

2021-20 STEM Influencer Report – Educators of Aboriginal and Torres Strait Islander Students

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Executive summary

This research report is a qualitative extension of the *Teachers & Career Advisors 2020/21* research and aims to provide a deeper insight into a sample group of educators' experiences teaching STEM to Aboriginal and Torres Strait Islander students. The research also had a specific focus on uncovering gendered differences within this cohort. With a deeper understanding of educators' experiences, educators and policy makers can assist in supporting Aboriginal and Torres Strait Islander girls to persist in STEM education and consider future STEM-related careers.

The data was collected through 17 one-hour in-depth interviews. While the majority of educators interviewed are involved in teaching STEM, some are focused on providing general educational support for Aboriginal and Torres Strait Islander students.

Complimentary to the qualitative data, this report also includes survey data extracted relating to Aboriginal and Torres Strait Islander students from the *Teachers & Career Advisors 2020/21* report.

It is important to observe that due to the niche nature of the research audience and challenges that educators faced due to the COVID-19 pandemic, non-traditional recruitment methods were employed to reach the desired number of participants. While all efforts were made to ensure the sample was representative, it is important to note that no Torres Strait Islander educators participated in the research. There were also no participants from Queensland or South Australia. These sampling limitations should be acknowledged upon interpreting the findings of this report.

Another important consideration when reading this report is that this research aims to pull together common perspectives among the 17 educators interviewed. In doing so, participants' viewpoints have been summarised, and a narrative has been constructed to convey the findings. The report is in no way attempting to make generalisations of Aboriginal and Torres Strait Islander peoples, customs, laws or traditions.

Opportunities to improve engagement with STEM

The research identified various opportunities which could help support engagement among Aboriginal and Torres Strait Islander girls, and the wider Aboriginal and Torres Strait Islander student community, in STEM.

According to educators, the hands-on nature of science, technology, and engineering classes often appeals to all students, including Aboriginal and Torres Strait Islander students. These classes tap into students' natural curiosity about the world and their interest in how things work. Educators stressed the importance of delivering STEM concepts more interactively, as they believe that this will be more engaging and appealing to a wider range of Aboriginal and Torres Strait Islander students. Many were supportive of extra-curricular STEM programs to help increase interest in STEM, as they are often more interactive than regular classroom lessons.

Educators also highlighted the importance of improving teacher confidence in teaching STEM subjects. They believe that this can be achieved by equipping teachers with culturally relevant resources, training and support networks. The educators believe that by boosting teachers' confidence, they will feel more comfortable creating interactive lessons that are more relevant for their students, which is likely to subsequently increase engagement.

Moreover, some educators acknowledged a need to strengthen and develop their understanding of the culture of the Aboriginal and Torres Strait Islander students, for instance the ways in which some

Aboriginal and Torres Strait Islanders share knowledge between individuals. Educators agreed that those working in schools with an Aboriginal and Torres Strait Islander student population should undertake specialised training to effectively communicate with cultural sensitivity.

Further to this, educators stressed that integrating Indigenous Knowledge and cultures with STEM is critical to making lessons more relevant to Aboriginal and Torres Strait Islander students and the importance of starting this process from the younger grades.

Benefits of this integration of knowledge were also found in the research by Hansen (2016). The study observed a group of 25 Year 9 Aboriginal students from a school in Perth. It found that embedding Indigenous knowledge into science lessons increased the emotional and behavioural engagement of the Aboriginal students and led to a deeper understanding and valuing of Aboriginal cultures for all students. The analysis identified four main reasons for the change in student engagement: increased sense of connectedness; improved confidence in Aboriginal students; appeal to Aboriginal students' learning strengths; and changed perceptions about learning science held by the Aboriginal students.

According to educators, integrating Indigenous Knowledge into STEM lessons also benefits non-Indigenous students. There were views that positioning an alternative cultural view as equal to the Western view also creates a space where students from diverse backgrounds can feel safer and more welcome to share their own cultural knowledge.

Educators also highlighted the importance of community partnerships to encourage academic success among Aboriginal and Torres Strait Islander students in STEM and other subjects. Strong community partnerships enable the sharing of skills and knowledge between teachers, Aboriginal and Torres Strait Islander support staff and local Aboriginal and Torres Strait Islander Elders. Aboriginal and Torres Strait Islander education support staff are a crucial component in this relationship as they are the link between community and teachers and help integrate cultural knowledge with the curriculum. Aboriginal and Torres Strait Islander support staff can help teachers develop materials that integrate Indigenous Knowledge and provide culturally appropriate guidance.

Considerations for STEM engagement

While educators agreed that the hands-on STEM components resonate well with students, they also reported that there is the potential to increase student outcomes by providing students with further support beyond the interactive elements, to develop the skills required to analyse what they have learned, complete worksheet tasks and participate in formalised examinations. Educators explained that the need for additional support with the academic elements of the STEM lesson is required for all students with literacy and numeracy skills below national minimum standard for their grade, including some of their Aboriginal and Torres Strait Islander students.

Educators noted that Aboriginal and Torres Strait Islander students, owing to many factors, often perceive STEM education as being reserved for advanced students or students intending on pursuing a STEM career, which may not align with how students perceive themselves. Educators explained the importance of working with Aboriginal and Torres Strait Islander students to reposition STEM education as interesting of its own accord, without strictly linking it to a specific career. Repositioning STEM in this manner could provide students with useful skills for any occupation, according to educators.

Another consideration is the difficulty of STEM competing with sport, art and music, particularly in after school activities. The educators interviewed considered their students tended to have greater interest and (self-perceived) ability in these latter subjects. While educators were referring to their Aboriginal and Torres Strait Islander students, it was noted that this is also a common theme among non-Indigenous students.

While the educators interviewed realise the benefits of integrating Indigenous Knowledge into STEM lessons, they also spoke about the challenge of managing the time and effort required to do so, as this is not currently built into the curriculum. They explained that making these integrations also requires a strong understanding of both the base curriculum and knowledge of Aboriginal and Torres Strait Islander cultures. Educators acknowledged that it is not always possible to secure additional time and resources to create integrated lessons. According to educators this can be more of a challenge in schools with smaller Aboriginal and Torres Strait Islander student numbers.

Educators appreciate that there is no singular Aboriginal and Torres Strait Islander culture or a consistent way in which the culture is practised. Hence, cultural considerations need to be adapted to individual students and local community needs. The research identified four key challenges surrounding educators' awareness of cultural considerations: the risk of cultural appropriation; cultural norms regarding interaction between genders; diversity of Aboriginal and Torres Strait Islander students; and avoiding overemphasis on cultural identity.

Addressing broader education needs

The research also uncovered educators' perceptions of the broader educational needs of Aboriginal and Torres Strait Islander students. Educators acknowledged that many of their Aboriginal and Torres Strait Islander students require additional support with numeracy and literacy. The educators made it clear that for all students, regardless of gender or background, literacy and numeracy skills are critical to progress in most subject areas. According to educators, addressing this need is pivotal to increasing engagement with STEM among Aboriginal and Torres Strait Islander students.

According to educators, another factor that has a broader impact on Aboriginal and Torres Strait Islander student education was inconsistent attendance, a finding which was also identified in the research and literature review by Hansen (2016). Educators reported that absenteeism of Aboriginal and Torres Strait Islander students is a complex issue with multiple factors influencing their attendance. Often, a commitment to their culture and heritage means that student school attendance is impacted. Educators believe their students require greater support to balance their commitments to their culture while remaining engaged with school.

Educators noted the value in undertaking outreach activities to facilitate increased parental and community awareness and understanding of Westernised education and local school initiatives. Parental support and community buy-in were considered critical in encouraging student engagement and achievement. Educators stressed the importance of raising awareness of these broader educational needs to develop more effective differentiated learning strategies for Aboriginal and Torres Strait Islander students.

Understanding challenges faced by Aboriginal and Torres Strait Islander students

The research also identified specific challenges faced by Aboriginal and Torres Strait Islander students, which educators believe need to be considered carefully.

One such challenge which all educators mentioned was understanding the feeling of 'shame'. Interviewees noted that this was commonly experienced among their Aboriginal and Torres Strait Islander students and something that needs to be carefully considered when engaging with students. Educators explained that the feeling of shame often arises when students are singled out in front of peers to answer a question or demonstrate their work. Educators perceive that in these instances some students feel ashamed about their perceived skill levels, their capacity to seek help from others, and their Aboriginal identity.

Educators also stressed the importance of developing trust in the student-teacher relationship. Educators reflected that in their experience, this was especially important for supporting Aboriginal and Torres Strait Islander students to engage and thrive in the classroom. They explained that building trust extends beyond the classroom and requires teacher engagement with families and communities.

Teaching strategies that help build student confidence was highlighted as another critical consideration by educators. In all interviews, it was raised that greater support is required to help counteract feelings of self-doubt for some Aboriginal and Torres Strait Islander students, particularly girls. Some educators put forward ideas of setting up girls-only classes to help them feel more comfortable and build their confidence in the subject before moving into larger classes where they work independently and within a mainstream setting.

Supporting Aboriginal and Torres Strait Islander students with goal setting and raising awareness of the pathways available to them was another key area identified by educators. They spoke about the importance of helping Aboriginal and Torres Strait Islander students realise their potential. While this may be equally important to non-Indigenous students, educators explained that a series of factors including few culturally relevant role models, limited exposure to opportunities available, and challenges around relocating for study or work, reinforce the need for teachers to provide guidance to Aboriginal and Torres Strait Islander students, particularly girls, about what they can achieve and how they may go about doing this.

Educators also spoke about the opportunity to improve Aboriginal and Torres Strait Islander students' cultural capital in Western science through involvement in more activities like outreach programs, excursions, hands-on events and generalised STEM classes. Educators believe these activities can help all students, including Aboriginal and Torres Strait Islander students, build a base level understanding of science, which can help increase students' interest in STEM and encourage them to choose STEM subjects later in school.

Educators emphasised the importance of education and training for teachers to understand the unique challenges experienced by Aboriginal and Torres Strait Islander students. The research identified three broad areas of professional development for educators: a general professional development course for all educators on engaging Aboriginal and Torres Strait Islander students; comprehensive preparation for educators going into schools with Aboriginal and Torres Strait

Islander populations; and in-community training, preferably from Aboriginal or Torres Strait Islander staff at the school, on the specific needs, challenges, opportunities and culture of the Aboriginal and Torres Strait Islander students at the school.

The STEM learning experience of Aboriginal girls

According to educators, gendered differences among Aboriginal and Torres Strait Islander students become more observable in secondary school. Similar trends reported in the *Youth in STEM* research, such as lower confidence in STEM subjects in older students, are also reflected among Aboriginal and Torres Strait Islander girls.

In the *Teachers & Career Advisors 2020/21* research, 40% of educators reported facing challenges in engaging Aboriginal and Torres Strait Islander girls with STEM. When asked to describe these challenges, respondents most commonly mentioned low interest in STEM. Many of the reasons given for this lower interest were linked to educators' perceptions of Aboriginal cultural norms. For example, some educators observed that Aboriginal and Torres Strait Islander girls in their class did not appear to be encouraged by family and community to pursue jobs that are perceived to be for boys / men.

While the core focus of this research was on Aboriginal and Torres Strait Islander girls, some educators suggested that it is the boys they work with who tend to require more support in class. Educators agreed that there are great opportunities to build on Aboriginal and Torres Strait Islander girls' academic achievements with specialist STEM programs. However, they cautioned that it is important to recognise the complex and interconnected set of circumstances that may impede Aboriginal and Torres Strait Islander girls from reaching their full potential in STEM.

Educators noted that while girls may outperform boys at school, this does not necessarily translate to increased interest in STEM subjects. As a result, educators explain that there is a limited pool of Aboriginal and Torres Strait Islander girls intending to enter tertiary STEM education.

Educators spoke about the potential benefits of having girls-only science classes, particularly for hands-on activities. Educators believed girls may feel more comfortable and be more willing to participate when boys are not present. It was also noted that gendered classrooms could be more culturally appropriate for students observing cultural norms.

All educators surveyed spoke about the need for more Aboriginal and Torres Strait Islander women role models in STEM. This was recognised as being critically important to Aboriginal and Torres Strait Islander girls' engagement in STEM and for inspiring their participation in further STEM education and careers. As more Aboriginal and Torres Strait Islander girls pursue STEM pathways, educators look forward to having more Aboriginal and Torres Strait Islander women celebrated as STEM role models.

Resource and program preferences

Educators were asked which STEM resources are most engaging for Aboriginal and Torres Strait Islander girls. Some of the suggestions included video content with relevant Aboriginal and Torres Strait Islander links to STEM (including Aboriginal examples in the curriculum); having Aboriginal and Torres Strait Islander support staff in classrooms; and professional development to build teacher

confidence in STEM and Aboriginal and Torres Strait Islander culture and to improve teacher capacity to facilitate STEM pathways for Aboriginal and Torres Strait Islander girls.

In conclusion

This report's findings uncover deep insights into the experiences and challenges of a small sample of educators teaching STEM to Aboriginal and Torres Strait Islander students. The insights provide valuable information for increasing engagement with STEM among Aboriginal and Torres Strait Islander girls, and for all Aboriginal and Torres Strait Islander students.

This research, along with the *Teachers & Career Advisors 2020/21* research, complements the insights uncovered through the *Youth in STEM* study by providing a deeper understanding and much-needed context around Aboriginal and Torres Strait Islander students' perceptions of STEM.

Moving forward, the Department of Industry, Science, Energy and Resources (DISER) will continue tracking from the experiences and perceptions of STEM of young people and their key influencers, with surveys to recur for each cohort biennially. The next round of research will be conducted in 2021 and will be the third wave of the Youth in STEM research.

Notes on interpreting the report

Aboriginal and/or Torres Strait Islander – As the sample did not include any participants (educators) identifying as Torres Strait Islander, this report makes references to participants as ‘Aboriginal’ and not ‘Torres Strait Islander’. When speaking about students, the report makes references to ‘Aboriginal and Torres Strait Islander’ or ‘Aboriginal or Torres Strait Islander’. References of external studies use the terminology used in that specific study.

When educators have used other terms to refer to Aboriginal and Torres Strait Islander people, such as 'Indigenous', these alternative terms have been included verbatim.

Acknowledgement of outsider's perspectives – This report acknowledges that the experiences shared by educators in this report are taken from their personal observations, based upon their own frameworks and worldview. As the majority of educators interviewed for the project are not Aboriginal or Torres Strait Islander people, we recognise that these observations are made from an outsider's perspective, as is the researchers' own analysis.

Convenience sampling and snowballing – Convenience sampling is a type of non-probability sampling that involves the sample being drawn from that part of the population that is close to hand. Snowballing is a non-probability sampling technique where existing study subjects recruit future subjects from among their acquaintances. These techniques were used for the recruitment of this project to overcome the recruitment challenges and achieve the target number of interviews required. While efforts were made to ensure the sample was representative of this niche audience group, these sampling approaches did not allow for fine control for strata such as state, location, and school type. Consideration is given to this in the analysis of results. Participation in the research, and therefore the inferences made from the interviews with participants, is skewed towards secondary school educators and the states of Western Australia and Northern Territory, where there are a higher proportion of Aboriginal and Torres Strait Islander students within school populations.

Educators – This term is used throughout the report to refer to all 17 participants who participated in the research from across the education sector. For instance, the sample includes educators who work in a student support role, as well as teachers.

Generalisations - An important consideration when reading this report is that this research aims to pull together common perspectives among the 17 educators interviewed. In doing so, participants' viewpoints have been summarised, and a narrative has been constructed to convey the findings. The report is in no way attempting to make generalisations of Aboriginal and Torres Strait Islander people, customs, laws or traditions.

Interpreting qualitative data – In reading this report, it is important to recognise that qualitative research does not aim to be statistically representative of the target audience but provide deeper insight into a topic by allowing individuals to share their personal stories and experiences.

Recognition of Aboriginal and Torres Strait Islander cultural diversity – This report acknowledges that there is no singular Aboriginal and Torres Strait Islander culture within Australia and that the Aboriginal and Torres Strait Islander community is made up of more than 500 unique language groups with different languages and cultural practice. Throughout the report, some references are made to Aboriginal and/or Torres Strait Islander people collectively. Doing so is not intended to overlook the vast cultural diversity of Aboriginal and Torres Strait Islander people, and the findings

of this report may not apply to all Aboriginal and Torres Strait Islander people. Within this report, verbatim comments from Aboriginal participants are highlighted as such to assist the reader in understanding which comments are made from an external perspective versus those from the Aboriginal and Torres Strait Islander community.

Recruitment challenges – The research team encountered significant challenges during the recruitment of research participants. Educators who are both STEM specialists and teach a large number of Aboriginal and Torres Strait Islander students are a niche target audience within the broader education sector. As a low incidence audience within typical research recruitment panels, using typical recruitment methods was not viable. COVID-19 was an additional burden on their time as some educators were also busy preparing teaching materials and teaching remotely. During the recruitment phase, several organisations specialising in STEM and/or Indigenous education expressed positivity towards the research but declined to participate due to the pressure educators were under due to COVID-19.

Specific cultural norms – With specific regard to the Northern Territory, the educators' experiences were often based on time spent teaching in community with students who maintained strong links to traditional Aboriginal cultures. The experiences shared by these educators, particularly regarding cultural norms, may not apply to Aboriginal and Torres Strait Islander students from all parts of Australia.

Teachers – This term is used when the references are made specifically about educators whose role involves classroom teaching within a primary or secondary classroom setting.

Verbatim quotes – Throughout the report, verbatim responses from the interviews have been included. These responses are written in italics and centred in the page. Each response is followed by a reference to the interviewee's state/location, school level and Aboriginal and Torres Strait Islander background (where applicable).

