

Executive Summary – First Evaluation Report Indigenous STEM Education Project

The Indigenous STEM Education Project is a five-year science, technology, engineering and mathematics (STEM) project operating from September 2014 to September 2019 for Aboriginal and Torres Strait Islander students across all states and territories funded by the BHP Billiton Foundation.

The project's overarching goal is to provide supported pathways that improve the participation and achievement of Aboriginal and Torres Strait Islander students in STEM subjects. The project consists of six program elements. Three are universal programs – Inquiry for Indigenous Science Students (I2S2) and PRIME Futures are science inquiry and mathematics programs implemented in metropolitan and regional communities, while Science Pathways for Indigenous Communities uses Traditional Ecological Knowledge (TEK) as the basis for teaching science in remote communities. Three are targeted programs – Aboriginal Summer School for Excellence in Technology and Science (ASSETS) and the Indigenous STEM Awards which support and extend high achievers; and the Bachelor of Science (Extended), which provides an alternate pathway to a university science degree for students requiring additional assistance.

This evaluation is primarily an implementation evaluation. Three main data sources were used: a literature review of Indigenous STEM education engagement, policy, and practice; interviews with project directors and program element leaders; and program element leaders' program materials and reports. The literature review provides important contextual information on both Indigenous education and STEM education, and where the two intersect. The review highlights the complex and contested socio-political environment in Australia for both STEM and Indigenous education; and seeks to provide an overview of this context for the diverse stakeholders in this project. The interviews were used in conjunction with data from program reports to describe the implementation of the program elements with particular reference to the inputs, outputs, and early outcomes identified in the program logics and the overarching Theory of Change. The interview transcripts were also analysed to identify common themes relating to pedagogical approaches, sustainability, curriculum reform, and policy implications in the Indigenous STEM education field. The findings on the early outcomes are limited; and are based almost exclusively on the perspectives of the program leaders and project directors. Delays in implementing the evaluation component of the program has meant that the mixed methods evaluation methodology that will provide more extensive and rigorous evaluation data has not yet been implemented. Data from this methodology will be presented in subsequent evaluation reports.

A key finding of the evaluation is that, guided by the Theory of Change and individual program logics, the initial implementation of the project is progressing well. Four of the six program elements – I2S2, PRIME Futures and Bachelor of Science (Extended), and ASSETS – have achieved the majority of their initial projected program outputs and short term outcomes. Science Pathways commenced in 2016 and is on track to meet its projected short term outcomes in early 2017; and the awards program will have its first round in December 2016.



Consistent with the best practice literature, the evaluation identifies four principles underpinning all program elements: 1) being place-based; 2) having strong cultural engagement; 3) being strength-based; and 4) being built on high expectations. This contributes to programs that are demonstrating the compatibility of science inquiry with Indigenous pedagogy; the engagement and aspirational benefits of utilising curriculum based on Indigenous knowledge and contexts; methodologies for building teacher and school pedagogical and cultural capacity; and the value for Aboriginal and Torres Strait Islander students of mentoring, personal support and the building of peer and professional networks.

The evaluation also identifies the complex cultural, policy, and institutional contexts in which the project is operating. These contexts necessitate a better understanding of the partnerships required to embed sustainable change; and the importance of Aboriginal and Torres Strait Islander leadership across the project in assisting in the navigation of these contexts, including the appropriate use of Indigenous knowledge. The leadership role that key stakeholders and science organisations like CSIRO can potentially play is a key area to further explore.

The project context is characterised by both positive and negative trends. On the positive side, there are fundamental shifts in the Australian school curriculum towards the integration of Indigenous perspectives; and a greater emphasis on the inquiry pedagogy in science, which is seen as more consistent with Aboriginal and Torres Strait Islander ways of learning than conventional transmission pedagogy. University enrolments are showing an increase in STEM engagement for Indigenous students including a closing in the gap of the proportion of Indigenous students studying STEM compared to non-Indigenous students. This is complemented by the finding that Indigenous students have a higher level of contextualised interest in science compared to their non-Indigenous peers.

Conversely, there are several key contextual challenges for the project. There is concern that the declining participation and achievement in STEM subjects in Australian high schools will mean that the workforce and broader society will not have the necessary STEM literacy to underpin the future workforce needs for a thriving economy. More specifically, the Aboriginal and Torres Strait Islander context is one of a continuing two-and-a-half year gap in student achievement in mathematics, literacy, and science compared with non-Indigenous students. This gap has not improved in the last 10 years. There is also a widening of the gap in the Australian Tertiary Admission Rank (ATAR) achievement. Schools often struggle to implement high expectations pedagogy and to build meaningful relationships with Indigenous families and communities partly owing to a lack of quality professional training in implementing Indigenous engagement and perspectives. While university enrolments are closing the gap, there are significantly lower completion rates for Aboriginal and Torres Strait Islander students compared with non-Indigenous students.

There are four key implications of these early findings:

1. More substantial quantitative and qualitative evidence underpinned by more rigorous evaluation methods are required to establish the extent, impact, and sustainability of outcomes. This will be a key focus of subsequent evaluation reports.
2. The project is demonstrating promise in regard to building the evidence base for best practice in Indigenous STEM education, and this, along with program element continuous quality improvement (CQI) processes, should remain a focus for future evaluation reports.
3. A key focus needs to be on understanding and documenting the partnerships necessary to enable project sustainability, including leadership and support roles for organisations such as CSIRO.
4. The program logics and Theory of Change would benefit from further revision and a clearer articulation of their impact pathways.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

WE DO THE EXTRAORDINARY EVERYDAY

We innovate for tomorrow and help improve today – for our customers, all Australians and the world.

WE IMAGINE
WE COLLABORATE
WE INNOVATE

FOR FURTHER INFORMATION

Monitoring and Evaluation Research Coordinator
Michael Tynan
t +61 3 9518 5962
e michael.tynan@csiro.au
e indigenous-stem-evaluation@csiro.au
w www.csiro.au/indigenous-education