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STEM Professionals in Schools

2018-19 program impact evaluation

CSIRO

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This report has been prepared for consideration of CSIRO in January 2020 by:

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We would like to acknowledge the Traditional Custodians of the land on which we are privileged to live and work, the peoples of the Yuggera Nation of south east Queensland; we pay our respects to all their Elders who have led the way in science, education and story-telling over thousands of generations. We are very grateful to the Traditional Custodians of other lands where this work was undertaken, with a specific thank you to the peoples of Central Australia who welcomed us on to Country to undertake an important case study.

We would like to thank and acknowledge the state and territory Departments of Education, Catholic Education and Independent schools who approved and supported our survey and case study work across the schools.

And finally, thank you to all the many teachers, principals, STEM professionals, students and CSIRO staff who gave us their time and their valuable input to enable us to produce this evaluation.

Disclaimer

This evaluation report includes consideration of quantitative and qualitative data, insights and experiences from more than 800 individuals from schools and organisations throughout Australia, and additional supporting evidence that includes program documents, publicly sourced data, and other relevant literature in STEM or associated areas. The evaluation findings, conclusions and recommendations presented in this report are those determined by Tessellate Communication Pty Ltd.

Executive summary

Science, technology, engineering, and mathematics (STEM) have an important role to play in Australia's future with a recent study indicating a one per cent increase in people choosing a STEM related career would boost the economy by over $50 billion.[1] However, Australia has been experiencing declining school enrolments and performance in STEM subjects.[2] To address this decline, governments and peak bodies are introducing policies and programs targeting STEM education and industry. The Commonwealth Department of Education, Skills and Employment (herein the department), has undertaken a range of initiatives targeted at progressing Australia's innovation and science agenda.[3] This report presents evaluation findings for one such initiative, the STEM Professionals in Schools Program (herein the program).[4]

The program connects school teachers and STEM professionals in partnerships that focus on STEM education and activities. Its purpose is to share knowledge, build teacher capability, and enhance the student learning experience in STEM. Goals include increasing student knowledge and interest in STEM subjects and fostering their awareness and interest in future STEM courses and careers.[5] The department has funded the STEM Professionals in Schools Program since 2007, with CSIRO managing the program since its inception, through a *Principal Agreement* with the department.

About the 2018-19 program impact evaluation

Independent evaluation of the program is a requirement of the *Principal Agreement* and aligns with the *Public Governance Performance and Accountability Act (2013)*. This impact evaluation investigates the extent to which the program is delivering on expected outcomes and how it is evolving in response to key challenges and lessons learned. It considers program activities and processes since the 2015 evaluation that are covered by the current funding agreement period from 1 July 2016 to 31 December 2019.

The evaluation occurred from 1 July 2018 to 31 December 2019 and has been conducted in accordance with Australia's National Statement for Human Research (NHMRC, 2018), with overarching ethics approval for the evaluation obtained through CSIRO's Human Research Ethics Committee in August 2018. Additional ethics processes were conducted with state and territory committees, Catholic dioceses, and Independent schools' associations or Boards, where required.

The evaluation utilised a mixed methods approach incorporating longitudinal surveys, in-depth case studies (including a student survey), a program team survey, and extensive documentation review.[6] The evaluation focused on the program's quality, impact, effectiveness and efficiency. Contextual events that have influenced the program during this period include:

- signing a new *Principal Agreement* with Department of Education and Training for 2016-2020
- changing the program name and branding
- implementing a new client relationship management (CRM) database[7]
- redeveloping the program website
- staff turnover within the CSIRO project team.

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[1] PricewaterhouseCoopers (PwC), 2015, A smart move, http://www.pwc.com.au/pdf/a-smart-move-pwcstem-report-april-2015.pdf

[2] Timms, M, Moyle K, Weldon, P & Mitchell, P, 2018, *Challenges in STEM learning in Australian Schools*, Australian Council for Education Research (ACER), Camberwell.