Aboriginal/Indigenous knowledge - References to the term 'Aboriginal knowledge' pertain the citations of research conducted by Jenet Jeniffer Hansen (Examining the Effectiveness of Including Aboriginal Perspectives to Engage Aboriginal Students in High School Science). For all other findings related to the primary research conducted for this report, we use the term 'Indigenous knowledge' a term used to cover a range of knowledge held and continually developed by Aboriginal and Torres Strait Islander people.

Project background

Background

Building on from the [Youth in STEM Research](#), Department of Industry, Science, Energy and Resources (DISER) has continued the collection and reporting of attitudes and perceptions of young Australians towards STEM. The objective of the research is to understand more about the perceptions of young Australians (12 to 25-year-olds) towards STEM skills and careers, particularly those of girls and young women.

With the previous Youth 2019/20 research showing that girls' perceptions of, and engagement with, STEM are strongly influenced by parents, teachers and career advisors, DISER made the decision to expand the research to provide insights into the attitudes and perceptions of these key influencer groups. From 2020 onwards, the *Youth in STEM* research will track both the 12 to 25 year-old group of young people and the influencer groups of parents and educators. Each survey is conducted biennially as below:

- 2019: People aged 12-25 ([completed report](#))
- 2020: Parents ([current report](#))
- 2020: Teachers & Career Advisors ([companion report](#))
- 2021: People aged 12-25
- 2022: Parents
- 2022: Teachers & Career Advisors

The studies focus on any differences and similarities in data outcomes based on gender, as well as investigating the intersection of other demographics, which may further influence STEM engagement and participation.

This research report is a qualitative extension of the *Teachers & Career Advisors 2020/21 research* to provide a deeper insight into the experiences of educators teaching STEM, any additional challenges seen for Aboriginal and Torres Strait Islander students, particularly girls.

Objectives

The overarching objective is to understand the experiences of those teaching STEM to Aboriginal and Torres Strait Islander students, with a specific lens on uncovering gender differences within this cohort.

Within this objective, there was focus on:

- The specific needs and experiences of Aboriginal and Torres Strait Islander girls / women when engaging with STEM subjects:
 - Cultural impacts
 - Socioeconomic impacts
 - Links between culture and STEM concepts / curriculum
 - Availability of role models and career pathways
 - Successful strategies for engaging girls / women in STEM.
- Awareness and use of support programs / services.
- Experiences of how to better engage girls / women with STEM curriculum.

Methodology

YouthInsight conducted 17 one-hour in-depth interviews with educators who provide STEM education to Aboriginal and Torres Strait Islander students. Interviews were conducted via video conferencing software, where internet speeds were capable of facilitating video conferencing and via phone for educators located in areas with limited internet access.

A consistent discussion guide was used for all interviews to ensure the conversation aligned with the objectives of the project. However, there was a high level of deviation from the discussion guide as influenced by the natural flow of conversation, the teaching position of the interviewee, the career experience and trajectory of the interviewee and the specialisation of the interviewee in topics such as STEM, Aboriginal and Torres Strait Islander culture and / or teaching Aboriginal and Torres Strait Islander girls.

Sampling

Participants in the research were sourced through multiple channels using a convenience sampling methodology:

- Referrals through professional networks and personal contacts of the research team from an Aboriginal and Torres Strait Islander background and/or who work primarily with Aboriginal and Torres Strait Islander communities.
- Invitations to participate in the research were emailed to schools identified as having a high population of Aboriginal and Torres Strait Islander students.
- Invitations were emailed to schools located in towns / suburbs with a high proportion of Aboriginal and Torres Strait Islander students.
- An invitation to participate in the research was posted to the STEM Australia Facebook group.

- A professional research recruitment supplier, Qualitative Recruitment Australia (QRA), was contracted to recruit participants using their LinkedIn profiles and location.

To qualify to partake in this research, respondents must have satisfied the below criteria:

- Regularly engage with primary or secondary Aboriginal and Torres Strait Islander students in either a teaching or student support role.
- Have substantial experience working with Aboriginal and Torres Strait Islander students and be willing / able to speak to the specific behaviours of Aboriginal and Torres Strait Islander girls within the school setting.
- Agree to share insights about their experiences engaging with Aboriginal and Torres Strait Islander students.
- Educators must also have experience with teaching STEM subjects or be able to speak about their observations of students' experiences relating to their STEM education.
- While not a strict requirement, educators who identified as Aboriginal and Torres Strait Islander themselves were given priority as participants in the research.
- Be available for a 60-minute phone or online conference interview.

Sampling limitations

As traditional recruitment methods were not viable due to the niche group of educators required for this research and the challenges faced by educators globally due to the pandemic limiting their availability, convenience sampling was the most appropriate method for recruitment of educators. This involves the sample being drawn from the population that is close to hand. Snowballing was also used, whereby acquaintances or colleagues of existing participants were approached to take part.

While efforts were made to ensure the sample was representative of this niche group of educators, these sampling approaches did not allow for fine control for strata. Most notably, no Torres Strait Islander educators participated in the research and not all states were represented (there were no interviews among educators in Queensland or South Australia). These sampling limitations should be acknowledged upon interpreting the findings of this report.

Quantitative data

Quantitative data relating to Aboriginal and Torres Strait Islander students was extracted from the survey used for the accompanying *Teachers & Career Advisors 2020/21* report.

Table 1: Proportion of Aboriginal and Torres Strait Islander students within surveyed educators' schools.

Q. What is the proportion of Aboriginal and Torres Strait Islander students within your school? (SC).

PROPORTION	Total %	Total sample
Less than 10%	63%	509
10%	15%	105
20%	8%	53
30%	3%	19
40%	1%	7
50%	1%	5
Over 50%	1%	6
Don't know	8%	64
Net proportion	Net %	Net sample
NET: 10%+	29%	195
NET: 20%+	13%	90
NET: 30%+	5%	37

Base: All educators excluding those in tertiary education – 768.

In the *Teachers & Career Advisors 2020/21 report*, almost a third of the educators (29%) reported their school population being made up of 10% or more Aboriginal and Torres Strait Islander students. These educators and those whose schools have specific support programs for students from Indigenous communities (55%) were then asked further questions around their perceptions of engaging Aboriginal and Torres Strait Islander students in relation to STEM.

Existing research

Throughout this report, references have been made to "*Examining the Effectiveness of Including Aboriginal Perspectives to Engage Aboriginal Students in High School Science*" by Jennet Jeniffer Hansen, Curtin University, 2016.¹ Hansen's thesis is a recommended reading in conjunction with this report.

¹ <https://espace.curtin.edu.au/handle/20.500.11937/57364>

"Improving educational outcomes of Aboriginal and Torres Strait Islander girls", published by The Smith Family in 2014, is also referenced in this report. It is likely to be of interest to readers of this report. The report is [available for download](#)

Participant profile

Table 1: Sample composition.

SAMPLE COMPOSITION	PARTICIPANT NUMBERS
Total	17
Gender	
Man	6
Woman	11
Main role	
Classroom teacher	13
Aboriginal program delivery	4
STEM qualifications	
Obtained prior to teaching	5
No specific STEM qualification	12
Year levels taught	
Primary	4
Secondary	13
Aboriginal or Torres Strait Islander	
Aboriginal	5
Torres Strait Islander	0
Non-Aboriginal or Torres Strait Islander	12
Location	
Northern Territory – Remote/regional	4
Northern Territory – Metro (Darwin)	5
Western Australia – Remote/regional	0
Western Australia – Metro (Perth)	4
New South Wales – Remote/regional	2

SAMPLE COMPOSITION	PARTICIPANT NUMBERS
New South Wales – Metro (Sydney)	0
Victoria – Remote/regional	0
Victoria – Metro (Melbourne)	2
Region - metro / regional	
Regional area or rural / remote area	7
Capital city / major metropolitan area	10
Socioeconomic status of the school	
Lower SES (Decile 1 - 5)	8
Higher SES (Decile 6 - 10)	9
School setting	
Specialised	0
Mainstream	17
Jurisdiction of school	
Government	11
Independent or other	5
Catholic	1

The demographic profile of the educators interviewed for this research reflects the profile of educators from the *Teachers & Career Advisors 2020/21* survey who reported their school population being made up of 20% or more Aboriginal or Torres Strait Islander students.

These educators were more likely to be working in regional/remote areas compared to educators at schools with a population of less than 20% Aboriginal and Torres Strait Islander students (65% vs 39%) and in lower socioeconomic areas (80% vs 47%).

They were also more likely to be working in government schools (79% vs 63%) and in specialised school settings as opposed to mainstream schools (30% vs 10%). One in ten of these educators (10%) identified as Aboriginal and Torres Strait Islander themselves compared to only 1% of other educators. There were no significant differences in gender between the two educator groups.

Table 2: Teachers & Career Advisors 2020/21 sample. Including a breakdown of schools with higher and lower Aboriginal and / or Torres Strait Islander student populations.

Educator profile - Teachers & Career Advisors 2020/21	Total	Over 20% Aboriginal or Torres Strait Islander students	Less than 20% Aboriginal or Torres Strait Islander students
Total sample	844	90	678
Gender			
Man	15%	9%	14%
Woman	85%	91%	86%
Jurisdiction of school			
Government	65%	79%	63%
Independent or other	16%	14%	16%
Catholic	19%	8%	21%
School setting			
Specialised	13%	30%	10%
Mainstream	87%	70%	90%
Region - metro / regional			
Regional area or rural / remote area	40%	65%	39%
Capital city / major metropolitan area	60%	35%	61%
Socioeconomic status of the school			
Lower SES (Decile 1 - 5)	50%	80%	47%
Higher SES (Decile 6 - 10)	50%	20%	53%
Aboriginal or Torres Strait Islander			
Yes	2%	10%	1%
No	96%	89%	98%
Prefer not to specify	1%	1%	1%

Research participant considerations

Concerns with the focus on girls – Based on educators' understanding of and experience with the education outcomes of Aboriginal and Torres Strait Islander students², some believed that focusing on Aboriginal and Torres Strait Islander girls was not appropriate when Aboriginal and Torres Strait Islander boys are also in need of assistance. These educators want to see all Aboriginal and Torres Strait Islander students lifted, and their engagement with STEM encouraged, not just the girls.

Making generalisations – This report aims to pull together common perspectives among the 17 educators interviewed. However, some educators highlighted that their own experiences varied across different roles, locations, schools and year levels. These educators were hesitant to provide generalised statements about Aboriginal and Torres Strait Islander girls.

Connection to culture is highly varied – The participants noted that their experiences showed the strength and expression of cultural identity can be quite varied. These are impacted by a wide range of factors including many which are driven by ongoing experience and intergenerational trauma. This was another reason for the concerns raised about making generalised comments about Aboriginal and Torres Strait Islander girls.

"Some of my kids are really connected to culture. The ones from the Islands or Arnhem Land still speak in language and go hunting. Kids from the towns are a bit more Westernised. Another kid is a foster kid, so her connection is split."

-Darwin, Secondary

"If they lack a cultural connection, it can be quite embarrassing for them. I had one girl say to me, 'Sister [redacted], I don't belong here because I'm too white'. It took me a while to convince her that she was Aboriginal and that she needs to be proud of who she was. [Compared with Perth] the culture in NT is extremely strong because they still have a traditional connection, they know where they belong and who they belong to."

-Perth, Secondary (Aboriginal)

² <https://ctgreport.niaa.gov.au/content/closing-gap-2020>

STEM opportunities and considerations

Opportunities

Appeal of STEM to students

The practical science, technology, and engineering classes are highly appealing to many students because of the high level of interaction involved, according to the teachers interviewed. The hands-on nature of these classes taps into students' natural curiosity about the world and their interest in how things work. Teachers highlighted that within these subjects, it is relatively easy for them and their students to make connections to the real world. This is true of all students, including Aboriginal and Torres Strait Islander students.

Teachers also find that these subjects have a “wow” factor they can introduce through experiments and demonstrations, which differentiates them from other subjects.

“Kids naturally love science and are curious about the world. I think the hooks which work particularly well for Indigenous kids (well, they work on all kids, really) is something with a bit of wow factor when they walk in the room. For example, the candle sucking the egg into the bottle demonstration. Kids want to know what's going on. They love a demonstration.”

-Darwin, Secondary

“I think PE, Digital Technologies and Science are the most engaged-with classes. It's because it's hands-on. There's robots, iPads, Lego... So on a normal day, they're pretty engaged.”

-Alice Springs, Secondary

“The kids have loved it [STEM subjects] since the beginning. They love the making side of it, they love that it's a real-life problem. It makes sense to them in real life, it's something they can care about, and it's relevant to them.”

-Darwin, Secondary

A challenge reported by teachers is taking the engagement observed in the exciting, hands-on activities and pulling that through to the more academic aspects of the class, where there is a greater need for students to read, think and write about what they have learned. It was perceived by the educators interviewed that Aboriginal and Torres Strait Islander students may require more support in this transition from hands-on aspects to academic aspects.

“The STEM kids love building stuff, they hate doing any sort of planning beforehand or reflection or writing afterwards.”

-Darwin, Secondary

Using extra-curricular programs to build interest

Several teachers mentioned the use of extra-curricular science programs and activities to build student interest in STEM. These programs tend to be very hands-on and operate differently from typical classes. There is less focus on instruction and examinations and more of an emphasis on learning through doing and experimentation, an approach which, according to educators, is perceived to align better with many Aboriginal and Torres Strait Islander students' way of learning.

The teachers suggested that teaching STEM in this way aligns more with the scientific method, allowing students to direct their learning and be led by their innate curiosity and problem-solving skills. Students involved in these types of initiatives may be more likely to get involved in STEM competitions.

"I'm running the subject as an after-school class. It's all hands-on activities, and each one takes a few weeks. There's minimal teaching. It's more about problem-solving and letting the kids find the solution themselves. It's about getting them to try things and then returning each week to continue to test and learn."

-Darwin, Secondary

"At the time, there was a bridge-building competition with Oricon and a robocup that kids were interested in (as an afterschool activity). I thought this should be a subject. I put a proposal to the board expecting there to be a lot of pushback, that they wouldn't support it, only to be told to start it next year. That left me having to create a curriculum from scratch. I decided the STEM elective should cover robotics, as the kids usually haven't got any experience with that. The focus is on "computational thinking" where you take a big problem and break it down into small little bits to come to a solution."

-Darwin, Secondary

Teaching STEM in an active manner

Teachers were emphatic that STEM education should not be limited to sitting in a classroom learning from a book. They do not feel that STEM, particularly the science, technology and engineering component of STEM, can be taught successfully unless students are physically involved in the learning activity.

"I want them to see that it's just not all sitting at a desk with a, you know, a textbook. And I think we haven't done a good enough job in explaining what STEM is to our kids and showing them different jobs and really cool jobs that can go with STEM."

-Regional NSW, Secondary (Aboriginal)

“I gave feedback to ACARA on the new curriculum that there's too much theory here. Take a subject out and put in some more prac work. Get the kids doing the real science. Hands-on is more impactful because they're learning for themselves, experimenting for themselves. The lab tech jokes I'm the largest user of plasticine in the whole school. That's because when you create a model and then have to explain it to someone else, you really understand it. You get excited by it. Surface learning, by rote is not exciting, and you don't deeply understand it.”

-Darwin, Secondary

“Some of the Indigenous boys redesigned the chicken coop to be more functional. It's time out of the classroom, but it's engaging them with something they're passionate about. You need to think about teaching them skills in innovative ways. The kids wouldn't have realised they're learning engineering, but that's what they were doing.”

-Melbourne, Primary

Educators explained that developing hands-on, interactive activities as a way to teach the STEM curriculum requires additional time and planning compared with textbook-based learning. Many of the educators said they are prepared to put in the additional effort to teach in this way as they believe it is more engaging and impactful for students.

Educators interviewed would like to see a greater proportion of STEM concepts and subjects delivered in a more interactive and hands-on way, as they believe changing the way STEM is taught will better engage students.

“It's worth going through the risk management requirements to get some dry ice in if it means I can start a lesson with a demonstration that will get them excited and interested. The kids are more likely to get involved in the study side if there's a demo/something active before. Kids learn when they're engaged. It's not just about fun, it's about piquing curiosity. It's also heaps of fun for me.”

-Darwin, Secondary

The educators also suggested that a more hands-on approach may open up STEM to a wider pool of students with a more diverse set of talents. It may also improve accessibility for students who require additional support with numeracy and English literacy and therefore experience difficulty engaging with textbook-based learning methods.

“The program allows a student who thinks differently and whose focus is on doing an activity (rather than getting a mark in an assessment) to succeed. Students with learning difficulties (such as dyslexia, ADHD) can participate.”

There's nothing that needs to be completed in a set time. There's no succeed or fail. Next week you come, and you continue, and you keep going. It's about them developing their own ideas and able to work at their own speed. That said, it's also good for kids who want to be extended.”

-Darwin, Secondary

Teacher confidence

The interviews emphasised the importance of ensuring that teachers feel confident in teaching their subject matter. The educators explained that taking a hands-on, interactive approach to the STEM classroom often requires a highly knowledgeable and confident teacher in the subject matter. Without the knowledge and confidence, teachers are likely to stick closely to the prescribed curriculum and textbook. They are unlikely to develop unique activities of their own or adapt the subject matter to their students' specific needs. Educators believe that ensuring teachers have the resources and support they need to feel confident in teaching STEM is a crucial step in increasing engagement.

“You need teachers skilled in their teaching area because they're comfortable with the basics. They are better at simplifying the concept without losing the concept. How do you reduce a complex topic to younger students if you don't know the underlying science?”

-Darwin, Secondary

“I think it's very important that STEM teachers have a science degree because the syllabus is becoming more complex. Science areas are becoming more industrial-based, and it's useful, as a teacher, to have a deeper understanding of those areas specific to undergrad degrees in science and maths as it enables you to connect the theory to the industrial side of things. It also helps to bring a more diverse set of perspectives and examples into the classroom.”

-Darwin, Secondary

“A lot of teachers don't have confidence in teaching STEM, so they come to me for advice. I break down the concepts for them simply and help them to make sure they're pitching the content to the right level. They have to come to me as there's a lack of clear guidance in the curriculum, and in the upper years it jumps and extends too quickly.”

