Increasing STEM education participation: Aboriginal Summer School for Excellence in Technology & Science (ASSETS) Evaluation

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The Indigenous STEM Education Project
Aboriginal Summer School for Excellence in Technology and Science (ASSETS)
History of ASSETS

• Running since 1992 in Adelaide
• Delivered byCSIRO since 2014
• Across three locations
ASSETS by numbers

- **Alumni 3rd year**: 28
- **Total Alumni**: 430
- **Female Alumni**: 61%
- **Alumni 2nd year**: 98
- **ASSETS with CSIRO**: 13
- **Male Alumni**: 39%
- **Alumni 1st year**: 101
- **Alumni in Year 12**: 104
- **Alumni in Year 11**: 99
Student distribution
Beyond Summer School

- Work placements
- CREST opportunities
- Awards
- Cadetships
- Scholarships
- References
- Letters of recommendation
- Other opportunities
- Mentors

83 Work placements
26 WP hosts
6 Award winners
3 CSIRO cadets
18 ASSETS mentors
348 Facebook members
ASSETS Program Focus

Western Science

Indigenous Knowledges
ASSETS Program Focus

Western Science

Indigenous Knowledges

Cultural Interface
ASSETS Program Focus

- Personal Development
- Western Science
- Indigenous Knowledges
Monitoring and Evaluation

- Ensuring the voices of Aboriginal and Torres Strait Islander students are strongly represented
- Contemporary research evidence
- Strengths-based approach
- Multi-method approach
- Outcomes focused
Program Impact Pathway

Impact Statement Canvas for Aboriginal Summer School for Excellence in Technology and Science (ASSETS)

Participation:
- Cultural patrons, CSIRO
- Universities, Accommodation, STEM Professionals
- ASSETS Team
- Students, School leaders, SMS
- Funding partners, SMS

Inputs:
- $2.8m
- Staff
- Pre-existing model for summer school
- Accommodation providers (Wiripa Boarding)
- STEM professionals
- Cultural providers (patrons)
- University and CSIRO resources of summer school sites (e.g., Wiripa site, Regional BHP Site, content experience, National framework for work placements (SMS))

Activities:
- Recruitment of students, academic providers (universities, CSIRO) STEM professionals, cultural mentors, accommodation providers
- Development of Integrated STEM, cultural and personal development programs, delivered through 5 day summer school
- Development of ongoing personal development and leadership program maximizing work placements, mentoring, Facebook page, regional meetings, attendance at university and STEM events
- Leadership and support program materials
- Development of program monitoring processes

Outputs:
- Partnerships with universities, CSIRO units, STEM professionals and cultural mentors
- Applications and assessment process
- Conduct of 3 summer schools featuring an integrated STEM, cultural and personal development program in Newcastle, Tweedvale and Albury
- Work placements, Facebook page, networking activities and individual support
- Monitoring data

Outcomes:
- The uptake, adoption or consumption of our work
- Social cohesion/ reconciliation
- Cultural and Indigenous knowledge & two way science
- Schools, students and families increasing focus on high expectations of Indigenous students and higher university outcomes

Impacts:
- Benefits to eco, survival, socio

Assumptions:
- Integrating academic high expectations with culture and personal development is the best pathway to success
- This program’s primary focus on university pathways for STEM careers needs to accommodate possible alternate pathways

External factors:
- Students may wish to do science in years 11 and 12 but the classes may be unavailable
- Some schools may not offer certain subjects
- Importance of school experience in influencing education outcomes
Impact Pathway Outcomes

1. High aspiration for stem career.

2. Subject choice referencing prerequisites for university STEM courses.

3. Better understanding of and confidence pursuing STEM career pathways.

4. Greater confidence in cultural identity and the relevance of culture for STEM career.

5. Growth in student and professional networks.

6. Increased community, parental engagement.
Case Study Methods

1. Interviews and focus groups
   - Students
   - Program staff
   - Program partners and STEM professionals

2. Online surveys
   - Pre- and post student
   - Year 11
   - Year 12
   - Destination
   - Parent

3. Self-reported grades
Aspirations

I intend to study a STEM field at university
n = 175

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<th>Pre</th>
<th>Post</th>
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<tbody>
<tr>
<td>61%</td>
<td>79%</td>
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Per cent ‘strongly agree’ or ‘agree’

I intend to have a career in STEM
n = 175

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<tbody>
<tr>
<td>51%</td>
<td>76%</td>
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Per cent ‘strongly agree’ or ‘agree’
Prerequisites

I know what a prerequisite subject is

Per cent ‘strongly agree’ or ‘agree’

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<tr>
<td>n = 175</td>
<td>71%</td>
<td>93%</td>
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I know what the prerequisite subjects are for what I want to study at university

Per cent ‘strongly agree’ or ‘agree’

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<th>Pre</th>
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<td>n = 175</td>
<td>53%</td>
<td>84%</td>
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Understanding