[3] Examples of Commonwealth Government initiatives include those funded through the National Innovation and Science Agenda available at https://www.industry.gov.au/strategies-for-the-future/boosting-innovation-and-science and https://www.education.gov.au/support-science-technology-engineering-and-mathematics

[4] The program commenced as the Scientists in Schools Program in 2007. In 2009 it was extended to incorporate Mathematicians in Schools, and in 2014 engineering and information technology partnerships were recognised.

[5] Department of Education and Training, 2016, Deed of variation no. 2 to funding agreement in relation to funding for the Scientists and Mathematicians in Schools program, Australian Government, Canberra.

[6] Further details on the evaluation methodology are available in the *Interim findings report,* an internal report provided to CSIRO and shared with the department in September 2019.

[7] During 2017 and 2018 CSIRO Education and Outreach moved to a Microsoft Dynamics client relationship management (CRM) system. The re-registration of participants was imperative to ensuring compliance with Child Safe requirements. Since October 2018, the data contained in the new CRM is considered the 'source-of-truth' for program partnership and participant details.

Evaluation questions and data

The overarching evaluation questions (EQ) posed by CSIRO for the 2018-19 impact evaluation were:

1. How is the STEM Professionals in Schools Program delivering a quality program, focused on sustainability of partnerships, success for participants, and facilitating industry involvement?
2. What are the benefits for students, teachers, and STEM professionals as a result of the STEM Professionals in Schools Program?
3. How is CSIRO, through the STEM Professionals in Schools Program, providing teachers with professional learning opportunities to strengthen their knowledge of STEM practices and change classroom practice?
4. What is the benefit(s) for Industry of involvement with STEM Professionals in Schools Program? What are their employees bringing back to their organisations?
5. What are the key challenges and lessons learned? What opportunities exist for the program?[8]

The evaluation included more than 800 people involved with the program sharing their views and insights (see Table 1).

Table 1: Summary of evaluation participation

Data source	Participants	
Longitudinal survey – 2018	• 159 teachers (current) • 40 teachers (prior)	• 242 STEM professionals (current) • 96 STEM professionals (prior)
Longitudinal survey – 2019	• 90 teachers (current) • 5 teachers (prior)	• 166 STEM professionals (current) • 4 STEM professionals (prior)
Case studies (4 cases) – June to November 2019[9]	1. Mentor partnership (ACT) features a model where the STEM professional assists with generating ideas, providing guidance and contributing to a community event. 2. Inclusion of Indigenous students (NT) features a group of STEM professionals from one organisation delivering activities during National Science Week, as well as ongoing interactions with curriculum preparation and other activities. 3. Extra-curricular robotics program (SA) involves a long-standing robotics program where the STEM professional directly assisted students with preparation for, and participation in, competitions, and using robots at school and community events. 4. Engaging girls in STEM (NSW) includes girls from multiple class-levels selected to participate in an extra-curricular, all-day workshop conducted by a female STEM professional.	
Case studies – embedded student surveys (2 cases)	• Case study 3 had 9 students take part in the student survey • Case study 4 had 16 students take part in the student survey	
CSIRO program team survey May and October 2019	• Conducted with 16 past and present CSIRO program team members	
Documents reviewed throughout	• See Appendix 1 for details	

Evaluation findings

Figure 1 shows the program has delivered at a fair level on the quality aspects incorporated in the evaluation. These have focused on the engagement of stakeholders and the delivery of sustainable partnerships and program through sound program management. Opportunities were noted for improving understanding of, and data collection for, the different partnership models to gain deeper insights into how these may impact on other program aspects such as partnership and program sustainability or the attainment of benefits.

[8] Request for quote, Assessment of impact: STEM Professionals in Schools program, CSIRO April 2018.
[9] Individual case summarises for each case will be available on the program's CSIRO website in 2020.