-Melbourne, Primary

“Resources aren't the shortfall - it's teacher confidence. You can teach STEM with a piece of paper, you don't need a \$600 engineering kit if you know the underlying science.”

-Melbourne, Primary

Integrating STEM and Indigenous Knowledge

The educators interviewed had mixed opinions and experiences regarding the integration of STEM curriculum and Aboriginal culture. There is positivity and an eagerness to include more Indigenous Knowledge in the classroom as teachers recognise natural overlaps between culture and STEM education in many subjects. However, some teachers interviewed, found it more difficult to make a connection in areas where the connection is less obvious and / or there is a lack of teaching materials to support them.

“Collaboration, communication, innovation, creativity - are often part of Indigenous mindsets. Seeing resources and using them to their advantage is an important aspect of STEM. The general curiosity is something that is there.”

-Darwin, Secondary

“Our students are all Indigenous, and we try wherever possible to engage with STEM and all subjects by relating it to stories, working on country, visiting with local Elders, visiting with local ranger groups, comparing their knowledge with other mobs, hands-on wherever possible.”

-Rural/remote WA, Secondary

Educators highlighted that they tend to find it easier to encourage Aboriginal and Torres Strait Islander students' engagement with biology, health and environment subjects. They reported finding it easier to integrate Indigenous Knowledge within these subjects. On the other hand, educators reported that Aboriginal and Torres Strait Islander students often require more support with some of the STEM subjects perceived by students as “harder” such as chemistry, physics and advanced maths, subjects where the educators themselves often find it difficult to introduce Indigenous Knowledge.

“I've noticed the Aboriginal girls don't go into the hard sciences, and I don't know why. They are mostly interested in healthcare and biology. I think there's a "perceived accessibility" around biology.

-Regional NT, Secondary

“There's a push at our school to take subjects that fit with your career plans. There haven't been girls that want to go into STEM careers that require physics or chemistry. I had an Indigenous girl doing chemistry last year, but she didn't continue on into year 12.”

-Regional NT, Secondary

“Teachers don't teach Indigenous culture alongside Western because it's not in the syllabus. There are certain topics that can easily be extended, but other content is specifically European content. It was easy to extend the ecology part of the course with Indigenous topics, but part two of the course, we did rocketry, and there's nothing Indigenous in that.”

-Darwin, Secondary

Improving Aboriginal and Torres Strait Islander student engagement in STEM

In both the interviews conducted for this project and the study undertaken by Hansen (2016), it was noted that integrating Indigenous Knowledge and Aboriginal ways of learning into the STEM classroom improves the likelihood of engagement among Aboriginal and Torres Strait Islander students.

The research by Hansen (2016) involved observing a group of 25 year nine Aboriginal students, of both genders, from a school in Perth. The results indicated that embedding Aboriginal perspectives and cultural knowledge into the science lessons increased the emotional and behavioural engagement of the Aboriginal students significantly and also led to a deeper understanding and valuing of Aboriginal culture for all students. The analysis identified four main reasons for the change in student engagement:

- increased sense of connectedness.
- improved confidence in Aboriginal students.
- appeal to Aboriginal students' learning strengths.
- changing perceptions about learning science held by the Aboriginal students.

These findings align with the insights uncovered in this research. Educators highlighted that Aboriginal and Torres Strait Islander students tend to be more confident in classes in which Indigenous Knowledge is integrated as it builds from their existing knowledge. Entering the topic with existing knowledge is likely to make Aboriginal and Torres Strait Islander students more confident in their abilities and may help to overcome any feelings of shame and self-doubt that they may experience.

“This year, we did spear throwing as part of science through CSIRO. I got them in groups to do a mind map about spears – the types of spears, the uses of spears. They then took the spears they had made and put them on the board to talk about it. I used this to highlight that they already know a lot about spears, that they're smart.

-Darwin, Secondary

Educators highlighted that identifying the STEM related skills and knowledge Aboriginal and Torres Strait Islander students already hold and then using this as an entry point into new subjects and STEM learning areas is often a successful approach for building the confidence of Aboriginal and Torres Strait Islander students.

“I say to my kids, you may not speak English very well, but you speak five languages and have a huge amount of knowledge. If I get lost in the bush, I want to get lost with you, not those kids over there. You need to build from the science skills they do know: Survival, spears, the first mining people being Aboriginal when they used rocks and tools. I talk to them about Indigenous medicine: How did they figure it out? They must have tested it? That makes Aboriginal people the first scientists. You can be a scientist too.”

-Darwin, Secondary

In addition to leveraging existing knowledge, demonstrating relevance to Aboriginal and Torres Strait Islander students may be another effective strategy for increasing engagement, according to educators. According to educators, when students have a personal interest and connection to the topic, they often pay more attention to it, understand it more deeply, and retain the knowledge afterwards. Teachers who had taken the time to learn their students' interests and design their classes around these interests reported seeing better results from their students.

“We set up a café this semester, and the kids had to design and develop the logos and brochures. I used this to teach literacy and numeracy rather than putting the literacy and numeracy at the front.”

-Remote NT, Secondary

“It's all about making it relevant to them. Don't talk about "being an engineer", that's like saying flying to the moon. What's relevant to them in science is biology, their bodies, the environment, growing things, bush tucker, water systems, how they use the land, and then you can convert that into something current such as environment, climate change and then link that to technology. Engineering is a scary word. It's too big.”

-Regional WA, Primary

“I had a year 12 Indigenous girl who I had a hard time engaging in chemistry. Her dad is a mechanic, so I snuck that in. She remembered that stuff more than anything delivered out of the textbook.”

-Regional NT, Secondary

“They have a different world view to mainstream schools. A lot of them have only ever lived in their community, so you have to relate everything back to that. There’s no point relating things to anything overseas or even interstate. If you get outside of their sphere of knowledge or worldview, it quickly becomes irrelevant.”

-Alice Springs, Secondary

“They really like automotive, so I try to link robots to automotive. We also do a lot of weather stuff and GIS and satellite imagery, and that can be related back to land and country.”

-Alice Springs, Secondary

Educators also stressed that Indigenous Knowledge should be presented on an equal footing with Western knowledge. According to educators, to be most effective, concepts should be taught without the assumption that the Western view is the primary or correct view and instead present the Indigenous alternative as equally valid.

“I always make sure I’m very clear that I’m presenting the Western perspective of something, and I’ve had students ask which is correct, and I make it clear that there is more than one way of knowing something.”

-Regional NT, Secondary

“I’ve worked hard to have the appropriate Aboriginal terms of engagement with the curriculum - not just doing a colour the flag activity, but when teaching seasons also teaching the Aboriginal seasons. The kids have also been learning about murnong (a root vegetable) and how they [local Indigenous people] used to dig for it. I was then able to link this back to sustainable farming.”

- Melbourne, Primary

Increasing engagement with STEM by building Indigenous Knowledge and making the teaching more relevant to Aboriginal and Torres Strait Islander students also has a positive effect on behaviour, according to the educators. They explained that increasing the confidence and involvement of students and thereby decreasing shame and self-doubt is likely to improve Aboriginal and Torres Strait Islander students' behaviour in class. Educators see this as an added and very important benefit of changing their approach to teaching STEM to Aboriginal and Torres Strait Islander students.

“Behaviour in the classroom is a really big focus for us as there is generational trauma which leads to behaviour issues. Our 5/6s work in the class, and then we take some time out to work in the garden as part of behaviour management. A physical activity and engaging with the environment helps to build relationships with the kids, but it also makes them easier to settle.”

-Melbourne, Primary

“Maths has become their new favourite subject, and that has opened up their ability to access other STEM subjects. I’ve got a real passion for teaching maths, and now that they’re getting it. They are starting to feel they are clever. The girls in this class, the behaviours were really extreme, other teachers often put them in the too-hard basket, and now they’ve really calmed down.”

-Darwin, Primary

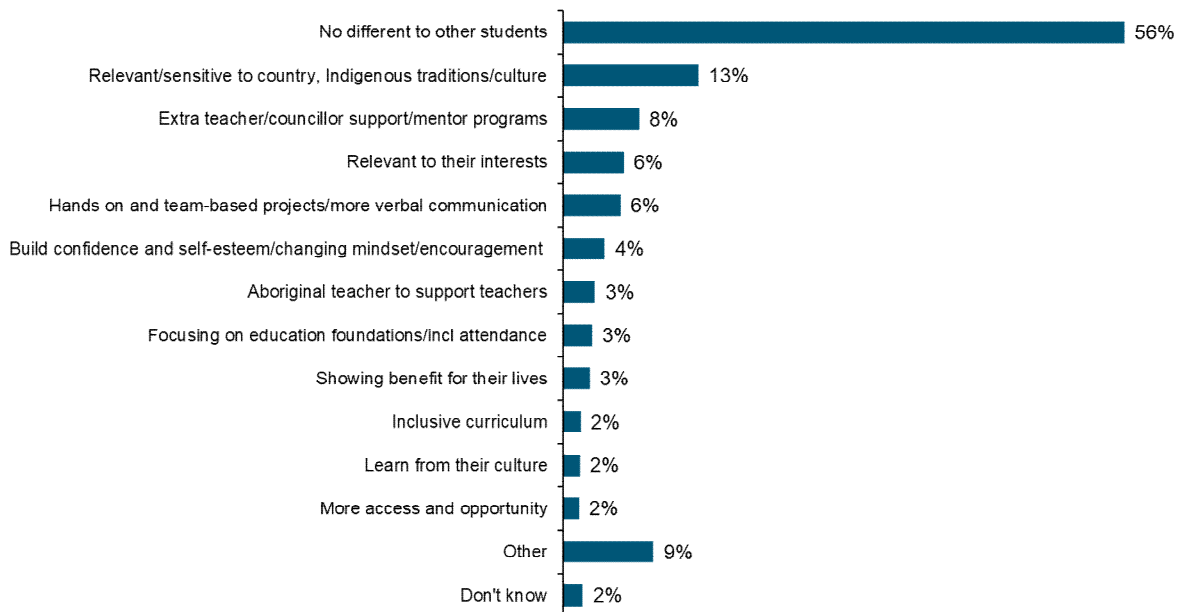
Similar findings were also reflected in *the Teachers & Career Advisors 2020/21* survey, where the most common strategy for engaging Aboriginal and Torres Strait Islander students with STEM was by making lessons more relevant to Aboriginal and Torres Strait Islander traditions and culture.

The survey uncovered a variety of approaches of how educators link STEM content and Aboriginal culture, including consultations with Aboriginal and Torres Strait Islander leaders, providing STEM concepts from an Aboriginal perspective and discussing the relevance of STEM to Aboriginal culture.

Another key area of focus identified in the survey was providing additional support for Aboriginal and Torres Strait Islander students either themselves or via counsellors or support programs.

Figure 1: Strategies for engaging Aboriginal and Torres Strait Islander students with STEM subjects.

Q. What is your strategy for engaging Aboriginal and Torres Strait Islander students with STEM subjects? Is this different to other student groups or the same? – Coded



Base: educators with experience with Aboriginal or Torres Strait Islander students – 267.

Below are some of the quotes from educators who completed the survey:

“Try and link the problem / task to their culture or the world around them as much as possible to ensure they make a connection to what they are doing. Same as other student groups.”

-Regional NSW, Primary

“Engaging Aboriginal Support workers to help find topics that provide motivation and engagement.”

-Metro SA, Secondary

“Making the activities meaningful and relevant to their lives. Also, lots of hands-on experiences. This is the same for all students.”

- Regional VIC, Primary

Cross-cultural benefits

According to the educators, the benefits of integrating Aboriginal culture into the general curriculum are not limited to Aboriginal and Torres Strait Islander students. The benefits to the broader student population reflect the objectives and methodology of an integrated approach: presenting alternative views on a topic in a hands-on learning environment. Delivering a curriculum that presents two different forms of knowledge in a hands-on, interactive manner engages all students and fosters reconciliation and cross-cultural communication.

The interviews highlighted that cross-cultural communication creates respect for Indigenous Knowledge from students from non-Indigenous backgrounds. According to educators, this approach places Indigenous Knowledge on equal footing with Western knowledge. Positioning an alternative cultural view as equal to the Western view creates a space where students from culturally and linguistically diverse backgrounds can feel safer and more welcome to share their own cultural knowledge.

One educator gave a simple example of this: teaching the local Aboriginal seasons alongside the European seasons.

“One of our topics we went through was looking at the interactions of things in our local environment and then linking that into Noongar names if we could find Noongar names for them. That was really interesting as it was engaged with by the Indigenous kids and non-Indigenous kids within that class. We also have a lot of recent arrivals, kids from migrant backgrounds, who were looking at two different cultural representations of the same thing and then bringing their own cultural background to the conversation. It put all the different representations on an even footing. It's not here's the Western name and here's the others, but here's all the names, and they're equally valid.”

– *Perth, Secondary*

“Having all the signs around the school in language is amazing. It helps to break down stereotypes by having day to day contact with Aboriginal families and for Indigenous students to have their culture so celebrated is phenomenal.”

–*Melbourne, Primary*

“There hasn't been much pushback [from non-Aboriginal students], and my Indigenous students have been really receptive to that sort of content. In year 12 organic chemistry, all the contributions to our medicines industry from Aboriginal Australia I include. If there's ever anything about Aboriginal events on this day in history, I'll always go into them in extra detail. Any time I can frame

things in Aboriginal understanding, it goes down well. Even with non-Aboriginal students.”

-Regional NT, Secondary

Hansen’s (2016) secondary research also identified that embedding Aboriginal knowledge and perspectives has the potential to:

- Improve the academic performance of Aboriginal students;
- Improve the attendance and participation of Aboriginal students;
- Build better relationships between Aboriginal and non-Aboriginal students;
- Enhance the social identity of Aboriginal students;
- Increase interaction with the local community, parents and Elders;
- Improve the engagement of Aboriginal students.

“I felt good that our culture was not laughed at or made to look silly but was important in science. Sometimes you get teased and bullied for being Aboriginal, you know you get called names Black this or that, but instead of feeling shame, we felt proud to see the white kids learning our stuff and listening to true stories about what really happened to Aboriginal people and how they still remain proud in their culture and scientists today are using Aboriginal knowledge to help save the planet.”

- Student feedback following a STEM class with integration of Aboriginal knowledge (Hansen, 2016).

The younger the integration, the greater the impact

The educators who are already successfully integrating Indigenous Knowledge into their classrooms and seeing the positive benefits suggested the next step is to develop this content and deliver these interventions for younger grades. Educators hope that building Indigenous Knowledge into more junior classes will help engage young Aboriginal and Torres Strait Islander students with STEM and build their confidence in this area to persist with STEM education through secondary school.

“Part of my role is finding the link from culture to put into STEM for teachers and students. Once I can get that link for teachers and for the students, they are more likely to engage in the lesson. If we can pick them up in seven and eight and create those links and put those perspectives in then, we're seeing a trend that the kids will then pick those subjects as they get older. So it's about working with the early years to make connections with culture, and then hopefully they'll engage with STEM in 10, 11, 12, and carry that on.”

-Regional NSW, Secondary (Aboriginal)

Community partnerships

The educators from schools running successful Aboriginal engagement programs and who have integrated Indigenous Knowledge into their curriculum highlighted the importance of community

partnerships to their success. The interviews highlighted that strong community partnerships enable the sharing of skills and knowledge between teachers, Aboriginal and Torres Strait Islander support staff and local Aboriginal and Torres Strait Islander Elders.

According to the educators, Aboriginal and Torres Strait Islander education support officers or other support staff are a crucial component in this relationship as they are the link between community and teachers. They are best positioned to assist with collating knowledge, applying Indigenous Knowledge and integrating it with the curriculum.

Educators in schools with skilled Aboriginal and Torres Strait Islander support staff reported that the integration of culture into the classroom is easier. Having skilled Aboriginal and Torres Strait Islander support staff who can assist with the development of teaching materials, activities and lessons that integrate Indigenous Knowledge may allow teachers to focus their efforts on other areas. Aboriginal and Torres Strait Islander support staff may also play an important role in guiding teachers towards what may or may not be culturally appropriate.

“We have a full-time Aboriginal teaching aide, an Aboriginal youth worker, three Special Education Support Officers and there’s a support staff in the high needs area who is an Aboriginal woman who also does a bit of culture and things.”

-Regional NSW, Secondary (Aboriginal)

“We've got an Aboriginal teacher here at the school full time, so we have the availability, and she's able to work well with the teachers in all subjects. She delivers lessons in history, geography, English. We've got that available to the students here, and that works well because then she's able to modify the lesson with the teacher. She's an older lady. She's got years of lived experience as an Aboriginal person. She was the stolen generation, so she's able to give her own lived experience. The students are really engaged and find it fascinating. It's different to reading from a book and then presenting the lesson and doing assessments.”

-Perth, Secondary (Aboriginal)

Strong school-community partnership can also enable schools to bring in Aboriginal and Torres Strait Islander community members to strengthen delivery of Aboriginal and Torres Strait Islander perspectives in the curriculum. This approach, according to educators, is likely to foster greater cooperation and build relationships between the schools and their local Aboriginal and/or Torres Strait Islander communities, rather than having teachers interpret and present this content from their world view.

“Indigenous culture and education is a major part of the school's culture. It’s something that we are committed to. As part of this, we have strong community engagement, the Elders gave their blessing to teach Aboriginal culture and

language within the school. We have an Aboriginal teacher from Broome who teaches culture and oversees all aspects of the Indigenous program at the school.”

-Melbourne, Primary

Some teachers see an opportunity in using STEM programs to engage their Aboriginal and Torres Strait Islander students and then to leverage this to build the relationship between the school, parents and the broader Aboriginal and Torres Strait Islander community.

