requisites

Are students required have undertaken a prerequisite or co-requisite unit for this unit?

☐ Yes   ☒ No

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SECTION 2 – ACADEMIC DETAILS

Brief description of the content of the unit

This unit enables the participant to reflect on what "traditional teaching" and "contemporary/student-centred approaches" mean in science and mathematics. The topic of Science, Technology, Engineering and Mathematics (STEM) education is also a focus in this unit considering the recent drive of the Australian Government towards enhancing STEM education in schools. In addition, key understandings and information leading to the design of different approaches to teaching science and mathematics are put forward to provide the participant research-based options that are applicable in the Australian school context. The unit also enables for the design of school-based professional development programs to enhance science and mathematics education in the school classroom. Opportunity for collaborative learning through online discussions is provided in this unit.

Learning outcomes for the unit

1. Critically evaluate contemporary research, and best practice, in productive teaching of mathematics/science;

2. Critically analyse the potential and value of digital technologies in student-centred approaches to science/mathematics teaching and learning.

3. Critically evaluate an actual school implementation of an approach for integration of modern digital or web-based applications and utilities into mathematics/science teaching.

4. Design a professional development plan, including teaching resources, to enhance science/mathematics teachers' knowledge capacity and skills in implementing student-centred approaches to teaching and learning.

Assessment tasks

Type	Learning Outcome/s assessed	When assessed – year, session and week	Weighting
Literature review (2500 words) Review of current best practice in mathematics/science teaching, including evidence of how they applied in classroom teaching and learning.	1	Week 6	25%
Case study (2500 words) Case study of an identified exemplary school in terms of its application and integration of technology in science and mathematics teaching. This assessment task is not intended as original research. Secondary sources are used.	2, 3	Week 10	25%
Professional development program plan, including seminar (5000 words) Plan for professional development program for science and mathematics teachers, including delivery of a mini seminar	1, 2, 4	Week 14	50%

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2.1 Prescribed and recommended readings

Provide below, in formal reference format, a list of the prescribed and recommended readings for the unit.

Prescribed reading:

Recommended reading:

Ben, Y., Kolikant, D., Martinovic, D. & Milner-Bolotin, M. (Eds.). (2020). *STEM teachers and teaching in the digital era.* Springer.

Doris, E. (2010). *Doing what scientists do: Children learn to investigate their world*. (2nd ed.). Heinemann.

Fitzgerald, A. & Corrigan, D. (2018). *Science education for Australian students: Teaching science from Foundation to Year 12.* NSW, Australia: Allen and Unwin.

Gordon, M. (2016). *Enabling students in Mathematics: A three-dimensional perspective for teaching Mathematics in Grades 6 – 12.* USA: Springer.

Groth, R. (2012). *Teaching mathematics in Grades 6 - 12: Developing research-based instructional practices*. Thousand Oaks, CA: SAGE Publications Inc.

Harlen, W. & Qualter, A. (2014). *The Teaching of Science in Primary Schools.* (6th ed.). London: Routledge.

Lowrie, T., Downes, N. & Leonard, S. (2017). *STEM education for all young Australians: A Bright Spots Learning Hub Foundation Paper for SVA, in partnership with Samsung.* University of Canberra STEM Education Research Centre.

McKenna, T., Cacciatolo, M., & Vicars, M. (2013). *Engaging the disengaged: Inclusive approaches to teaching the least advantaged*. Cambridge, UK: Cambridge University Press.

Posamentier, A. S., Germain-Williams, T. L. & Jaye, D. (2013). *What successful math teachers do, Grades 6 – 12: 80 research-based strategies for the common core-aligned classroom.* (2nd ed.). USA: Corwin SAGE.

Solomon, G., & Schrum, L. (2014). *Web 2.0: How-to for educators*. (2nd ed.). Washington DC: International Society for Technology in Education.

Willis, J. (2010). *Learning to love math: Teaching strategies that change student attitudes and get results.* Alexandria, VA: Association for Supervision & Curriculum Development.

Journal articles

Fitzgerald, A. & Smith, K. (2016). Science that matters: exploring science learning and teaching in Primary Schools. *Australian Journal of Teacher Education, 41*(4), 64-78.

Jimoyiannis, A., Tsiotakis, P., Roussinos, D. & Siorenta, A. (2013). Preparing teachers to integrate Web 2.0 in school practice: toward a framework for pedagogy 2.0. *Australasian Journal of Educational Technology, 29*(2), 248-267.

Kelley, T. R. & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *International Journal of Stem Education, 3*(11).