The program has performed best in terms of delivering benefits to direct and indirect program recipients. The greatest impact was with teachers and in the broader community where there was a good level of benefits. There were also consistent indications of a fair level of benefits to STEM professionals, and students, including increased engagement. Benefits identified in schools and organisations offer an opportunity to review the current partnership model.

The effectiveness and efficiency of the program was at a fair level, considering the significant changes in the program's contextual environment and restructuring over recent years. However, more needs to be done to address the targeted equity areas; and to develop strategies to guide development in these areas and set performance measures against which to regularly review progress.

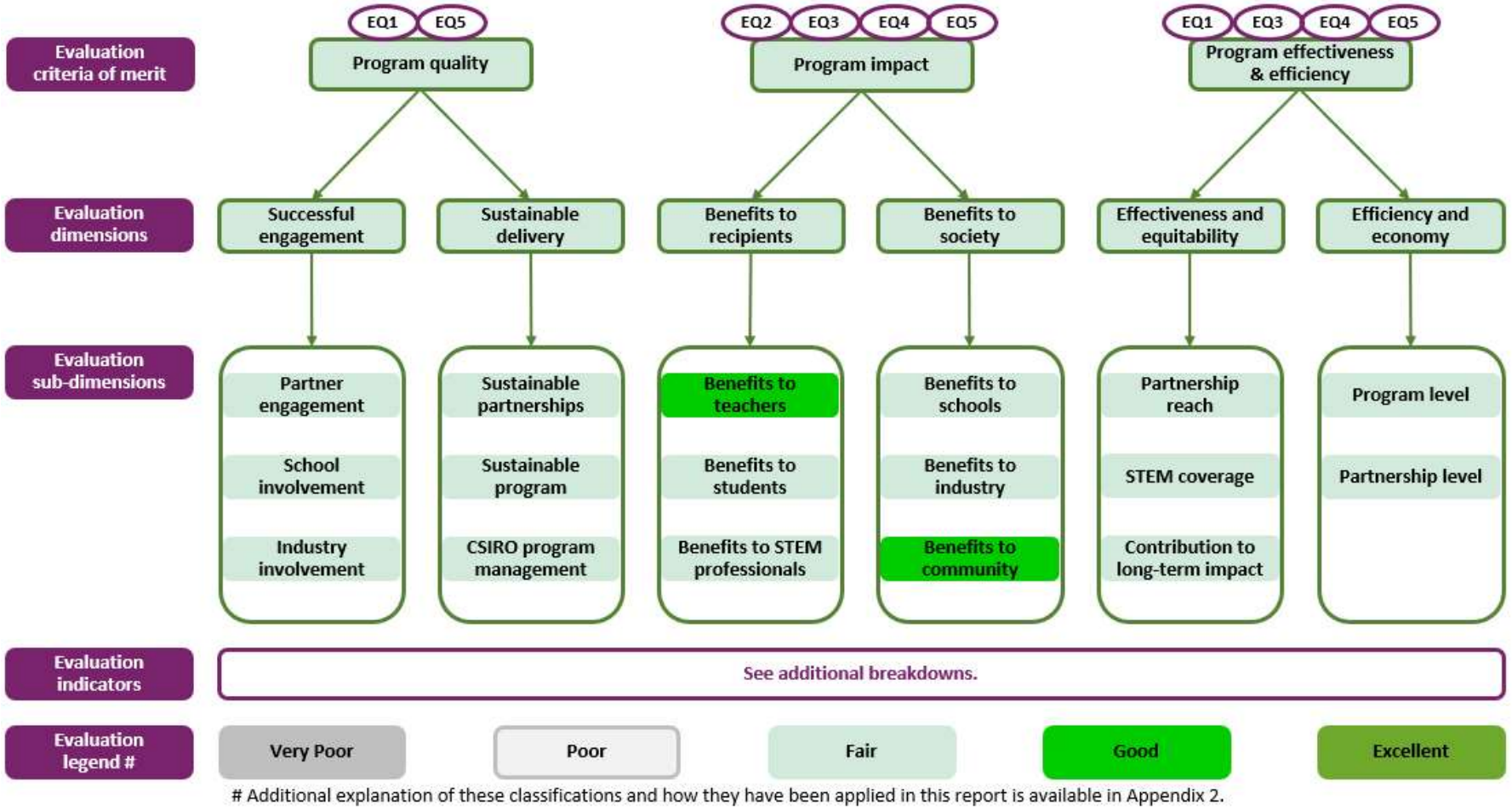

Figure 1: Evaluation findings

Recommendations based on areas of strengths and development

Recommendation	Evaluation findings
1. The government consider continuation of program funding, with CSIRO being reappointed as program manager	• CSIRO's strong reputation undoubtedly attracts partners to the program (p. 20) • Partners have high regard for the program and are willing to refer to others (p. 20) • Partnerships are effective in delivering value to a range of stakeholders (p. 23-30) • Program provides good attainment of teacher benefits including professional learning (p. 24) and benefits to the broader community (p. 29) • Program is contributing to student STEM engagement (p. 26)
2. Develop a strong program vision including clear strategies, goals, objectives, and indicators to deliver its value proposition	• Partnership numbers are lower than the 2015 evaluation, due in part to a change in program administration system that required reregistration of all partners and partnerships (p. 7) • There does not appear to be a clearly documented and shared strategic vision to support the operationalisation of the consolidated program (p. 25 and p. 43) • Re-naming and branding of the consolidated program requires further work to increase program visibility (p. 20 and 41)
3. Ensure a targeted approach is taken for partnership growth in key equity areas	• Program includes national coverage of all school sectors and school types although partnerships are predominantly in schools within major cities and inner regional areas (p. 12) • Program has identified target equity areas of high disadvantage, low-socio economic areas, and regional and remote communities (such as