“I want my room to be an open-door classroom, which we really couldn't do. I wanted to show parents what STEM is like, as some parents wouldn't know what it is if I said STEM to them. They wouldn't have a clue what I was talking about. But we could educate them and maybe even have a little workshop where the kids can bring their parents in and spend a couple of hours with the parents, working on something together and have a cup of tea and make it all fun and things like that.”

-Regional NSW, Secondary (Aboriginal)

“We need the kids to educate their parents because the parents don't like coming to the school. That's something that I'm trying to break down. So I need the kids to be able to work through that barrier, to give the kids the confidence to explain to the parents, hey, look what I've just done. Look what we've made, come in and do that with us. Maybe even taking it from the school, adding to the community, we could go to the park, and we have a STEM day at the park.”

-Regional NSW, Secondary (Aboriginal)

Considerations

Considerations for STEM engagement

Throughout the interviews, teachers who deliver STEM based after school programs reported having difficulty competing against sport, art and music, subjects in which they believe many of their students tend to have greater interest and (self-perceived) ability in. While educators were referring to their Aboriginal and Torres Strait Islander students, it was noted that this is not too dissimilar with non- Aboriginal and Torres Strait Islander students.

“I’ve tried to engage the Indigenous kids after school, but it hasn’t happened. I’m competing with sport which is their number one thing. I think I need to make my class feel less threatening. There’s a perception that it’s only for the smart kids.”

-Darwin, Secondary

Teachers reported that it is important for them to support repositioning STEM subjects for their Aboriginal and Torres Strait Islander students as not only for students who already have high marks or who want to go into a STEM career.

“Aboriginal kids can be just as interested in STEM subjects as others [subjects]. I think it's just the stigma, and I think we need to break that down, sell it differently. That's what I want to work on next year at my school is selling STEM a little differently. Like, hey, it's not just for the really bright kids.”

-Regional NSW, Secondary (Aboriginal)

“There is also the stigma of being told when they're a kid that they're not going into that career. That's not a career for you. If your teachers have always told you you're no good at maths, why would you go into STEM if you've grown up thinking this.”

-Regional NSW, Secondary (Aboriginal)

Educators also reported that some students consider that STEM subjects lead only to STEM-related careers. According to the educators interviewed, STEM should be repositioned as subjects taken not as a gateway to a STEM career but as interesting classes in their own right, which could provide students with useful skills for any occupation. The quote below highlights the impact that a hands-on, generalised STEM class can have on the students who participate.

“Very few move from this activity to wanting to work in STEM. The main function of this type of class is that it gives them confidence. Kids [who require

greater support with] literacy and numeracy are able to come in here and achieve something really good. To feel proud about themselves. To get some kudos for it. Don't underestimate this at all. Really shy kids coming out of their shell a little bit because of achieving something in this room. That's a massive thing with all the challenges these kids face before they even get to school.”

-Alice Springs, Secondary

Considerations for cross-cultural integration

While the positives around integrating Indigenous Knowledge into STEM have been discussed earlier in the report, the interviews highlighted three broad areas where educators reported facing challenges when attempting this integration.

1. Educators' ability and capacity to access resources and Indigenous Knowledge
2. Cultural considerations when delivering Aboriginal content
3. Community engagement and support

Ability and capacity to access resources and Indigenous Knowledge

A major consideration to integrating Indigenous Knowledge into the classroom, according to educators, is the additional time it takes compared with delivering the standard curriculum. As it is not currently built into the curriculum, teachers are required to invest additional time to research Indigenous Knowledge and then devise an appropriate method to integrate it into their lessons. According to educators, this process requires a teacher who has a very strong understanding of the base curriculum. Without a strong foundation and high confidence, it is difficult for teachers to further extend their teaching into Aboriginal perspectives of the topic.

“I will run everything by our Aboriginal education workers and have them look over the resources, and then they let you know if there's anything you need to change or be aware of. That part is the easy part, it's finding the resources that are relevant in the first place, which is the challenge.”

-Regional NT, Secondary

Educators noted that embedding Indigenous Knowledge also tends to be less of a priority in schools with low Aboriginal and Torres Strait Islander student populations. As a result of teachers' time pressures and competing priorities, linking Indigenous Knowledge in these schools is not always possible.

Cultural considerations

The interviews identified that considerations need to be given to Aboriginal and Torres Strait Islander culture and Aboriginal and Torres Strait Islander students when integrating with the Western curriculum are varied. Educators understood that there is no singular Aboriginal and Torres

Strait Islander culture and no singular and consistent way in which the culture is practised. The wide variety of cultural practices means individual schools will need to address their students' needs and the local community's specific needs. The following challenges were encountered or highlighted by educators in the interviews:

- Risk of cultural appropriation
- Cultural norms regarding interaction between genders
- Diversity of students and relevance of the Indigenous Knowledge being taught to their own cultural practice
- Balancing focus on Aboriginal culture to avoid overemphasis on cultural identity.

Cultural appropriation

Some teachers explained that they avoid teaching Aboriginal content as it is not their culture, and they are hesitant to risk being accused of cultural appropriation. They also identified risks associated with the improper use of Aboriginal terms or knowledge.

“I'm never 100% if I'm supposed to be talking about it. I'm still very ignorant of Aboriginal culture, so I'm only going to talk to things that I'm 100% sure I'm allowed to talk about. I always have concerns over what is suitable for male students vs. female students.”

-Regional NT, Secondary

“The kids informally call me uncle, and it nearly got me fired a few years ago because I'm not an official 'uncle' in that community.”

-Regional NSW, Secondary (Aboriginal)

“I'm not Indigenous, and you've got to be careful. If there's any sense of cultural misappropriation, you get torn to shreds pretty quick. Some teachers will avoid going into that space at the risk of upsetting students who think that you're getting it all wrong. The kids who are strong in their culture and practice don't want to get it from me.”

-Alice Springs, Secondary

Gender laws

For those educators working in communities where cultural laws remain in place, they noted that rules around how genders interact could create additional challenges for male teachers. These challenges are not insurmountable but require extra planning and additional teaching resources to ensure that the girls receive the same level of educational support as others in the class.

“I don’t see all that much difference between my students [Aboriginal girls vs. boys]. Sometimes, for cultural reasons, some of the teachings has to go through an assistant teacher first. With some of the girls, you have to keep your physical distance and level of communication to a minimum. In these instances, I will use the assistant teacher to guide the girls through the class. With the fellas, I have a similar relationship to the boys I would have at a mainstream school. I can work directly with the boys without any cultural limitations.”

-Alice Springs, Secondary

Aboriginal and Torres Strait Islander student diversity

Educators in large schools, with student populations that include boarding students from across Australia, highlighted that the diversity of the Aboriginal and Torres Strait Islander student base must be considered when teaching Indigenous Knowledge because of the incompatibilities between unique Aboriginal and Torres Strait Islander language groups, which adds a greater level of complexity to teaching.

“When the school first started, it was students from Alice only, and there were three language groups. It's now 40+ language groups across the NT, WA, SA and Queensland, so you can't teach culture because they're all different.”

-Alice Springs, Secondary

Balancing focus

Aboriginal educators also identified that an excessive or heavy-handed approach to promoting Indigenous Knowledge has the potential to create push back from Aboriginal and Torres Strait Islander people who may feel there is too much emphasis being placed on their cultural identity. Some educators perceived that some students do not wish to be singled out or constantly engaged with based only on their Aboriginal heritage, as there are other aspects of their person, which they also value.

Some educators suggested that this risk can be tempered by comparing and contrasting views from Indigenous cultures from other parts of the world. Examining multiple Indigenous perspectives can be helpful as it puts multiple forms of knowledge on equal footing. When providing examples, it is not just Aboriginal contrasting Western but can be presented as multiple points of view from multiple cultures.

“I was smashed as a kid with ‘You're Aboriginal, so let's do Aboriginal stuff’. In my classes, I like to use Indigenous stories from all over the world: Maori, Inuit, Native American etc.”

-Darwin, Secondary (Aboriginal)

Delivering STEM education in remote areas

The interviews uncovered that consideration should also be given to the challenges faced by educators in remote areas. These challenges aren't specific to Aboriginal and Torres Strait Islander communities but all schools operating in remote areas. However, higher Aboriginal and Torres Strait Islander student populations in remote areas may necessitate the need for specialist programs for Aboriginal and Torres Strait Islander students and the educators in these locations.

Educators highlighted that there are both professional and personal challenges when working in remote locations that impact their teaching of STEM.

Professional

- Inconsistent or slow internet access
- Lack of computers, tablets, or other devices
- Inability to buy resources on the spur of the moment as there are no shops. Having to ship items in takes time and is an additional expense.

“We have internet, but it's really slow. If a storm rolls in, then it drops out. In the dry season, it's OK.”

-Remote NT, Secondary

By contrast, access to technology and resources was not a commonly mentioned significant consideration for educators in metropolitan areas. They feel that their schools are well resourced, and they are able to use both digital and physical resources to extend their students' STEM education.

Personal

- Access to school
- Access to shops
- Lack of medical facilities
- Being away from family / friends.

“I ended up coming home to Melbourne early as I caught Ross River virus and then a bacterial blood infection from the water.”

-Remote NT, Primary

Furthermore, a study conducted by the Australian Institute of Health and Welfare, titled Closing the Gap (*Helme & Lamb, 2011*) identified that completion of Year 12 is strongly associated with place of residence, with failure to complete being much more likely in rural and remote areas. The research found that the gap between Indigenous and non-Indigenous completion is greatest in very remote locations. The main causes of early leaving relate to access to school (provision), school participation (attendance) and academic achievement.

Addressing broader education needs

From the existing *Youth in STEM* research, it is understood that gender bias in schools, families and the broader community impacts girls' ability to engage in STEM education and pursue STEM careers.

While these challenges also exist for Aboriginal and Torres Strait Islander girls, other systemic issues were identified by the 17 educators interviewed in this research, which may impact Aboriginal and Torres Strait Islander students' ability to engage with STEM. While educators acknowledged the benefits of specialist STEM programs for Aboriginal and Torres Strait Islander girls, they also believe that the success of these programs depends on addressing the following challenges.

Literacy and numeracy skills

All educators interviewed mentioned that their Aboriginal and Torres Strait Islander students often require additional support with numeracy and English literacy. This was also found by Lamb, Walstab, Teese, Vickers and Rumberger (2004) and highlighted in the literature review by Hansen (2016). According to interviewees, children who have grown up in community often speak other languages in addition to English, and for some, English is unlikely to be their first language. Educators explained that, as with any student who speaks English as an additional language, support with literacy is required to improve engagement with any subject, not just STEM.

For most educators interviewed, providing additional support around literacy and numeracy was a higher priority than focusing on increasing participation in STEM. Educators believe that the priority should be to help build up these fundamental skills before considering more complex subjects.

According to the interviewees, students who required additional support with literacy and numeracy do not hold back from participating in STEM related activities. However, once the activity is complete, extra support is required to help them analyse what they have learned, complete worksheet tasks and participate in formalised examinations.

"Most of my Indigenous students were realistically ESL (English as a second language). They couldn't communicate deeply [in Standard Australian English]."

-Darwin, Secondary

"I'm usually aiming my [Digital Technologies] curriculum to year 5 or 6 or 7. I have a year 12 class working at a year 8 level and another working at a year 5 level. I also have an advanced year 6 class working at a year 5 level, so they're close to being caught up to where they should be. It all ties back to literacy and numeracy."

-Alice Springs, Secondary

"Most of my Indigenous kids are less academically strong. They are behind in literacy and numeracy. This doesn't affect experimentation and their thinking, but it limits how they can write about it afterwards."

-Melbourne, Primary

Educators highlighted that for all students, regardless of gender and ethnicity, literacy and numeracy skills, are critical in order to progress further in other subject areas. According to these educators, there is a need to improve student engagement with STEM for students who do not meet the national minimum standards for literacy and numeracy.

Intergenerational trauma and cycles of socioeconomic disadvantage

It is important to acknowledge that intergenerational trauma and socioeconomic disadvantage are sensitive and complex issues demanding in-depth consideration, which is beyond the scope of this project. These terms have been used in this report to group together comments from educators who spoke of intergenerational trauma and socioeconomic disadvantage.

Educators acknowledged that Aboriginal and Torres Strait Islander students often carry the weight of intergenerational trauma and face socioeconomic disadvantage, which, according to them, can impact students' engagement with all aspects of their education. Many educators expressed concerns about their Aboriginal and Torres Strait Islander students' general well-being and the impact the stability of their home life can have on their education.

"Potentially, it's the grandparents rather than the parents driving school attendance. There's lots of trauma in our community. The parents are from the 'lost' generation somewhat. There's lots of drug and alcohol issues."

-Remote NT, Secondary

Attendance and absenteeism

Absenteeism and the difficulty of obtaining consistent attendance was a common theme across interviews. This finding was also highlighted in the research and literature review by Hansen (2016), which refers to the study conducted by *Purdie & Buckley (2010)*. Educators reported that absenteeism of their Aboriginal and Torres Strait Islander students is not always due to their personal disinterest in school. It is a complex issue with multiple factors influencing their attendance, and often their commitment to their culture and heritage means that it impacts their attendance levels.

The interviews highlighted that greater support may be required for Aboriginal and Torres Strait Islander students to balance their commitment to their culture while remaining engaged with school.

"Success for me was if a student actually completed year 12, as only 10-15% of our Indigenous students do. It's hard to tell how many would make it to year 12. They may come for a year then disappear. Or do a term, go home and do another term the following year."

-Darwin, Secondary

"When teaching grade 4 or 5, we were doing a year 3 level of curriculum to match where the kids were at due to absenteeism. They might come to school

for a while, and then they would go out bush for weeks on end hunting. It was very traditional."

-Regional NT, Primary

"Indigenous kids are away a lot and not always because they don't want to be at school. You need to get to know the kids and the families and make allowances for why they're away and then adjust the curriculum to these things."

-Darwin, Secondary

Parental / community support for formal, Western education

Educators perceived that, in some communities, there appear to be low levels of support for Westernised education and formalised schooling from parents and / or the local community. Educators spoke about what they interpreted as the distrust of schools among these communities due to negative interactions with white institutions over many generations. According to educators, this can influence parents' decisions to enforce their children's attendance at school and support their education.

In addition to their classroom role, educators noted the value in undertaking outreach activities to facilitate increased parental and community awareness and understanding of Westernised education and local school initiatives. Parental support and community buy-in were considered critical in encouraging student engagement and achievement.

"As 'head of house', which was a pastoral care role, I was responsible for taking care of specific communities, the go-between of school and community. I would be on the phone to communities and parents and occasionally fly out, so they had a face to the name. When you have the community onside, then you are much more able to have an impact."

-Darwin, Secondary

"Some of these kids, their parents don't want them to do any culture at school. The parents are scared of schools and have had bad experiences with institutions when they were growing up. There's also Aboriginal grandparents who have hidden their Aboriginality their whole life and don't identify as Aboriginal, but they allow their kids to engage."

-Regional NSW, Secondary (Aboriginal)

Stress of boarding and being away from family / community

Particularly in the Northern Territory, weekly boarding was common for secondary students, according to the educators who had taught in this territory. Educators reported that some Aboriginal and Torres Strait Islander students would only return to community and their family for the weekend or at the end of term. Given the close ties of some Aboriginal and Torres Strait Islander families and communities, more support could be given to boarding students to help them through difficult times of being away from family / community. Educators believe this support would have a positive impact on their mental health and, in turn, their education.

"Often, it felt like the kids were stuck in this middle ground between Indigenous culture and Western culture. Coming into a school with an attitude that I'm just going to hang on my phone. It's difficult for them to be away from home at boarding school, away from community, in with a bunch of kids from all different backgrounds."

-Darwin, Secondary

Understanding challenges faced by Aboriginal and Torres Strait Islander students

The research also uncovered specific challenges faced by educators in their efforts to engage Aboriginal and Torres Strait Islander students at school. These challenges need to be taken into consideration when developing any programs specifically designed to support Aboriginal and Torres Strait Islander students.

Shame

The term 'shame' arose in the interviews with all educators. The use of the term 'shame' is different in an Aboriginal context than in a non-Aboriginal context. Mental Health First Aid Australia notes in their handbook 'Communicating with an Aboriginal or Torres Strait Islander Adolescent' that:

The feeling of shame for an Aboriginal or Torres Strait Islander person is not easily defined and bears little or no resemblance to a dictionary definition. Shame can occur when a person is singled out or in a circumstance that directly targets a person's dignity. Shame may be felt as a result of:

- a lack of respect
- embarrassment
- self-importance / self-promotion
- rudeness
- a breach of accepted Aboriginal "norms" and/or taboos.

A "shame job" is an event that causes a person shame or embarrassment. The concept of shame is very important within many Aboriginal and Torres Strait Islander communities. Shame can be overwhelming, disempowering and can also act as a challenge in seeking help³.

Further, Charles Darwin University's Indigenous Voices project, which works to improve the learning experiences and outcomes of Indigenous students, notes:

The concept of *shame* used by Aboriginal English speakers is broader than the non-Indigenous use of the word. The meaning of shame extends to include embarrassment in certain situations (Leitner & Malcolm 2007:169) and is often due to attention or circumstances rather than as the result of an action by oneself (Vallance & Tchacos 2001). The feeling of shame can totally overwhelm and disempower a person⁴.

An Aboriginal interviewee highlighted the long-term impact of the word shame being embedded within Aboriginal culture. The frequency in which the word is used strengthens the negative impact it can have on Aboriginal and Torres Strait Islander students.

³ http://mhfa.com.au/sites/default/files/ATSI_AdolecentHelp_eversion_2014.pdf

⁴ <http://indigenousvoices.cdu.edu.au/support.html>

"When I got to high school, the word shame would be everywhere. So it was kind of a part of the vocabulary for me and my other Aboriginal classmates. So obviously, if you're saying it often, you're manifesting that shame, and you're going to live in that shame. My personal experience of feeling like a second-class citizen, that being Indigenous and being Aboriginal, you're second class in a way. I'm just being really honest, that because you're not white, you think you're not good enough."

