Leading impactful teacher professional learning in STEM: Research in NSW public schools

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Building teacher capacity and confidence in teaching and learning in Science, Technology, Engineering and Mathematic (STEM) is recognised as a significant challenge for school education systems in Australia. A series of reports by the Office of Chief Scientist states that the situation is urgent. The National Research Council in the United States as well as the Organisation for Economic Co-operation and Development (OECD) also suggest that reform initiatives will require a substantial change in how the STEM disciplines are taught at school and that an equally substantive change is needed in professional development practices in teacher education. In this paper I take up both of these challenges and examine how two mixed methods research projects in eight primary schools that involved action learning using a technology enhanced learning scaffold supported change in STEM teaching and learning in classrooms. Furthermore the research demonstrated a focus on planning well-integrated inquiry-based units of work when supported by an academic partner is a successful approach to teacher professional development in the STEM disciplines and the Arts/Humanities. The paper draws on findings from 37 early, mid and late career teachers who not only collaborated in school-based teams they also increased their content knowledge in multiple subjects and experimented with new pedagogies that disrupted their beliefs about the nature of STEM education in primary schools. After 10 weeks teacher capacity and confidence measured in several rounds of survey responses including two-point document analyses, observations and interviews showed a marked increase in innovative processes and their adoption in STEM. Almost 1000 students aged 7-12 participated in the two studies. The ‘hands on’ interactive approaches in deeper learning sequences demonstrated a significant shift in their attitudes towards STEM. Students in a support classroom at one of the school’s developed more autonomous inquiry skills and abilities in STEM when choice is sustained. Principals participated in interviews and their insights focused on leadership to build a positive STEM culture. This factor was vital to the success of STEM in primary schools while some also recognised that effective cross-disciplinary programming in several content areas remained challenges for many teachers. Findings from these two action research studies were steps towards addressing such concerns. Effective STEM education is a projection towards the future as well as drawing from the past. To be managed and progressed, the teaching of the STEM calls into question how and what learning in primary schooling is prioritised.