Indigenous communities) although there are currently proportionately low partnership numbers in these areas (p. 31-32) • Reporting against specific targets in key equity areas does not currently occur (p. 43) • Program does not currently link partnership data with ACARA/ABS datasets to enable effective identification and use of criteria such as ICSEA or proportions of female or Indigenous students (p. 6 and 41)
4. Review the current partnership process and supports to address identified issues	• Historically, the highly flexible approach enabling partners to progress partnerships in accordance with their own goals was viewed positively (p. 18) • Partners now indicate a lack of time, poor co-ordination and competing commitments as impeding partnership progress (p. 16) • Partners identified that some existing partnership supports were largely ineffective and that a lack of access to resources inhibits partnership potential (p. 21) • Many partners indicated that activities/artefacts created during a partnership could be shared with/used by other partnerships (p. 32-33)
5. Review the current partnership model to determine its continued relevance	• The current partnership model relies largely on a one-on-one partnership between two individuals who volunteer their time, with no specific requirement for school and/or organisational support (p. 38) • The majority of partnerships that close do so due to the inability to overcome barriers (e.g. a lack of time, inability to coordinate, distance) or due to changing personal circumstances of partners (e.g. change in jobs, relocation, retirement) (p. 7) • School support was identified as an important enabler of successful partnerships (p. 16-17)
6. Review enabling administration systems, processes and data model to improve reliability, usefulness and governance of data	• The program administration system was changed at the end of 2017 with a gradual reregistration process occurring during 2018 and 2019 (p. 2 and 7) • Further work is required to address data integrity, inclusion and control issues within the current system which reduce the usefulness and reliability of data • Current system limits the ability to efficiently and effectively link to existing public data sets (such as ACARA, ABS, NAPLAN, PISA and similar). Doing so would enable » potential to pre-populate fields improving data integrity » reliable data for participating schools (e.g. ICSEA, student numbers/details) » tracking changes in student STEM achievements and enrolments to provide evidence to substantiate program impact over time