-Perth, Secondary (Aboriginal)

Within this research, shame was described by educators in the following situations:

- A pejorative form when students don't want to do an activity in front of others:
 - when being called on in class to answer a question
 - being asked to demonstrate something in class and
 - participating in extra-curricular activities.
- Students being ashamed of their perceived lack of skills or abilities and choosing not to engage with the activity at all or disengaging from the activity when they did not have immediate success.
- Shyness then manifests as an inability to seek help from others.
- Personal shame about their Aboriginal identity.

Educators went on to explain that some situations that cause shame appear to be more prevalent among their Aboriginal and Torres Strait Islander students. Educators gave examples such as entering class late due to personal reasons or involvement with specialist Aboriginal programs, and so feeling unwanted attention which makes them feel shame.

Educators observed that, like non-Aboriginal or Torres Strait Islander children, shame manifests more strongly in high school when peer pressure and the drive to conform behaviours are at their highest.

"If you ask boys a question in class, you'll get a behaviour response, but the girls will attempt to answer the question. You've got more chance of getting an answer from a girl aged 7-9, and then it drops off again. Once the girls get to high school, they won't engage at all because 'shame job miss'."

-Regional WA, Primary

Some educators identify the source of this shame as an incompatibility between Aboriginal ways of learning and Western school systems' learning process. From their observations of Aboriginal and Torres Strait Islander children and their interactions with Elders, the process of learning a new skill and the expectations regarding proficiency operate differently.

"The Indigenous kids don't like to have a go and get it wrong. They don't like to fail in front of others. When Indigenous kids learn in culture, they watch

someone do it and then when they think they have watched it enough times that they are confident, then they step up and do it. They watch their uncle build a spear 20 times [over an extended period of time], and then they have a go. It's very different to the non-Indigenous way of learning. If I was teaching my daughter to make a spear, I would involve her from day one, but I wouldn't expect success. I'd work with her each time she failed to help her learn what to do better next time."

-Darwin, Secondary

Educators reported that this shame might lead to disengagement within the class. Educators believed that even when called on, often students would rather not answer than provide an incorrect response.

"In Aboriginal culture, there's not a lot of talking in class because of feelings of shame or embarrassment. Girls won't share their answers or contribute as much when the boys are in the room. They don't want to look dumb in front of a boy."

-Darwin, Secondary

Educators who are aware of the impact of shame on Aboriginal and Torres Strait Islander students' ability to engage in activity put a lot of emphasis on making sure their students feel comfortable. They reported easing students into an activity with lots of support and encouragement.

Educators noted that programs designed specifically for Aboriginal and Torres Strait Islander students will often structure activities to be run one on one or in small groups as a method to mitigate shame that may arise from presenting in front of an entire class or asking for help when others are present.

"In the dance classes, I make it clear upfront that you don't have to do it in public. You don't have to get up and do it at events. It's ok to come to class and just sit and watch if that's all they're comfortable doing. I want to be inclusive. I don't want to pressure someone out. I'm not a dancer, and I get embarrassed. I wouldn't have done it at school when I was a kid. The kids who need the connection to community the most are the ones who aren't going to come and dance."

-Regional NSW, Secondary (Aboriginal)

"The Follow the Dream program helps to alleviate shame because it's one to one learning, and they don't have to speak in front of other kids. We focus on building confidence and building resilience. These kids live transient lives,

they're moving between households regularly, and they have past experiences of being picked on or the teacher making a scene in front of the class if you are late or you don't have the right uniform. The kids feel picked on for things they can't control."

-Perth, Secondary

The educators interviewed suggested that shame can also be alleviated by having a trusted person, preferably Aboriginal or Torres Strait Islander, present to reassure the student that there is no shame in doing the activity or asking for assistance when they need it. In their opinion, a well-attuned support person also has the ability to pick up on when a student is withdrawing due to shame and step in to assist as needed while also knowing when they should sit back and let the student drive their own engagement.

"Shame comes from not being confident. I sometimes have to walk students into class because they don't want others to look at them. A lot of kids pull out of general classes after week one because they found it too hard. There's also racism, being picked on, the fear that everyone will look at me in that class."

-Perth, Secondary

"Part of the strategy is taking them to places and being that support person. And then once they get to meet the people, when they are comfortable, and they're getting confident, then you let them go. I might take them that first time to the university doing a two hour [introduction]. It might be taking them for the first time to do the admin for a school-based traineeship. It's a bit like taking them to meet the manager of the program and sitting with them, and supporting them in that way. I find that really works. And that's successful. Some students wouldn't turn up if they didn't have you going with them, to be there supporting them."

-Perth, Secondary (Aboriginal)

Educators perceived that shame is a difficult component of culture to overcome, as it has an intergenerational aspect.

"A lot of our STEM students who are successful, I would say that's mainly due to their parents. And if the parents have instilled in them no shame, give everything a go. But then you've got the students whose parents still struggle with that shame, you know, due to their own personal lived experience or their circumstances, so they pass that on."

-Perth, Secondary (Aboriginal)

Educators highlighted that resources, programmes and initiatives work best when they consider the impact of shame for Aboriginal and Torres Strait Islander students. Engagement may be low if the potential for shame arising from participation is high. Program or initiatives seeking to improve engagement need to have processes in place for minimising shame, such as:

- Utilising trusted support staff to encourage student participation and make them feel safe.
- Utilising trusted support staff to normalise asking questions and seeking support when needed.
- Working and presenting in small groups rather than to an entire class.

Trust

The interviews highlighted that building trust among Aboriginal and Torres Strait Islander students is fundamental to engagement and overcoming shame. Educators reported that a high level of trust between students, teachers, support staff and parents improves teachers' ability to teach and students' overall success and happiness at school.

Educators who acknowledge the heightened need for trust by Aboriginal and Torres Strait Islander students compared with non-Aboriginal and Torres Strait Islander students are more likely to invest a lot of time building up these relationships and maintaining student engagement with their schoolwork. Educators explained that developing this trust also allows teachers to build a deeper relationship with the student and provide them with holistic support to develop the whole student, not just academically.

"It's also about relationships. You need to build up trust. The girls I've had for two years will speak to me if their day is bad. They don't bottle it up. If there's something going on, I'll tell them to chill out for the first quarter and come back later in the day. Before I had that trust, they would just be disruptive all day, and I wouldn't know why."

-Remote NT, Secondary

"You really actually need to make the connection with them before they will trust you and before they will work for you or take any advice or suggestions. So I really think connection is the key. And once I can get our Headteacher to make a connection with these girls, the girls will work for him. And, and that's where I think we can lead into some really cool stuff with STEM for these girls."

-Regional NSW, Secondary (Aboriginal)

The educators interviewed recognise that building trust takes time, and in the short term, the relationship-building phase takes away from time spent learning. However, educators believe that the teaching and learning time lost upfront is worthwhile as it leads to better engagement and learning outcomes over time.

"In week one, I teach no content. I only do relationship building. The new kids may not even speak to you that week. They may have their shirts over their heads the first week because they are so homesick and shy."

-Darwin, Secondary

"It took quite a while for me to be able to connect. It wasn't until the end of my time there that I could teach well. I could go to a school in Melbourne and slot in straight away. It took 15 months to adjust to the behaviours, interests. People often leave before they get to that point."

-Remote NT, Primary

Building trust requires going beyond an educator's classroom activities and often involves engaging with their students' families, communities and stories, according to educators. This often requires educators to invest heavily in their students and plan to form a long-term relationship with the local community. However, educators reported that the willingness to maintain a long-term teaching position in a regional area is sometimes limited.

"I share, I show pictures of my family, of my grandma, of my husband. And then they start to talk about their families. And my husband comes to the school to meet the kids and so they can meet him. We've also been out into their community. I can then speak to their country. 'You've got a great swimming hole out there'. I'll make sure I speak positively about their country and their relatives I know. 'Do you know Uncle Raymond?'

-Darwin, Secondary

"The high turnover of teachers in these remote schools means teaching approaches change and are inconsistent, and that destabilises the kids sometimes. It's a tough lifestyle as a teacher. I can't see me staying here much longer."

-Remote NT, Secondary

The interviews highlighted that programs such as "Follow the Dream" leverage trust and relationships built in junior years of high school to maintain engagement with Aboriginal and Torres Strait Islander students into senior high school. Given how highly praised the program was by educators, other initiatives may benefit from employing a similar strategy as a method for increasing Aboriginal and Torres Strait Islander girls' engagement with STEM. It is likely to greatly benefit Aboriginal and Torres Strait Islander students if senior STEM teachers in pastoral, support or tutoring roles for junior students are able to build up a strong personal relationship prior to an academic relationship forming.

"It is really important that I make links with the kids in the lower school in [years] 7, 8, 9, 10 so that they know who I am when they get to senior school. One thing that stands out for the kids in the program is that self-esteem, with respect to school, is not high. They have a lack of confidence in the schooling system. When they come across [to the senior campus], they have seen some faces and received help from me before so they can informally come to me for help when they need it."

-Perth, Secondary

It was also suggested that teachers building better relationships with their students in junior years might improve the likelihood of Aboriginal and Torres Strait Islander girls selecting ATAR subjects, particularly STEM subjects. The educators spoke of their observations that Aboriginal and Torres Strait Islander girls were often more likely to select a class if they had a relationship with and felt safe around the teacher. Specialist outreach and engagement programs that partner Aboriginal and Torres Strait Islander girls in junior high school with senior STEM teachers may have the potential to attract more Aboriginal and Torres Strait Islander girls into these classes.

"It's about the science or maths teacher having a relationship with the student. Our kids perform best when they have a good teacher relationship. It helps to minimise the shame factor. For these kids, everything is family and relationship-driven, so sitting in a classroom of 30 and being a number they feel at odds with. I've worked in this program for 17 years, and if they don't like the teacher, they will do everything they can to wag class."

-Perth, Secondary

Self-doubt

Across all interviews, self-doubt was perceived to be high among Aboriginal and Torres Strait Islander students, particularly girls, and was also perceived as a contributor to feelings of shame. Educators spoke of this feeling of self-doubt often arising when Aboriginal and Torres Strait Islander students who are academically successful enter educational environments where they may feel removed from their Aboriginal and Torres Strait Islander peers. This may leave them feeling isolated and doubting their place in the class.

"I think one of the biggest issues is a bit of isolation in the class and the classroom environment. I know that I've had a few students experiencing that they might be the only Indigenous student in the class. I'm having to support them through that and telling them that that's a great thing that they're in the class and that they're getting the level of education that they are capable of.

-Perth, Secondary (Aboriginal)

"If an Aboriginal student misses one class or two, they then for whatever reason will feel like they've missed a chunk of the lessons. So, there's that shame. And then they are feeling like, 'Oh no, I've missed it now. I feel dumb'. When that happens, I arrange for some additional tutoring and to get the teacher to come and support them to catch up."

-Perth, Secondary (Aboriginal)

A suggested approach from the educators interviewed was to build up confidence and reduce self-doubt through the implementation of smaller classes with only Aboriginal and Torres Strait Islander girls. This approach aims to get the girls settled into a subject and improve their confidence before moving them into larger classes where they are required to work more independently and within a mainstream setting.

"They all think 'we can't do this, we are dumb, we'll never be able to do that.' I think if it was a class of only Aboriginal girls to start with, a small group of girls, and then once we build their confidence up, moving them into a larger group at [school name redacted]."

-Regional NSW, Secondary (Aboriginal)

Ambitions and goal setting

Throughout the interviews, educators highlighted that Aboriginal and Torres Strait Islander girls require greater support in identifying their goals and taking steps towards them. The interviews identified some key factors to be addressed in order to better support Aboriginal and Torres Strait Islander girls to identify their goals and ambitions:

- Increasing presence of relevant role models (this is discussed in more detail in the section: The learning experience of Aboriginal and Torres Strait Islander girls)
- Improving awareness of opportunities and future outcomes
- Reducing focus on local opportunities.

Another common theme in the interviews was a need to promote role models who can help Aboriginal and Torres Strait Islander girls identify career pathways and opportunities in STEM. The educators suggested that this is even more important among Aboriginal and Torres Strait Islander students from families with limited experience with or exposure to Western education system.. The educators believed that it would be easier for these students to imagine what their future education and career might look like if they had these role models to take inspiration from.

"Some are really interested in STEM and good at it but don't have the marks for uni entrance, and they don't come from supportive homes, so they don't think uni is for them. 'I'm not smart enough to go to uni', 'My parents didn't go to uni'."

-Regional NSW, Secondary (Aboriginal)

"I believe that you can't be what you can't see. You need to see behaviour repeated until it becomes normalised, and then it can become an expectation. I come from a family of overachievers. I have three aunties with a PhD. My mum just went into her professorship. I look at my kids, and that's never been an option for them. They've never seen it being done, so why would they think to do it?"

-Darwin, Secondary (Aboriginal)

"They see all the VCAL (Victorian Certificate of Applied Learning) kids in their fluoro heading off to TAFE or apprenticeships, and they think that's all that is available to them. They [think they] need to go from school into getting a job. I didn't think about a job after high school because I just assumed I was going to uni next."

-Darwin, Secondary (Aboriginal)

Some educators explained that many of their Aboriginal and Torres Strait Islander students have only seen the pathways of their parents and others in their local community, and often have little

awareness of other opportunities that may be available for them. Some Aboriginal and Torres Strait Islander students require greater support from their educators to motivate and inspire them to see beyond their immediate surroundings.

"There's no internal motivation, so you need to always be rewarding and showing the carrot. Whereas when I have taught in mainstream schools, the students believe in themselves."

-Remote NT, Secondary

"Having goals and wanting to succeed is really important. I think chats with those students about 'what do they want to do with their life', their long-term goals is an important part of my role. I help them get an understanding of that and a motivation to want to graduate and finish and succeed."

-Perth, Secondary (Aboriginal)

The interviews highlighted that the close ties many Aboriginal and Torres Strait Islander students have to their families, community and local land mean that often these students' goals and ambitions stay close to home. According to the interviewees, for girls, particularly, there is often a strong draw towards becoming a mother and having a family. Leaving to further their studies would be a significant change in their life. Educators stressed that pathways to leave the community and complete further education should be presented in a way that enables the students to know how they may return to their community and add value, rather than leaving to continue their lives away from their culture and community.

"I would ask the really bright kids about their future, the ones I felt who had the potential to go on and study and do big things. They didn't have the view of leaving the community and going on to do anything else."

-Remote NT, Primary

"Their families have a large impact, home life, money, the parents not valuing the education. I didn't go to uni, your aunty didn't go to uni, stay home with the family. Most of these kids have never left the town before. To leave and live in another city is really tough."

-Regional NSW, Secondary (Aboriginal)

"A lot of them [Aboriginal girls], when you ask them about future goals and careers, it's like 'we will be having the baby and staying at home.' When you talk to the boys, they will have a career in mind, a mechanic, a builder or electrician. The girls very much don't plan to leave town. They will stick around and help out at home."

-Regional NSW, Secondary (Aboriginal)

Some educators spoke of the importance of being able to identify situations where feelings of shame, isolation and self-doubt manifest in high-performing Aboriginal and Torres Strait Islander students, and providing these students with additional support to progress and fulfil their potential.

"There's smart kids, and they'll actually dumb themselves down. I've got a girl in the top English class, and she'll do everything she can to put herself in the bottom English class. I'm working very hard on that, to put groups of kids together in top classes. If two of them want to be in there and the third one doesn't, I'm trying to get them to stay there and don't dumb themselves down."

-Regional NSW, Secondary (Aboriginal)

Cultural capital in Western science

Educators also highlighted the benefits of improving Aboriginal and Torres Strait Islander students' access to cultural capital in Western science. This is the type of cultural capital built by going to museums, science centres and watching documentaries through childhood. Educators believe these activities provide students with a base level understanding of the concept of "science" and explained that often their Aboriginal and Torres Strait Islander students do not have access to these.

Outreach programs, excursions, hands-on events and generalised STEM classes funded and accessible to Aboriginal and Torres Strait Islander students help build up this cultural capital and exposure to STEM. According to educators, these initiatives help increase students' interest in STEM and encourage them to choose STEM subjects later in school.

"We need more science camps, engineering camps and the like. They're important as Aboriginal students often don't come with any cultural capital (in terms of [Western] science education) through going to museums and science centres when they're growing up. Some of our parents haven't finished high school or made it to year 10."

-Perth, Secondary

Cultural understanding among educators

Educators highlighted that managing the aforementioned web of factors that impact how Aboriginal and Torres Strait Islander students engage with the education system is often a challenge for educators who are not Aboriginal or Torres Strait Islander, especially if they are not aware of or prepared for them when joining a school. Educators who had been in this position spoke to the challenges they faced in delivering the curriculum alongside addressing these factors and highlighted the need for preparing new teachers and supporting them while they adjust. This finding was also highlighted by Hansen (2016) in their research and literature review (Aikenhead, 1996, 1997; Biddle & Cameron, 2012; Dockery, 2013; Kawagley, 1990; Ogawa, 1995 Patten & Ryan, 2001).

Furthermore, some educators shared stories of observed behaviours of their Aboriginal and Torres Strait Islander students, which they did not fully comprehend. They recognised that developing a better understanding of some Aboriginal and Torres Strait Islander cultural norms may help significantly in these circumstances.

These observations suggest that teachers may need to re-evaluate their existing teaching methods and develop new ways of engaging their Aboriginal and Torres Strait Islander students individually and in the classroom.

“For those living in community, people have an ‘ownership’ over knowledge. It might be a part of country or a particular hunting technique, and that knowledge belongs to their family. Someone else may have the same knowledge, but they don’t hold ownership or responsibility over that knowledge. This impacts the kids because [they] don’t critically look at something someone else is doing and ask them about it. That’s their knowledge, and you don’t question why they are doing something that way. As a teacher, you need to teach them that it’s ok to ask questions. It takes about two years, but by year 9, they’re more comfortable asking questions. It takes little steps, demonstrating by asking questions and by asking them to ask questions.”

