



‘What works’ in Indigenous STEM education

This document summarises success factors identified through the monitoring and evaluation of the Indigenous STEM Education Project (ISEP), funded by the BHP Foundation and delivered by CSIRO. These synthesised findings are based on the wisdom and feedback from students, educators, program staff, and community members, particularly Aboriginal and/or Torres Strait Islander peoples, who CSIRO gratefully acknowledges. Most of the success factors were in place as part of the planning and delivery of ISEP; however, some factors were still emerging but were identified in some places or circumstances that indicated their importance to overall program success.

Overall success factors

- Building and fostering strong relationships and trust with teachers, schools, and communities.
- Prioritising community involvement and local connections.
- Flexibility and patience to allow new programs to evolve and flourish over several years of implementation and iteration.
- Leveraging national footprint, resources, and infrastructure of an organisation.
- Realistic expectations of program outcomes and acknowledgement of environmental, historical, and other factors.

Designing programs

- Aboriginal and/or Torres Strait Islander peoples engaged as leaders and experts in the planning of programs.
- Robust research and consultation to develop resources and materials (e.g., referenced, peer reviewed, input from range of knowledge custodians).
- Scaffolded approaches inclusive of all student levels (low to high achievers, and not engaged to highly engaged) focusing on facilitating independent learning.

Evaluating programs

- Strengths-based approach focusing on ‘what works’ (including avoidance of deficit discourse), while acknowledging challenges and barriers.
- Flexible Impact Pathways and measures/indicators that reflect evolution of programs and incorporate community-driven measures of success.
- Use of multi-method designs and Indigenous research methods, and privileging the voices of participants in analysis and reporting.
- Disseminating findings in a range of ways that are meaningful for different audiences.

Sustaining programs

- Role models and ambassadors drawn from program alumni that sustain program aims.
- Promoting role models that show students viable education and career pathways and opportunities.
- Sustainability plans built in to program design stage.
- Dedicated focus on influencing and informing education systems and partners.
- Facilitating the creation of peer and professional networks (and skills to create own networks).

Delivering programs

Student engagement and support



- Practical, hands-on, on-country activities connected to content and curriculum.
- Continuity of support provided beyond program duration, based on strong relationships with program staff.
- Connecting program alumni with opportunities based on the knowledge and professional networks of program staff.
- Ensuring work experiences and other opportunities are culturally safe.
- Consistent program staffing (i.e. low turnover) to maintain continuity and trust with partners and participants.
- Facilitating safe (culturally and socially) places for young people to explore their cultural heritage and identities.
- Multi-layered support structures, including academic and pastoral.

Teacher engagement and practice



- Teachers have confidence and capacity to:
 - teach science content
 - use the (open) inquiry approach
 - use Aboriginal and Torres Strait Islander knowledges as context
 - use hands-on, practical activities
 - make assessments of understanding and learning using diverse techniques.
- Teachers tailor content to class, including connecting to students' everyday life.
- Enabling 'flipped knowledge/learning' where students lead or share knowledges.
- Teachers create a safe space for individual students to voluntarily share their cultural knowledge.
- Teachers are adaptable and flexible with lesson planning and delivery of inquiries (often outside direct control of program).
- Teachers open to learning new ways of teaching STEM, including acknowledging past failures of education systems to properly support Aboriginal and/or Torres Strait Islander learners (often outside direct control of program).

Embedding knowledges in the curriculum and two-way science



- Respecting and utilising Aboriginal and Torres Strait Islander knowledges.
- Using Aboriginal and Torres Strait Islander knowledges from across the Country, but allowing space for local knowledges to be included at the community level.
- Local Aboriginal and Torres Strait Islander knowledges and/or languages incorporated with the active assistance of local knowledge custodians (who are remunerated appropriately).
- Utilising culturally responsive STEM resources, including those that build knowledge and capacity more broadly (e.g., cultural competency of teachers).
- Policies and curriculum structures that support the integration of Aboriginal and Torres Strait Islander knowledges.

Community involvement



- Authentic partnerships among schools, programs, and Elders, Traditional Owners, and/or other knowledge custodians at the program and local levels.
- School Aboriginal Education Worker(s) / Community Education Officer(s) actively engaged with facilitating programs and contributing expertise.
- Parental and/or family engagement encouraged where relevant (e.g., in class, at school, at home, at events, at student decision points).
- Strong, enduring connections to industry and other partners (e.g., Ranger groups) with aligned goals.
- Community's (and student's) goals for learners understood and incorporated into programs.

School engagement



- Frequent face-to-face visits to schools (or as needed), including modelling instruction, to build relationships, trust, and capacity, and to champion (multiple) programs.
- Strong Head of Curriculum / Department champion for the program or approach, and explicit and ongoing Principal support, including for teacher professional development (often outside direct control of program).
- A critical mass of year levels and classes to create a community of practice within the school, and allow for multi-year planning.
- Internal peer support, practice sharing, and/or reflective opportunities in place for educators (organised by program or self-generated).
- Collaboration and sharing with other schools (e.g., cluster models).
- Incentives and/or recognition in place for teachers to deliver programs.