Abstract

Science, Technology, Engineering and Mathematics (STEM) education has been identified by the Australian Government as being of critical importance to the economic future and development of Australia (Department of Education, Skills and Employment, 2019). This in turn has led to a STEM policy focus that prioritizes STEM for future careers which, as Panizzon et al. (2018) forewarn, could promote a narrow interpretation of STEM. However, the Australian Government's focus on careers related to STEM has led to an increased emphasis on STEM in primary and secondary schools. The implementation of STEM in schools has taken many forms and the extent of its success has varied. While there are many positive examples of STEM practices in schools, there are also elements such as inflexible timetable structures, particularly in Secondary Schools, that can be a barrier to its implementation. This article is based on our work with teachers and students across a range of STEM in Schools projects. For example, O'Keeffe et al. (2018, 2021), Panizzon et al. (2021), Scott et al. (2021).

Science Teacher Education

Conclusions and Further Professional Development

Science education, whether it aims at introducing all learners to the main ideas and principles of science or at the training of future scientists, calls for teachers with specific qualifications. To teach science effectively, that is, in a way that promotes students' understanding and abilities, science teachers need a thorough understanding of the ways their students learn science content and skills, and what sort of learning difficulties may occur, and why. Moreover, it is important that science teachers understand what and how science can be interesting or challenging for their students. Closely connected to this understanding, science teachers need to develop a large repertoire of instructional strategies and representations of science content, which they can use in classroom practice in a flexible way so as to accommodate student learning, stimulate interest in science, and anticipate differences between students. Moreover, similar to teachers of other subjects, they need to know and use a repertoire of formative and summative assessment techniques, which goes beyond the traditional and familiar ways of testing. In this article we have demonstrated how science teacher education can contribute to the initial development of the professional knowledge needed to teach science. For a more lengthy discussion, the reader is referred to the ‘Further Reading’ section. We conclude this article with some remarks about science teachers' further professional development.

Preparing science teachers during initial teacher education is only the first step in their professional development. As newly qualified and beginning teachers, they continue to work toward gaining expertise. In particular, since science knowledge is dynamic, science education is constantly evolving, thus requiring science teachers to be continuously critical of what and how they teach. The challenge for science teacher educators is to help teachers develop into adaptive experts (Bransford et al., 1999), that is, professionals who have developed a set of important routines, but at the same time, keep looking for new possibilities to improve and adapt their practice, experimenting with new approaches, and so on. In any case, it is important that science educators help science teachers move beyond copying the models from their own education that worked well for them in the past, because those methods likely will not work with many of their students.