-Regional NT, Secondary

“When I was doing outreach for CSIRO, most schools had the girls and boys separated. Within the groups, they would then allocate who was going to do the work. I’m not sure how that would happen, it just seemed to happen naturally. Problems occurred when a kid in the group might know the answer, but if they’re not the designated person for the task, they won’t step in or speak up. As an outsider visiting, I didn’t understand the hierarchy of the groups, how they formed, and the rules the kids had for working together.”

-Darwin, Secondary

Based on feedback provided by the educators interviewed, educators moving into schools with an Aboriginal and Torres Strait Islander student population should undertake specialised training to

effectively communicate with Aboriginal and Torres Strait Islander students with cultural sensitivity. The research identified three broad areas of professional development which educators would benefit from in developing their cultural understanding, these include:

1. A generalised, broad professional development course for all educators on engaging Aboriginal and Torres Strait Islander students.
2. A more comprehensive preparation for educators going into schools with high Aboriginal and Torres Strait Islander populations.
3. In-community training, preferably from Aboriginal or Torres Strait Islander staff at the school, on the specific needs, challenges, opportunities and culture at the school with the Aboriginal and Torres Strait Islander students at the school.

The interviews highlighted that the development of cultural understanding might be vital for educators to understand how to provide the necessary support for classrooms and students who require this. Without this understanding, educators may use pedagogical approaches which are less effective and can potentially exacerbate already challenging situations. Educators may not know the question to ask to get to the root of any problems and students may not raise or explain if there is something culturally inappropriate in the classroom.

“I went into a year one classroom doing teacher support, and the teacher said, ‘I can't get Jimmy to sit on the mat’. I asked, do you have a particular spot for him? Is there something around him in that spot that he doesn't like? [I discovered that] She had him sitting next to a relative that he wasn't allowed to sit next to, talk to or look at. They're related. You can't sit him there.

Universities need to teach this as a subject. Not just for Aboriginal kids, but how to get to know your students generally. These skills are also important for students from religious or different cultural backgrounds.”

-Regional WA, Primary

“There were a lot of cultural things I had to learn coming here from Melbourne. A Tiwi boy and girl, brother and sister, are not meant to engage with each other. Half the school still follows that cultural rule. The boys will not engage with girls from their family. I have to have a Tiwi teacher assistant in every class to help with this.”

-Remote NT, Secondary

“I was in Broome for a couple of years with my wife teaching. After two years, I had no idea still how it [local culture] worked. The culture is so complex.

We were working through open-ended project work, but it was still a very Westernised approach. If the student didn't see a purpose to what they were doing, they would just walk away from it. They never tried to please us as teachers to do the work because we asked them to. If they weren't interested,

they just didn't do it. Particularly if the leader of the group says they're done with this, then the others will follow suit and disengage.”

-Darwin, Secondary

The STEM learning experience of Aboriginal and Torres Strait Islander girls

Generally, primary school educators reported fewer differences between Aboriginal and Torres Strait Islander girls and boys when teaching STEM. At younger ages, engagement with STEM education was comparable across both genders. However, moving to secondary school, similar trends reported in the *Youth in STEM* research, such as lower confidence in STEM subjects among girls, were also reflected among Aboriginal and Torres Strait Islander girls.

According to the educators, gender bias against Aboriginal and Torres Strait Islander girls is two-fold, combining stereotypical gender roles from a Western cultural perspective and elements of Aboriginal and Torres Strait Islander culture regarding gender-based customs and cultural norms.

“In community, with gender roles, there's always a golden boy who can do no wrong, and the girls can be a little bit mother hen. They're expected to look after their younger siblings and cousins. I'm a huge feminist, and so are my aunties, but when we have a family gathering, we still do all the cooking and cleaning.”

-Darwin, Secondary (Aboriginal)

“I think it's [gender bias] more pronounced in Aboriginal than non-Aboriginal students. I think it goes back to that, there are more opportunities for boys and boys are supposed to be strong. The boys are out there doing this, doing that, where for the girls, they still do have that shame element. As a community, we're not encouraging our girls to be strong, independent women. That's something that I'm trying to break down. We can be strong, independent women. We can do exactly what the boys can do. I'm trying to build that up within the school, but the thing is, I only have them for five hours a day, and then I send them home again.”

-Regional NSW, Secondary (Aboriginal)

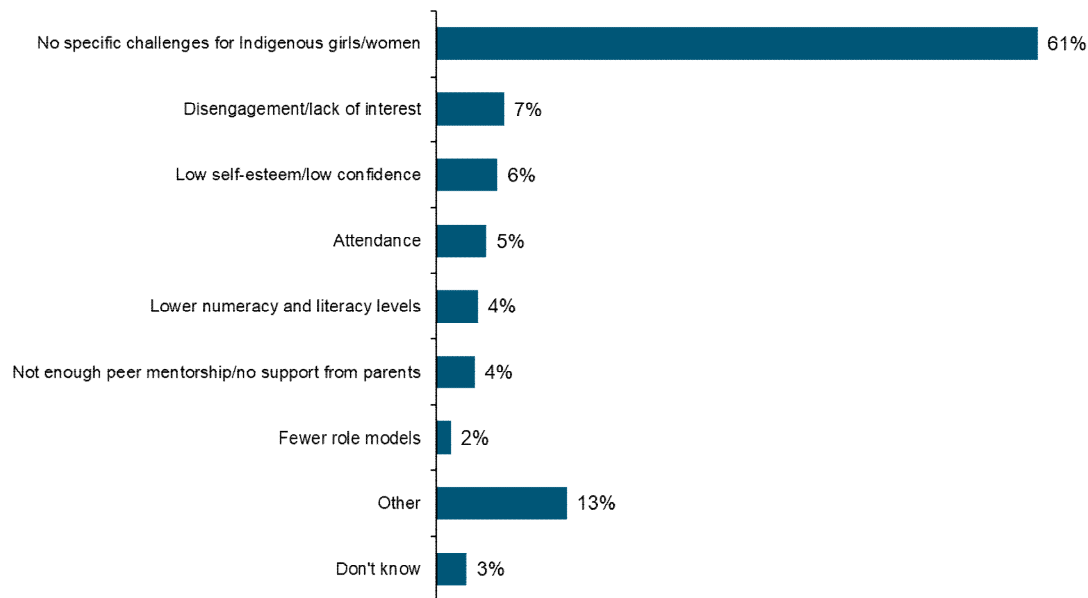
In the *Teachers & Career Advisors 2020/21* research, educators reported challenges in engaging with Aboriginal and Torres Strait Islander girls in STEM. Although the majority (61%) said the challenges are not isolated to Aboriginal and Torres Strait Islander girls but rather applicable to all girls, there were still around 40% who cited challenges specifically encountered by Aboriginal and Torres Strait Islander girls.

In an open-ended question, educators were asked to describe the specific challenges they face when engaging Aboriginal and / or Torres Strait Islander girls / women with STEM. A specific challenge commonly mentioned was lower interest in STEM, which may also apply to non-Aboriginal and Torres Strait Islander girls, however, some of the reasons given for lower interest were linked to Aboriginal and Torres Strait Islander cultural norms, according to educators. One such example relates to the gender role associated with STEM jobs, with educators suggesting that some

Aboriginal and Torres Strait Islander girls are not encouraged by family and community to pursue jobs that are for boys / men.

Figure 2: Challenges faced when engaging Aboriginal and Torres Strait Islander girls with STEM.

Q. Are there specific challenges you face engaging Aboriginal and Torres Strait Islander girls / women with STEM? – Coded



Base: educators who have had experience with Indigenous students – 275.

“It's changing the mindset of all girls regardless if they are Aboriginal or Torres Strait Islander or not.”

-Regional NSW, Primary

“Female Aboriginal students often don't take much interest in typically male subjects as they aren't brought up with an emphasis on these values.”

-Regional VIC, Primary

“Indigenous cultures have things which are men's business and women's business. I need to have local Indigenous women speak with our girls and our boys, and I can't share in this.”

-Metro VIC, Combined

“Girls from many cultures, including Aboriginal and Torres Strait Islanders, receive much less home support and may be actively discouraged from engaging in 'male' subject areas.”

-Metro NSW, Primary

Girls outperforming boys

Some of the educators challenged the premise of the research as they felt the Aboriginal and Torres Strait Islander girls in their classes outperformed the boys academically. With comparatively higher levels of literacy and numeracy than the boys, girls were seen to be more likely to be successful in other STEM subjects as a result, according to educators.

“When I’m teaching STEM, girls are overall more capable, but the boys are more interested in science. The girls have higher literacy coming out of community, just like non-Indigenous classrooms.”

-Darwin, Secondary

“The [Aboriginal] girls here are actually quite confident, more so than the non-Aboriginal girls. The [Aboriginal] boys are more reserved in terms of leadership and engagement. I’m not sure if this is cultural or individual students. If you flip it to sport, the [Aboriginal] boys are way more confident, but not necessarily more capable.”

-Melbourne, Primary

“The girls were way more engaged. In Kununurra and Wyndham, there had been a movement where Indigenous mothers had almost said this is going to make your future better.

-Regional WA, Primary

“Girls seem to be more literate and willing to take risks in their learning. At around year 3 or 4, if the boys couldn't read, that was it. They would give up and wouldn't do anything to try, whereas the girls were more likely to keep at it. The cultural commitments seem to impact the boys more than the girls - the boys turn up to school less as they have more cultural commitments. The boys also have more [Vocational Education and Training] programs and other employment opportunities out of school, which means they can struggle more academically as they are in class less than the girls.”

-Regional NT, Secondary

Educators believe there are great opportunities to build on Aboriginal and Torres Strait Islander girls’ stronger academic achievement with specialist STEM programs specifically developed for them. The interviews highlighted that compared to Aboriginal and Torres Strait Islander boys, Aboriginal and Torres Strait Islander girls often demonstrate having stronger pre-requisite literacy and numeracy

skills and the study habits required to be able to engage and have success with these types of programs.

While educators suggest that Aboriginal and Torres Strait Islander girls may be more academically prepared than Aboriginal and Torres Strait Islander boys, they also recognise that there is a broad, complex and interconnected set of circumstances that can still impede Aboriginal and Torres Strait Islander girls from reaching their full potential in STEM.

Educators highlighted that Aboriginal and Torres Strait Islander girls are often similar to non-Aboriginal or Torres Strait Islander girls regarding their interest in STEM subjects in senior high school. Educators observe that while they are likely to outperform Aboriginal and Torres Strait Islander boys, this does not often translate to increased interest in the more difficult or advanced STEM subjects. Educators viewed that this results in a limited pool of Aboriginal and Torres Strait Islander girls that enter tertiary STEM education and STEM careers as they are less likely to complete the ATAR STEM subjects that would propel them down that path.

“In my engineering-based classes, the girls start to drop off in later high school. The ability doesn't change, but the interest seems to wane. I have both high performing boys and high performing girls in those classes, but the proportion of girls in the class drops off.”

-Darwin, Secondary

“STEM is perceived as being too hard (in terms of pathways) whereas arts and humanities have alternative entrance pathways which don't exist for the hard sciences. The Cert II in business is going well with the students.

-Perth, Secondary

“The girls are more studious, they're more prepared, but they're not doing chemistry and physics. They tend to choose general science, biology, general maths, not math methods. Those other subjects are seen as too rigorous, too hard.”

-Perth, Secondary

Gendered classroom settings

Reduce the opportunity for shame

Several educators across the interviews mentioned splitting the boys from the girls during science classes, particularly for hands-on activities and experiments. They split their classes by gender as the girls are often observed by educators to be more willing to participate when the boys are not present. According to the educators, the shame element that inhibits participation is likely to be reduced when boys are not in the classroom; girls are more likely to feel confident to participate and experiment when there are only other girls present.

“Often, I send the teaching assistant to take the girls to go do something separately as they are more willing to have a go when the boys aren't there.”

-Darwin, Secondary

“The boys are more willing to take risk and put themselves out there a little bit (even though you still have to coax things out of them a lot). The girls are definitely less willing to take risk, but I don't know why. I assume it's a cultural thing, but I'm not certain if that's the reason.”

-Darwin, Secondary

For programs designed to engage Aboriginal and Torres Strait Islander girls with STEM, educators suggested that gender-specific activities rather than a co-education format are more likely to be successful.

“I do think they [Aboriginal girls] would be more comfortable going into STEM if there were female-only activities or competitions or things like that. [It would be helpful for] girls who have a low self-esteem or who aren't as confident as what the boys are when it comes to the STEM.”

-Regional NSW, Secondary (Aboriginal)

As a response to cultural sensitivities

In addition to the shame and engagement aspect, educators noted that gendered classrooms are often more culturally appropriate for those following traditional cultural norms. Many language groups have cultural norms that prevent men / boys and women / girls from the same language group interacting or provide strict rules for the way different genders can communicate with each other within or between language groups.

Educators who have students with strong ties to traditional cultural norms may require additional assistance navigating this aspect of Aboriginal and Torres Strait Islander culture and ensuring that all of their students are able to engage with the class.

“Not all the students, but some come from very traditional, conservative communities where culture is still very intact. The law and the skin relationships are still really strong, and you have to navigate that space. By the letter of the law, you're not allowed to speak to certain people from the same language group. Often you find out the offence that you've caused after the fact as it's very nuanced. If the older girls are avoiding eye contact or avoiding talking to you, there's usually a reason for it. In these situations, the assistant teacher is vital. They are the best value for money at the school. Having them onsite is critical.”

-Alice Springs, Secondary

Women role models

The importance of positive, women role models was consistent across interviews and highlighted by educators as something that is critically important to Aboriginal and Torres Strait Islander girls' engagement with their schoolwork and to inspire them for further education and careers.

“Having role models for young girls is so important [extreme emphasis]. We watched a Cathy Freeman documentary, and some kids didn't know who she was. One of the Indigenous girls was amazed and wanted to do a project on her.”

-Melbourne, Primary

Finding the right role model for their students was highlighted as an additional challenge faced by educators. The interviews highlighted the need for high-profile Aboriginal or Torres Strait Islander women outside of sport and entertainment, with educators reporting that it can be difficult to highlight successful Aboriginal or Torres Strait Islander women in STEM occupations. In the absence of famous role models, educators look to local, relatable and achievable role models. Depending on the type of inspiration the teacher wishes to instil and the objectives of this inspiration (i.e. general engagement with school versus career pathways), they select the most appropriate role model.

“I struggle with this. There aren't a lot of people to look up to in terms of Aboriginal women in STEM. The role models I'm pulling in are the ones from the local community who are pro-education. We're trying to have people from community telling the kids how important it is to go to school.”

-Darwin, Secondary

“I've tried having people from community in before, and that can be hit and miss. If they're Indigenous from the east coast, they have no connection to the country my kids are from. Or I've had guest speakers who have strong English skills and speak using high-level English that is beyond my kids. Health workers often can't build a connection because they speak too technically for where these kids are at.”

-Darwin, Secondary

“I use people in their own family a lot and Indigenous people from the local community. My GP is Aboriginal, so I brought her in to chat with the girls. We've also had a police officer, midwives, nurses. It all comes back to who you know, and I'm only new to Darwin. In terms of famous women, Deborah Mailman and Cathy Freeman are the usual examples.”

-Darwin, Secondary (Aboriginal)

Educators noted that having women STEM role models within the school is often particularly impactful. Having successful women with STEM expertise within the school can have an immediate impact on students. According to the educators, STEM role models within the school demonstrate to the girls that the kinds of occupations which are available to them. Educators believed they also may show these jobs are interesting, achievable and relevant to them, or useful to the local community.

“Up until this year, it's been lots of girls in my agricultural science classes. Seventy per cent girls. The highest achievers and hardest workers were girls. My wife was the other ag teacher, and she was a very good female ag role model. There's lots of women doing STEM at the school, and that drew the higher-performing girls to us.

-Regional NSW, Secondary (Aboriginal)

In the absence of role models in school or the local community, educators reported that social media has become the main source of role models for girls. This is where educators see their students engaging most often; it is the channel with the biggest opportunity to introduce relevant role models to Aboriginal and Torres Strait Islander girls.

“It's a bit of everything, I suppose. They're always on YouTube, always on the internet. Musicians, artists, Instagram bloggers. Years ago, it might have been Cathy Freeman, but that's changed a lot, and now it's a lot more Instagram famous models. They look up to those social media role models more now.”

-Perth, Secondary (Aboriginal)

Pathways for Aboriginal and Torres Strait Islander girls

Educators highlighted the need for more pathways into senior STEM in secondary school for Aboriginal and Torres Strait Islander girls. They also believed this to be the case for tertiary STEM education and STEM careers. This is an area where educators would like to see more investment and support to demonstrate that STEM careers are both accessible and fulfilling. Educators noted this could start with engaging Aboriginal and Torres Strait Islander girls with science in their younger years to increase the number who then move into studying STEM subjects in senior secondary school.

We need more help providing students with pathways for employment. We need to increase the understanding that by doing this [learning STEM], you can do that [career].”

-Darwin, Secondary

“We need further education courses that are specific to the needs of Indigenous students. This ATAR is needed for this course isn't going to work. There are other skills from their Indigenous life that could apply that to that career, but the current system doesn't recognise.”

-Darwin, Secondary

“In the wider community, it's lacking [Aboriginal women]. It's an industry that could do with more input into school to show the role models. We've run some courses for women in STEM at the school through some different universities but nothing targeted towards Aboriginal girls and no Aboriginal women in that program. We need to get more role models [if we want to attract Aboriginal girls].”

-Regional NSW, Secondary (Aboriginal)

According to educators, increasing the number and variety of pathways also requires strong working relationships between schools and the higher education sector, and educator awareness of alternative pathways. Educators noted that this enables them to present them with a wider array of options and help students think about different options. The interviews highlighted that there is a feeling by teachers and student support staff that this is an area that is rapidly improving.