I have a good understanding of STEM careers

Pre: 59%
Post: 97%

n = 176

I know how to apply for university

Pre: 45%
Post: 72%

n = 176

Per cent ‘strongly agree’ or ‘agree’
Cultural connections

I know where to learn more about my culture

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<tbody>
<tr>
<td>% 'Agree'</td>
<td>60%</td>
<td>80%</td>
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n = 176

I feel a strong connection between science and my Aboriginal and/or Torres Strait Islander culture

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<th></th>
<th>Pre</th>
<th>Post</th>
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<tbody>
<tr>
<td>% 'Agree'</td>
<td>53%</td>
<td>86%</td>
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n = 174

Per cent ‘strongly agree’ or ‘agree’
Parents’ perceptions

My child is capable of being successful at university

93% parents

Per cent ‘strongly agree’ or ‘agree’

I know how to apply to university

53% parents

Per cent ‘strongly agree’ or ‘agree’

n = 97
Growth in networks and ongoing support

I have kept in contact with other ASSETS participants
n = 55 and n = 24

Year 11: 75%
Year 12: 88%

Have you been involved in any of the ongoing ASSETS support and activities?

Year 11: 51%
Year 12: 67%

n = 55 and n = 24
How significant an impact was ASSETS on your study and career directions?

n = 38

- 29% Life changing
- 53% A lot
- 18% A little
- 0% None
STEM Grades

Year 11
n = 55 students
n = 134 grades

28% A
39% B
31% C
3% D

Year 12
n = 24 students
n = 57 grades

21% A
42% B
35% C
2% D
Destinations and work placements

Destinations of ASSETS alumni
n = 38

- 71% university
- 18% employed
- 8% TAFE
- 3% gap year

Work placements 2018
- 29 placements
Quotes: Academic

ASSETS “changed the way I worked at school, it made me *work harder* to reach my goals.” - *student*

ASSETS “helped me *feel more secure* about the STEM subjects I have already picked for Years 11 and 12.” - *student*
Quotes: Personal

ASSETS “*further developed* my ability to meet and work with people while *learning to adjust* to new situations I would otherwise not go for.”
- student

“After attending I felt *my confidence rise* as well as becoming more aware of the many pathways to a STEM career.”
- student
Quotes: University, Career and Networks

“she...is in constant contact with everyone...the support network will be very beneficial for all their futures.” - parent

“Through attending the ASSETS program....[it] assisted....me having the courage to apply for other jobs.” - student

“This program has given me insight into a career I never knew existed. It influenced me to change my subjects to best suit that career so I have the pre-requisites to get in.” - student
Quotes: Culture and Community

“I want to undertake research and projects in my community that mean something to my people.” - student

“...it makes me think a lot more about the culture and want me to learn more...not only just for science....it makes me want to go back and try and learn that way; not always the Western science way.” - student

The summer school experience allowed “me to become a role model in my community.” - student
Summary of Evaluation Findings

ASSETS:
• builds on existing high aspirations for STEM careers
• leads to better understanding of and confidence pursuing STEM career pathways
• helps build greater connection to culture
• facilitates growth in student networks
• builds the skills and confidence of students to build professional networks and community engagement
The strength of relationships: CSIRO and Wollotuka’s

How did CSIRO and The Wollotuka Institute, University of Newcastle have the ability to Indigenise a large proportion of the ASSETS summer School Program and become traditionally inspired through STEM technology?

- First contact based on mutual respect;
- Based on what educators refer to as a ‘backwards scaffolding approach’ and deep collaboration (the key to the success of the program at UON);
- Strong sense of reciprocity;
- CSIRO team have a deep understanding and a strong sense of integrity regarding local community protocols;
- The team localised content and activities where possible;
- Relationship based on reciprocity.

“Quality consultation requires respect, trust and openness, with a focus on building a partnership with Aboriginal people that is equal and genuine.”

NSW BOS 2008

Academic research around unit design and deep engagement

Backwards design scaffolding
Puntambekar S, Kolodner J (2005)

Backwards faded scaffolding
Lyons, Daniel J, (2011)

Backwards Planning
Jones, Karrie A (2018)
Engaging and supporting students
• The cultural components of the program assist in validating the students' sense of place and belonging within higher education settings;
• They provide a safe space where students learn that they are all on different journeys of Indigeneity and where students can explore science through an Indigenous lens;
• Reinforces the importance and richness of Aboriginal and Torres Strait Islander knowledge systems.

Engaging with Local Community
• Procuring of Aboriginal and Torres Strait Islander business’s and organisations for aspects of the program. E.g. venues, buses, food, facilitators, mentors.
Snap shot at one Indigenous component of the program at UON
Humanising technology and mathematics components through Aboriginal dance
Conclusions

• ASSETS Program focusses on the intersection between: 1. Western Science 2. Indigenous Knowledges 3. Personal development

• Evaluation of ASSETS showed it is successfully supporting Aboriginal and Torres Strait Islander students to pursue STEM pathways

• The programs strengths are based upon a 2-way process were each group gains from the relationship
Questions
References:

We acknowledge the transformative research conducted by others that enable researchers to move beyond program limitations.


