Rosicka, C. 2016, *Translating STEM education research into practice*, Australian Council for Educational Research, Victoria. Retrieved from: https://research.acer.edu.au/professional_dev/10

Summary

This report reviews recent research literature in the areas of teacher capacity, integration of STEM disciplines, active learning and student engagement and participation to help inform the world of practice. The literature review was restricted to STEM practices in primary schools.

Analysis

The author used the following definition of STEM for the purposes of this report: 'Teaching and learning between/among any two or more of the STEM subject areas and/or between a STEM subject and a non-STEM subject, such as the Arts'.

Regarding *teacher capacity,* a key message from the research is a need for ongoing support, which could come in the form of mentoring programs by STEM-industry professionals, employing STEM specialist teachers and extended professional learning programs for teachers.

A key message for the *integration of STEM disciplines* is for there to be coherent integration, not convenient integration. The author notes that this problem is exacerbated by the fact that the Australian Curriculum does not have an 'alternative … integrated STEM curriculum.'

The report cites that where teachers lack confidence in teaching mathematics and or science as standalone subjects, it is more difficult to mount a STEM offering. The research also reveals that integrated STEM units provide opportunities for students to develop capabilities aligned with the general capabilities in the Australian Curriculum such as Critical and Creative Thinking, and aspects of Personal and Social Capability such as communication and self-regulation.

The research also reveals that STEM initiatives promote *active learning*, and this motivates and deepens learning. Focusing on real-world problems helps students understand not only what they are learning but why they are learning the concepts and skills. The report also highlighted research findings stating that allowing for and supporting failure were important to student learning.

It was also reported that STEM education that involves *student engagement and participation* activities, such as incursions and excursions, sparks enthusiasm in learning and in career exploration. Furthermore, the author suggests that inquiry-based integrated STEM

activities can nurture curiosity and questioning, which are important attitudes for STEM learning.

The report has an appendix that lists a range of suitable STEM education programs, such as EngQuest, CS Unplugged, Primary Connections and Wonder of Science Challenge, as well as an appendix that compares a range of STEM education process frameworks, including the ‘processes and production skills’ strands in Design and Technologies and Digital Technologies.

Reflection

Christine Rosicka presents a report that succinctly translates bodies of research into some clear messages about the teaching and learning of STEM programs. The STEM definition used in this report aligns with Kelly and Knowles’ (2016) notion of STEM embracing a learning area outside Science, Technology, Engineering and Mathematics.