“Murdoch and Curtin, UWA, ECU, have dedicated Aboriginal Education pathways, schools or departments. Through my own experience but also through our careers counselling teacher, she has been very good at publicising all these different entry pathways. You don't have to only get an ATAR, you don't just have to do ATAR subjects, the universities are drifting towards portfolio assessments and university preparation courses as alternative entries.”

-Perth, Secondary

“As school attendance improves, I expect more of my girls are going to go into further study. More than the previous generations. The stigma around these things, the expectations around Aboriginal kids in school and women in STEM is changing rapidly.”

-Darwin, Secondary (Aboriginal)

“In the last five years, the number of our Aboriginal girls going to uni would be quite low, but it's gradually changing, and as us teachers are getting better at putting girls into the STEM career, and the unis are getting better at attracting the kids and offering alternative pathways. They're changing the course names, course descriptions, adding new exciting subjects in uni degrees.”

-Regional NSW, Secondary (Aboriginal)

When presenting and developing pathways for Aboriginal and Torres Strait Islander girls, educators highlighted the importance for these to be simple, relevant and achievable. The students must be able to make the real-world connection. Educators noted that greater support for goal setting and breaking down of self-doubt can help Aboriginal and Torres Strait Islander girls imagine the opportunities and careers available to them. Drawing them to roles that will add value to their local community could be another effective engagement strategy. According to interviewees, it is important to show them how the skills they develop will enable them to improve the quality of life of everyone around them.

“I talk to them about pathways and stepping stones, about how to get to the career they want by doing a, b, and c first. I like to frame it about giving back to community. If you become a science teacher or a nurse, then you can stay here in your community and help others rather than having a different white person come in on 6-month rotations.”

-Darwin, Secondary

“Making real-world connections is really helpful. In class, I'll make a connection between what we're learning, and they can do this sort of thing as a job.”

-Melbourne, Primary

Resource and program preferences

As a closing activity for the interviews, educators were asked what resources they would like developed or what programs could be launched to improve engagement with STEM education among Aboriginal and Torres Strait Islander girls. In this section, we outline the main types of supports that educators said they would like to see developed.

Teaching resources

Video content

The interviews highlighted that video content is often highly appealing to teachers and already used by them in their lessons. Short videos are frequently used to introduce students to a topic at the start of the class. This approach allows teachers to engage the students in the class from the very beginning and then use the concepts presented in the video as a launch-pad for discussion.

Many teachers reported finding YouTube content created by, or in conjunction with, the Aboriginal and Torres Strait Islander community particularly useful. Videos that feature song and dance are often highly successful. Video is also useful for teachers as it tends to be more engaging for students who require more support with literacy.

Summarised, the video content teachers would like to see includes:

- Short 3 to 4 minute videos of Aboriginal and Torres Strait Islander women working in STEM occupations who share their stories
- Videos that better explain the types of STEM careers available
- Videos that show what STEM workplaces look like
- Science and education content that doesn't feel like typical education content

"I don't think they have a good understanding of STEM. Showing them the jobs that you can get within STEM. I don't think they realise the opportunities with STEM. We need hands-on resources, practical things, taking these kids to industries where they can see people at work. I think they actually need to see it before they'll engage with it."

-Regional NSW, Secondary (Aboriginal)

Simplified English teaching materials / activities

The need for simplified teaching materials is not limited to STEM but all teaching areas, according to the educators interviewed. They mentioned that this goes hand in hand with the additional support some students need with literacy. Teachers face a challenge to find the balance simplifying their classes' language to meet the needs of their students while trying to maintain the complex concept at the core of the topic being taught.

"Their literacy level doesn't align to their maturity level. It's the same problem for any student with literacy issues, not just Indigenous students. They

disengage because a 15-year-old doesn't want to read about a puppy. You need resources and materials written in a language they understand but talking about topics that are relevant to teenagers.”

-Darwin, Secondary

Related to the need for simplified English is the need for resources to be customisable. Resources that are easy to edit or customise were appealing for the teachers spoken to as it makes it easy for them to adapt them to their students' needs and capabilities.

“It needs to be something I can customise. I can read the lesson plan, and then discard half of it, and only take the key ideas. Customise it to something that's going to work better and be more successful with my kids. For example, recording the results might be too complicated, with too many variables or columns. I'll create a simpler way to record or display the information and align it to the learning outcomes I want to achieve for the lesson.”

-Remote NT, Primary

Curriculum materials with Western and Aboriginal and Torres Strait Islander examples / references

The interviews highlighted that it is not always the case that educators have a strong partnership with the local Aboriginal or Torres Strait Islander community or Aboriginal and Torres Strait Islander support staff who can help develop and deliver an integrated curriculum of Indigenous Knowledge and Western knowledge. In lieu of this, educators could refer to trusted and pre-approved resources.

The Primary Connections website was found to be widely used and familiar to the educators interviewed. According to the educators, it is important to provide resources that are both functional and rigorous. Adding Aboriginal and Torres Strait Islander content to this site could be a quick and easy solution for educators.

“We need a curriculum aligned with Indigenous knowledge. Some sort of collection of Indigenous knowledge linked to the different parts of science you teach in school. A central depository of examples, stories etc. I've found it really challenging to jump on the internet and try and find that information.”

-Regional NT, Secondary

“The Department of Education has started the Aboriginal perspectives units, and all universities in Perth have Aboriginal Science programs. The CSIRO runs the I²S² program. Teachers need a whole department putting this together. Someone to collate all the teaching resources and materials.”

-Perth, Secondary

Equipping schools to deliver STEM education

The hands-on and practical nature of STEM education means that these classes often require more resourcing than other subjects. Educators highlighted that improving funding and delivery of education services to Aboriginal and Torres Strait Islander students could increase Aboriginal and Torres Strait Islander girls' participation in STEM without the need for gender-specific programs and interventions. Some teachers believe that providing schools/teachers the resources (physical teaching resources) and support (through teacher aides / specialist STEM educators) to deliver hands-on interactive STEM education, is a bigger priority than having gender targeted programs.

Among the teachers spoken to, it was noted that teachers in schools that are well resourced, with reliable support staff, are better able to deliver hands-on STEM classes.

"We need quality teachers, who are passionate about teaching STEM, with good resources and high support. Some of the schools I've worked at are incredibly difficult to work at. I wouldn't have dared to do some of the things I do here. Here I'm hugely supported. I've got a TA at all times. I've got 20 kids and two adults so I can do different things, I can experiment, I can have the kids doing different tasks, if one is really interested in things 'What if I make this straw spear really long?' I can send the TA with him to experiment and keep his excitement/interest."

-Darwin, Secondary

"I don't think we need to be targeting a gender. We need good quality, hands-on science, with good support, resources and money. STEM costs money. You have to build and construct and experiment, and you need gear for that. If we do that, we'll get the girls. What is good for the girls will also be good for the boys."

-Darwin, Secondary

"It's easier to have demonstrations in high school as you often have a tech (or teacher aide) to help you. It's not as easy in primary as you have to manage it yourself."

-Darwin, Secondary

Smaller classes

Throughout the interviews, teachers identified that a hands-on approach to STEM is often more successful and allows them to better engage their students. The teachers reported that smaller classes work best for teaching in a hands-on manner as there is more the teacher needs to do and monitor throughout the activity than a typical whiteboard, textbook or computer-based task.

“Make science more practical, recognise it's a practical subject and cap the numbers. Woodwork can only have 20 kids, cooking only 20, science you can have 30. Thirty kids limits what you can do hands-on. Deep learning can only happen when you do hands-on learning and investigation with a small number of students. Smaller classes, run by qualified science teachers who can give a deeper level of understanding by doing, will lead to more excitement in the kids and more kids going into STEM careers.”

-Darwin, Secondary

STEM rooms

The educators interviewed find STEM-specific rooms highly appealing. They would like to see rooms that are fitted out with physical resources that can be easily shared across classes. They recognise that resourcing is difficult and prefer to see resources that are multi-functional or can be used by different year levels rather than single-use or highly specific resources that can potentially end up sitting in a cupboard for most of the year.

“I’m crying out for any sort of hands-on science. Some Bee Bots would be great as it's maths, it's coding, it's hands-on, it's the stuff of the future.”

-Remote NT, Secondary

The educators find STEM rooms appealing as they are believed to place students in the right frame of mind for learning. Entering into a specialist space may help students orient themselves for STEM classes and differentiates the class from other subjects. Not having the typical desk and chair layout may also help to create this differentiation from other classes. Educators believe that with the correct resourcing, design and layout, rooms set up specifically for STEM may be better able to facilitate hands-on activities, experiments, etc.

“A room dedicated to science and technology would be amazing as I had this back at my previous school in Melbourne. In there, we had the coding robots, and I was also able to run a gamecon that was about building a game online. There's no way I could do that here.

A separate room is useful because it puts them in the headspace of "we're doing science now" in the same way they do when they go to the art room. It enables them to go in and explore, and the room is ready to go. We don't need to spend

time setting up and packing down. The kids can spill water and do experiments, and you can't do that in a normal classroom.”

-Remote NT, Secondary

“I have a space where the kids can come in and work, and no-one else uses it. So the kids can leave their stuff there, and next week they come back, and it's ready for them to pick up and keep going. We've got soldering irons, some glue guns, a junk box of left-over parts from a previous solar cars project. If the kids have an idea, they can go over into the corner and use those tools to experiment. Once they've come to a few sessions, the kids have a mindset when they enter. It's the STEM room that has its own position/brand much like the art room and creativity or the woodwork room and building.”

-Darwin, Secondary

The importance of “space” and creating spaces with set expectations for the activity and knowledge exchange within them is also important when bridging Indigenous Knowledge and Western knowledge. In her thesis, Hansen (2016) speaks to the importance of “third spaces” when collaborating with Aboriginal people. These “third spaces” are impartial settings on which neither party holds greater ownership. Third spaces value the contribution and identity of all participants and invite everyone to contribute by asking questions, challenging assumptions, and creating new ideas.

Delivery of STEM curriculum by STEM specialists

As highlighted earlier, this research has identified that teacher confidence is a major challenge to delivering innovative STEM education and extending students through activities beyond the base curriculum. To address teacher confidence, some educators advocated for introducing STEM specialists to deliver components of the STEM curriculum.

“In the short term, I would recommend using a highly-skilled STEM team that travels around to deliver fun lessons twice a term. In the long term, we need to change STEM education and how teachers are trained to deliver STEM curriculum. The team could leave behind packs for the teachers to support them through additional activities and let them know that they'll be back in week 6 to see how you've progressed. Or the teacher could tell the team what they want the class to learn about, and then they come back in August and do an activity on that. It's about building something that works in a similar way to ABCs BTN (Behind The News) but for STEM.”

-Regional WA, Primary

“I’d like to see an Intensive STEM program. A workshop once a fortnight or once a month that the kids could go to as most teachers don't have the confidence to teach science.”

-Melbourne, Primary

“There's so many different robots out there. You don't have the time and money to test them all out. But if someone comes who has all the stuff, knows how it works, knows the activities, and can spend a couple of days to support the teachers and do stuff with the kids, that would be fantastic.”

-Remote NT, Primary

Teacher education and professional development

Some teachers believe that the way STEM is taught should change, and to do this means that the way that teachers are taught should also change. The view among these interviewees is that the structure of teaching degrees and how we prepare teachers for teaching STEM is not the best possible approach.

“Very few teachers can take a student-led approach and then adapt that to curriculum. Our teaching degrees need to change from traditional expectations. Taking assessment from our own observations and anecdotal notes rather than a mark on a scale from a test from other people [or standardised testing].”

-Regional WA, Primary

“There should be co-construction of learning and knowledge. It's not the teacher at the front with all the knowledge.”

-Melbourne, Primary

Programs to build teacher confidence

Mirroring the *Teachers & Career Advisors 2020/21* research findings, the interviews highlighted that confidence is a key attribute in how a teacher approaches the STEM curriculum and their ability to tailor the delivery of the curriculum to the specific needs of their students. Programs designed to build teacher confidence to deliver STEM curriculum may improve Aboriginal and Torres Strait Islander students' outcomes by developing teachers to deliver the curriculum in an interesting and engaging way.

“I’m getting more confident as I teach here longer, trying new things and being more experimental. Because of this, I’m now seeing the girls get excited when they see science up on the board.”

-Remote NT, Secondary

“There’s a lack of confidence and knowledge in the teachers who are teaching STEM. It needs a co-ordinator who can support teachers and go out to schools. Train them up or offer to help them deliver STEM classes. Not just at one school but covering a whole area.”

-Remote NT, Primary

Better integration of Indigenous Knowledge

Educator networks

As demonstrated throughout this report, some educators already hold a wealth of knowledge about Aboriginal culture and understand how to engage Aboriginal and Torres Strait Islander students and people working in education. These educators have devised their own methods to assist their students to succeed.

Educators with these skills could be leveraged to help train others at the beginning of their experience with Aboriginal education. Some educators interviewed highlighted the need for more networks to share their learnings, resources and success stories with other teachers specialising in Aboriginal education.

Creating formalised networks to facilitate information sharing or promoting existing networks to those who are not aware of them may help teachers skill up and incorporate successful strategies into their own teaching practice.

“It would be great to connect with other schools to see what they're doing. Schools like to see other schools doing something. A community or network of schools sharing what they're doing helps with the confidence to try new things.”

-Melbourne, Primary

Better use of skilled educators

The interviews highlighted that the method for allocating teachers to particular schools could be reviewed to ensure skilled teachers are being deployed to locations where they would have the most impact.

“I moved to Darwin and got a job at [redacted], one of the best metro schools, but I wasn't given any roles to engage with those kids even though I was the only teacher with an Indigenous studies major.”

-Regional WA, Primary

“I undertook an Indigenous studies major in addition to my teaching degree because I thought that was the way education would go. [I thought] we would lift Indigenous engagement and bridge the gap between traditional Indigenous knowledge and modern Australian education. There was a big push for closing the gap when I moved to Darwin, but they didn't follow through. In the last 20 years, it doesn't feel like there has been any change. It has left me feeling undervalued as an educator.”

-Regional WA, Primary

Bringing Aboriginal and Torres Strait Islander people into the classroom

Educators interviewed who deliver successful programs highlighted the impact of bringing in an Aboriginal or Torres Strait Islander person to deliver lessons on Indigenous knowledge. In their view, this would add greater legitimacy to the learning activity and takes some of the pressure off the teacher.

“The best approach is working with an Aboriginal person. Like if it's a non-indigenous person delivering the sessions or the classes, getting that advice or support from an Aboriginal person in how to deliver the lessons appropriately. I feel like that really works. Teachers feel more confident. They've got that advice from an Indigenous person, an Aboriginal person, so they're confident to deliver it.”

-Perth, Secondary (Aboriginal)

Pathways to tertiary education

Improved ability to provide pathways

The interviews highlighted that some educators already have very strong connections between their school and tertiary education providers (such as universities and TAFE) through their careers counsellors, particularly when both the school and the university have specialist Aboriginal support programs and the pathways available are well known. Others need more help in this area and would benefit from staff who can bridge the gap between secondary school and tertiary education providers.

Aboriginal and Torres Strait Islander-focussed university open days

An Aboriginal educator from regional NSW shared the positive experience with an open day specifically for Aboriginal and Torres Strait Islander students run by the University of Western Sydney. They would like to see this type of event operated by other universities as they understand that students are more likely to attend a university that is close to their friends, family and support networks.

“UWS used to take a busload every year of Aboriginal kids and stay for 2/3 nights in bunks at the uni and go through all the different ways to get into that uni, different degrees, different career opportunities. Schools from all over the state with just Aboriginal kids.”

-Regional NSW, Secondary (Aboriginal)

This program was highlighted as particularly effective it made the students feel special. The students heard from current and past Aboriginal and Torres Strait Islander students, lecturers, and people in high paying roles. It demonstrated to the students what Aboriginal and Torres Strait Islander people can do and showed them that there are opportunities available if they are willing to go to university. The program also exposed the students to the availability of scholarships and pathways for Aboriginal and Torres Strait Islander students.

“If you go with 1,000 kids, and only 50 of them are Aboriginal, they think ‘this isn't for me’. We went to the Aboriginal centre, a building just for Aboriginal culture where they could hang, feel part of a community. There's something ingrained in the culture that being part of a community is a need they all have.”

-Regional NSW, Secondary (Aboriginal)

Buy-in and support from the Aboriginal and Torres Strait Islander communities

Educators reported that support from parents and the wider community often has a major impact on student engagement and outcomes. Throughout the interviews, educators identified this as a crucial element of success and suggested that delivering additional funding and / or programs to students will have the best outcomes if students have a supportive network that encourages them to engage with their schoolwork.

“It has to be done in partnership with communities, but that's not always possible. Some teenagers don't care, and good luck getting a hold of their parents. The kids listen to the community in general but not so much in the heat of the moment.”

-Darwin, Secondary

The success of the “Follow the Dream” program is due to the engagement and support from community, according to the educators interviewed. This buy-in from community helps to negate the shame regarding engaging with education, that some teachers identified as being common to their Aboriginal and Torres Strait Islander students.

“I've not noticed any shame in the students involved in the program. They want to access the extra support. It's well known and publicised. There's lots of community links between the program, and the kids are aware of its existence and enjoy being there. It gives them space to get things done and get things done with support. It's a safe place. There is shyness, but that is a very different issue, and that's across all students, not just Indigenous.”

-Perth, Secondary

“I meet more of the parents and family through the program than those of other kids [who aren't in the program]. It makes the school less of a faceless institution. It all comes back to making those community links, providing parents with an opportunity to meet the teachers or find out something about the school. Those informal links reduces the anxiety of the kids and the parents.”

-Perth, Secondary

“The first thing is to partner with the local Aboriginal corporation and ensure that the community owns the program. You can't dictate what you want to teach, [you have to] ask them what they want to teach, let them be in charge. You also need to make the families and community to feel welcome in the school.”

-Perth, Secondary

The interviews highlighted that rolling out programs like “Follow the Dream” in more schools may help students improve their self-confidence and become more successful in school.

“Not all the kids are coming into year 11 with particularly positive experiences about school. One of my kids said last year, “I’ve never passed anything in science”. That’s a sad indictment on the other schools that they’ve been at. That can’t be good for their self-esteem.”

-Perth, Secondary

[Because of] cultural and societal reasons they are dis-advantaged both culturally and academically and they don’t get a time to shine very often. Give them a chance to be a leader and not always on the periphery.

-Melbourne, Primary

Rebuilding trust between communities and schools

Educators suggested that the education system needs to go through a similar process to that occurring with community policing with the Aboriginal and Torres Strait Islander communities, to rebuild the trust between communities and schools. They referenced that these community policing programs developed in the Northern Territory are working to rebuild the relationship, to build trust, and change the narrative about policing to one which focuses on the protection of communities and the need to work together to achieve it.

“The broader [Aboriginal] community is definitely important, crucial I would say to the success of students. It’s about relationship restorations, connection, belonging, all those buzzwords. Families need to feel like schools have changed from what they experienced when they were children. It’s the same situation with policing. If the community felt welcome, and if there is 2 way communication between Indigenous and non-indigenous schooling there would be a huge success. Families need to know that we’re not educating your children to take them away from you but to make them more successful in their lives and give them a future.”

-Metro NT, Primary

“We need to learn from policing. The way the police are trying to build better relationships with communities. They’re trying to demonstrate that they’re not here to make your life worse, we’re here to make your life better.”

- Metro NT, Primary

“We need to have Aboriginal people in the school as part of the education system. We can be educating Indigenous kids, but we also need to be learning from the Indigenous community at the same time. Both are important. The education system as a whole needs to demonstrate that we're not taking your kids to educate them and change them into white people. They're going to be able to learn, we're going to make your lives better while still allowing you to maintain your culture.”

-Regional WA, Primary

The view of many educators interviewed was that true engagement requires two-way communication. They believe that there needs to be Aboriginal and Torres Strait Islander input into not just the curriculum but also the overall process of education in Australia. This is likely to require a broader range of approaches of educating, teaching and also ways of assessing students that goes beyond rote learning and standardised testing.

“We need to change the education rhetoric and develop a whole new way of educating and learning. Sharing a newsletter with community isn't engaging them. Let me use the analogy of "play based education" that so many schools say they do. They think they have play based education just because they have some Lego or Duplo but the way they are teaching is still the same. It's still filling out an activity sheet after doing an activity as a way to measure competence.”

Regional WA, Primary

Implementing STEM programs targeting Aboriginal and Torres Strait Islander students may not lead to success if the community engagement process is not also taking place, according to the educators interviewed. They believe that parents and caregivers should be brought along the journey to encourage their children into school and STEM.

“Indigenous parents really appreciate the school ethos and services, generally though there is a hesitancy with the school. We do a big NAIDOC day celebration but they [Indigenous parents] take a little bit of a back seat to being strongly engaged with the school and I put that down to generational trauma. Schools can be a source of trauma for parents. They don't want the school or government looking into their family.”

-Melbourne, Primary

Appendix

Aboriginal and Torres Strait Islander student support programs

The interviews identified several existing programs for Aboriginal and Torres Strait Islander students, which are currently successfully operating across Australia. According to the educators interviewed, these programs have high engagement from Aboriginal and Torres Strait Islander students, are well-funded and made up of staff with expertise in Aboriginal ways of learning. Many of the programs operate across numerous schools and, in some cases, across multiple states.

New programs or initiatives aimed at increasing Aboriginal and Torres Strait Islander girls' engagement in STEM could be done in conjunction with existing programs; leveraging an organisation's established network and processes may provide a greater chance of success. These organisations can help ensure that new programs are culturally appropriate for Aboriginal and Torres Strait Islander students and easy to use and implement by teachers.

Throughout the interviews, it was noted that, currently, existing programs are designed for all Aboriginal and Torres Strait Islander students in general, or specifically for boys. The incidence of programs specially tailored for girls is limited, and there were no Aboriginal or Torres Strait Islander girls-specific STEM programs encountered throughout the research interviews.

Below is a list and description of the programs identified throughout the interviews.

Clontarf Academy

Clontarf is one of the longest running and most well supported Aboriginal student programs. It is designed specifically for Aboriginal and Torres Strait Islander boys and uses sport to draw them in and engage them with schoolwork. The program provides a wide range of supports, implemented to different levels in different schools. Below is an outline of some of the services provided:

- Pick the boys up each morning to get them to school on time.
- Provide breakfast.
- Take them on cultural trips.
- Provide a safe, Aboriginal only space within the school.
- Connect them with potential employers.
- Assist with forms and applications.
- Prepare them for school-based apprenticeships and VET courses.
- Build relationships with Aboriginal mentors.

The main outcome of the program is to ensure boys finish high school and enter into vocational training.

Thornbury Primary School – Indigenous studies

See <https://thornburyps.vic.edu.au/learning/#indigenous>

From their website:

“Students at Thornbury Primary School have weekly lessons in Woiwurrung, the language of the Wurundjeri, taught by LOTE teacher Terri Lee-Fitzpatrick. Terri is Yarrajandu, Yarru woman from Broome in Western Australia and has been teaching at the Thornbury Primary School for 19 years.

Throughout the year, Terri teaches an Indigenous Studies program that links in with each class’ inquiry unit / main lesson and provides an Indigenous perspective to what students are learning. The program also focuses on key Indigenous events throughout the year, such as Sorry Day, Reconciliation Week and NAIDOC, as well as significant local and national Indigenous individuals or groups. Also covered in the program and appropriate to curriculum requirements for each grade level are any relevant historical and contemporary issues connected to these events and people.”

Follow the Dream

See <https://pff.com.au/programs-locations/programs/follow-the-dream/>

Follow the Dream is a program developed and delivered by the Polly Farmer Foundation. It is predominantly run in Western Australia but is also present in the Northern Territory and South Australia. It is a gender-neutral program that is usually run alongside Clontarf Academy.

Based on interviews with educators who were involved in the program, is it predominantly participated in by Aboriginal and Torres Strait Islander girls because the boys are already in Clontarf. However, the program itself was not designed as a girls-specific program but a program focussed on academic achievement rather than sport. To enter the Follow the Dream program, students have to have average or above average academic performance and aspirations for further education.

Some schools are extending “Follow the Dream” with the specialist “Deadly Sista Girlz” program. However, this program focuses more on personal development and health than academia.

Participants in Follow the Dream are provided with the following services and information to students:

- Up to 4 hours of tutoring per week if they are an ATAR student
- Tuition assistance
- Pathways to university, TAFE and VET (both incursions and excursions)
- A safe space that Aboriginal and Torres Strait Islander students can access at any time.
- Pathways into universities / TAFE / further education
- Provides a healthy breakfast and makes sure students are turning up to school

We're always there in their lives. They know they can come to us. We are the go-between, the liaison with teachers, the system etc. They lead transient lives in terms of accommodation, what's going on at home, they may be living with grandparents, there can be emotional upheaval. We never give up on the kids. There's always someone supporting them to make sure they come to school.

-Perth, Secondary (Aboriginal)

Deadly Sista Girlz

See <http://www.deadlysistagirlz.com.au/>

From their website:

“The Deadly Sista Girlz Program has been developed to engage, inspire and empower Aboriginal and Torres Strait Islander girls between the ages of 11-17 years. They aim to connect with the girls as friends, confidants, and mentors to encourage them to become great role models in their community and achieve success in their chosen career paths. The program works with Indigenous women role models to empower young Aboriginal and Torres Strait Islander girls to make informed decisions about their personal health and wellbeing to lead a positive and healthy lifestyle.

The Deadly Sista Girlz Program offers girls a stable environment in which they can discuss current and personal issues and allow them to trust and receive guidance in a safe environment. Each girl has the opportunity to be personally mentored throughout the program.”

Deadly Sista Girlz addresses the issues of:

- Self-esteem
- Identity
- Communication
- Women’s health
- Drug and alcohol abuse
- Healthy nutrition
- Financial literacy

“We do offer educational support but a lot of emotional support as well. And that's also like pathways... for when they finish school or if school is not working for them.”

-Perth, Secondary

Girls Academies

See <https://www.niaa.gov.au/news-centre/indigenous-affairs/new-providers-deliver-girls-academy-services-2021> The academies engage Aboriginal and Torres Strait Islander girls and young women to support them with their studies, increase Year 12 attainment and provide pathways to successfully transition into work or further study.

The program provides a range of activities designed to help young people thrive at school, including things such as in-class support, group homework sessions, mentoring, extra-curricular and personal development activities, health check-ups, transport to and from school, breakfast clubs, career and employment assistance, cultural activities and special camps or excursions as an incentive to maintain school attendance. All activities are delivered in partnership with the relevant school community and education department and are tailored to the needs of each cohort.

The program was previously delivered by Role Models and Leaders Australia.

Girls Academy is the counterpart to Clontarf Academy in many schools. Educators interviewed about this project felt that there is not currently the same level of engagement by girls in the program.

“At recess and lunch, 2 or 3 of the fellas will hang out in the Clontarf Academy in the tin shed funded by BHP. It will be heaving with fellas. The girls’ academy doesn't have the same energy or anywhere near the number of girls.”

-Alice Springs, Secondary

Teaching resources: Specific to Aboriginal and Torres Strait Islander students

The research also identified a range of different resources used by teachers to engage with students. While some resources have been specifically designed to help improve engagement with Aboriginal and Torres Strait Islander students, others apply to all students.

This is not an exhaustive list, only providing further information on resources which were identified through the interviews with educators.

8 Aboriginal Ways of Learning

See <https://www.8ways.online/>

In the interviews, some teachers mentioned the “8 Ways” framework as a method for better engaging with their Aboriginal and Torres Strait Islander students and challenging themselves to experiment with different approaches within their teaching practice. The 8 Ways framework is a NSW Department of Education initiative based on the idea that Aboriginal and Torres Strait Islander perspectives are not found in Aboriginal content but in Aboriginal processes. It encourages teachers to incorporate the following methods of learning into their teaching practice with Aboriginal and Torres Strait Islander students:

- Story sharing
- Learning maps
- Non-verbal
- Symbols & images
- Community links
- Deconstruct, reconstruct
- Non-Linear
- Land links

From the website:

“Every place, every People, has its own unique pedagogies. These 8 simple ones are merely a starting point for dialogue. Each school engages in a different way, and produces its own unique frameworks for Aboriginal education through dialogue with the community about local ways of doing things...

The most successful outcomes have been achieved by individual teachers who have been able to work with community to identify local Aboriginal systems in country and culture, explore the values inherent in these, respect enduring protocols and follow the ancient processes that still inform our ways of interacting with changing social and ecological landscapes today. Then they have brought all this alongside the school organisational system, vision, rules and learning sequences, developing new understandings to inform real change in their classrooms.”

Teachers interviewed who have used this approach have found it successful as it engages their Aboriginal and Torres Strait Islander students in a way that educators believe is more natural for

them. These teachers, who have come to teach Aboriginal and Torres Strait Islander students after previously teaching in capital cities, found the framework helpful to adapt their teaching methods to better engage with their students.

“I tried to base some of my class planning and instruction on the 8 ways framework, 8 different strategies to use in the classroom that are based on Aboriginal world views: Connection to country, telling stories etc. It was effective, particularly the less talking model. Demonstrating rather than telling.

At other times telling stories was a really big part of how I would engage them. Not saying when this might be useful but telling a story about when it WAS useful.”

– *Darwin, Secondary*

“The kids learn completely differently to any other kids I have taught before. Their motivation is different. Any other school, I can plan a lesson and know the kids will do it. Here, when I'm planning, my head is in a different space. I know they won't do that because their time on task is so different.”

–*Remote NT, Secondary*

For teachers interviewed who have been teaching in Aboriginal and Torres Strait Islander communities for a long time and who indicated that they have a deep cultural understanding, the 8 Ways Framework was reported to be less beneficial. However, they still see the value for others.

“I think it’s more useful for Indigenous mob that are less cultural or teachers teaching mob for the first time, so they need a cultural induction. At [redacted], we do a lot of this stuff intuitively, and it has been integrated over time. The kids are really good here at code switching. They go to DT class, and they switch to Western mode. If they're going to cultural class or hanging and talking in language, they're in Indigenous mode. The kids in our class are used to navigating between cultures. In class they translate between English into language.”

–*Regional NT, Secondary*

I2S2 - Inquiry for Indigenous Science Students

See <https://www.csiro.au/en/Education/Programs/Indigenous-STEM/Programs/I2S2>

From their website:

“The program has been developed to support Aboriginal and Torres Strait Islander students in years 5-9. The Inquiry for Indigenous Science Students (I²S²) program provides teacher professional learning to embed Aboriginal and Torres Strait Islander traditional knowledge

through hands-on inquiry-based projects to increase student engagement and achievement in science.”

“When you take a concept that they struggle to understand, then when they eventually understand it, there's a feeling of self-worth. That's where I²S² is really important.

-Darwin, Secondary

Junior rangers

See <https://nt.gov.au/leisure/parks-reserves/learn-and-be-involved/become-a-junior-ranger>

From their website:

“The junior ranger program offers children the opportunity to discover the natural and cultural environment through fun and hands-on activities. The program runs annually in three locations: Alice Springs, Katherine and Darwin.”

“We talked about careers and working as a ranger, and the program was building towards that. We teamed up with the local wildlife park outside of Darwin, and we'd do ranger-y type things, which was great. It was a partnership with Charles Darwin University, and they would get a Cert 1 in conservation and land management for year 9 students.”

-Darwin, Secondary

IHHP - Indigenous Hip Hop Projects (YouTube)

See <https://www.youtube.com/user/indhiphop>

From their website:

“Indigenous Hip Hop Projects (IHHP) is a unique team of talented artists in all elements of hip hop, media, entertainment and performing arts, who have been working extensively in Aboriginal communities around Australia since 2004.”

“It was really helpful in my classroom. I would do a deal with the kids that we would watch a video after every 15 minutes of work. It's effective because it's developed by community and has footage of community.”

-Darwin, Secondary

Other YouTube and video content

- [Dust Echoes](#): Series of animations of Aboriginal dreaming stories
- Video content from ABC Education

- Aboriginal based documentaries: Success stories and biographies of successful Aboriginal and Torres Strait Islander people

Deadly Science

See <https://deadlyscience.org.au/>

From their website:

“Deadly Science aims to provide STEM resources to remote schools across Australia. To date, they have shipped over 16,000 books and 500+ telescopes and resources to over 110 communities across Australia.”

“Deadly Science, we need to support them more. It's run by Aboriginal people for Aboriginal people. It encourages engagement in science in remote communities, and they already have the passion and community connections. That connection means it's relevant to kids in community.”

-Darwin, Secondary (Aboriginal)

Resources in language

Within the interviews, educators also shared some of the resources that have been developed at their school. Potentially many resources like this exist in isolation. Building better networks between STEM teachers who work with Aboriginal and Torres Strait Islander students could help to spread these resources to other schools.

However, it should be noted that resources developed in local language may not be usable by schools in other areas due to the large number of different Aboriginal and Torres Strait Islander language groups.

“I have an amazing resource to use this year which is a creole and English translation of human body systems. All the body systems in English and also into creole - the most common language in the greater Katherine region. That was developed by a previous teacher and our Aboriginal Education team.”

-Regional NT, Secondary

Books

The following books were mentioned in the interviews as useful resources for STEM teachers working with Aboriginal and Torres Strait Islander students or teachers looking to integrate more Indigenous Knowledge into their classrooms.

- [Codeswitching in the Classroom](#) by Jeff MacSwan / Christian J. Faltis
- [Tracks to Two-Way Learning](#), developed collaboratively by Aboriginal and non-Aboriginal researchers, educators and community people.

- [Deadly ideas: a collection of two-way bidialectal teaching strategies, 2004](#) by Education Department of Western Australia
- [Dark Emu](#) by Bruce Pascoe

Teaching resources: General STEM

micro:bit

See <https://microbit.org>

Micro:bit is a tiny motherboard that can be programmed using block code or python for more complex actions. The block code can be used to get the device to light up, display words, count steps etc. Educators praised the ease of use and the online tutorials that students can work through at their own speed. The micro:bit is suitable for both primary and secondary students.

“Had the best learning of the year with it. The kids were so engaged with it. It was able to span the kids who were at the very beginning as well as those operating at their year level ability.”

-Darwin, Secondary

Science by doing

See <https://www.sciencebydoing.edu.au>

An online website for high school Science Years 7-10 covering the Australian Curriculum. The site is free to all Australian students and teachers and presents science in an engaging, guided inquiry-based approach to lift student interest and understanding.

Amoeba Sisters

See <https://www.youtube.com/user/AmoebaSisters>

The Amoeba Sisters series of STEM-focussed YouTube videos was called out by educators as being particularly well produced and effective.

“Their videos are really great. Really engaging, fun, colourful. I get good engagement from both female and male students. Even when they're laughing at the video for a bit lame or dorky, I think they actually loving it.”

-Regional NT, Secondary

Teachers Pay Teachers

See <https://www.teacherspayteachers.com/>

Educators also spoke about Teachers pay Teachers, an online marketplace where teachers can sell the resources they've developed (i.e. worksheets, activities, homework tasks) to other teachers.

“I love teachers pay teachers! I can pay \$2 to get a whole unit which is fantastic. I bought one the other day all about plants. We have a farm at school so I was able to use that with the kids to look at plant lifecycles and growing cycles.”

-Remote NT, Secondary

Social media

Finally, educators also discussed the use of social media as a source of resources available to them to improve engagement. The three most commonly mentioned platforms included Facebook, Instagram and Pinterest.

“Pinterest as well for a lot of ideas. Instagram has also been really good with Covid. Lots of American and Melbourne teachers sharing their ideas. There’s a lot of overlap with their Melbourne school and can use their resources.”

-Darwin, Secondary
