



Australia's National
Science Agency

Generation STEM

2023 Annual Review



Acknowledgement of Country

CSIRO recognises that Aboriginal and Torres Strait Islander peoples have made and will continue to make extraordinary contributions to Australian culture, economy and science and we aim to promote and support the vision of 'A science landscape in respectful partnership with Indigenous Australia delivering innovative, sustainable, holistic solutions to meet our greatest national challenges'.

Generation STEM is managed by CSIRO and made possible by the NSW Government's \$25 million endowment to the Science and Industry Endowment Fund (SIEF).

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Executive summary

It was a pivotal year for Generation STEM. Its programs reached a new level of maturity and embarked on a strategic shift towards strengthening and deepening the impact and planning for a lasting legacy.

2023 marked the final year of Operational Plan 2, a period focused on growth in program offerings, geographical reach and participant numbers. The STEM Community Partnerships Program (STEM CPP) (Focus Area 1) continued to expand and is starting to see the benefits of its multi-year, longer-term implementation model. With 85 participating schools, the program is reaching more students than ever and is becoming increasingly integrated into school programming.

In the Illawarra-Shoalhaven and Moree regions, Deadly in Generation STEM (Focus Area 1) strengthened its presence and cultivated strong relationships with local Cultural Knowledge Holders, students, educators and Indigenous STEM professionals. A robust delivery model was developed to support schools to embed Indigenous science in the classroom, create culturally safe learning environments, and inspire Aboriginal and/or Torres Strait Islander students to explore STEM subjects and local STEM career opportunities.

Generation STEM Links (Focus Area 2) gained significant momentum with businesses, concluding the year with a remarkable 100 new requests for tertiary student placements. Having established itself as a unique, high-quality internship program which supports the needs of a diverse range of STEM businesses, the program is well-positioned for its final year in 2024.

Generation STEM continues to provide engaging opportunities that cater to the distinctive needs of students, schools and industry. The program's responsive approach combines structure with flexibility, empowering participants to build skills and confidence within a nurturing environment that fosters curiosity, growth and connection.

The solid foundation built over the past few years allowed Generation STEM to investigate and trial ways to further strengthen the programs in 2023. This included increasing teacher support and reassessing mentor-teacher partnership processes (STEM CPP), developing a teacher reflection session (Deadly in Generation STEM) and diversifying participating industry sectors (Generation STEM Links). Various initiatives were also developed to target parents and families as key influencers of student decision-making, including through the #WithSTEMYouCan campaign.

The ambitious Evidence X project is also taking shape, with the development of a clear problem statement and preparations underway to commence the next phase of the co-design process in January 2024. There has been considerable interest from industry, education and government stakeholders in the project, reflecting the need for innovative, design-led solutions to shift the dial in STEM education and ensure a stronger and more diverse STEM workforce in NSW.

The next four years will be crucial in ensuring Generation STEM continues to focus on increasing its impact and laying the foundation to tackle systemic challenges, enabling the program to leave a strong legacy in the STEM education system.

Generation STEM

2023 year in review

3,790 students
engaged across
3 programs

126
industry
collaborators

40 Links
placements
completed, with a
further 33 confirmed
or underway

1,560
attendees
across 8 STEM
CPP showcases

First Deadly
in Generation
STEM Camp
held in the
Illawarra

3 careers expos
held in Western Sydney,
Queanbeyan and
Orange, with over
450 students
attending

3 industry-
education
roundtables
held in Newcastle
and Dubbo

Co-design process
commenced and
problem statement
developed for
Evidence X

What program participants say about Generation STEM

“STEM CPP allows students to access and experience STEM in their local environment. It creates STEM opportunities that students can immerse themselves in while feeling comfortable. Students need to see it to be it.”
– Central West STEM CPP collaborator

“I’ve realised that STEM links up with a lot more culture than you would’ve thought, and I think I might do something with STEM in the future.”
– Student, Deadly in Generation STEM¹

“Letting the [Generation STEM Links] team handle the interviewing streamlined the process significantly. I was initially sceptical, but once I met Emma, I was quite surprised, because she was the perfect fit for the team.”
– Domenic Ammendolia, Founder and CEO, Trolley Data Management Network

Our impact

- 1 Increased student interest and engagement in STEM, and knowledge of STEM careers through STEM CPP
- 2 Deadly in Generation STEM students built connections with Indigenous STEM knowledges and improved their awareness and interest in STEM
- 3 Increased access for underrepresented students to engage in paid STEM internships, enabling them to increase their skills, knowledge and confidence through Generation STEM Links

Expanding our reach

54,000+ website views	22,000+ website visitors
23,590 organic social media engagements	Increased regional footprint across NSW
Engaged more with parents, families and communities through social media and at face-to-face events	

¹ Quote taken from: Cherry, Kate. Deadly in Generation STEM Insights: 2023. Unpublished; 2024.



Program highlights

Leveraging partnerships and collaborations to broaden student opportunities

In 2023, Generation STEM saw significant growth in the number and diversity of industry collaborators, with this growth having an even greater flow on effect for students. For STEM CPP, a 53% increase in participating businesses generated an 87% rise in student experiences. Meanwhile, the 78% growth in industry applicants for Generation STEM Links resulted in a 300% growth in student placement opportunities.

The expansion of industry collaborations and placements has unlocked new opportunities for students. For example, 419 students from STEM CPP schools with ICSEA² scores under 1,000 gained free access to the Sydney Science Trail program run by the Australian Museum and Botanic Gardens of Sydney. Furthermore, Generation STEM Links diversified its reach into emerging industry sectors with new applications from industry partners in design, renewable energy and research and development.

² Index of Community Socio-Educational Advantage is a scale that provides an indication of the socio-educational backgrounds of students. 1,000 denotes the median score, so schools with a score of less than 1,000 are in the bottom half of relative advantage.

Expanding our regional footprint

Generation STEM continued to embed and extend its presence in regional NSW across its programs. The number of participating regional STEM CPP schools more than doubled (21% in 2023 vs 9% in 2022) as it expanded to the Albury, Dubbo and Queanbeyan-Yass areas. Deadly in Generation STEM continued to build and strengthen its offerings and relationships with local Cultural Knowledge Holders, schools and teachers in the Illawarra-Shoalhaven and Moree regions.

The increasing focus on regional businesses and students engaging in Generation STEM Links led to 60% of new placement requests from outside Sydney, with a significant representation in the Hunter region. Given the success of the collaboration workshops in Newcastle in supporting diverse stakeholders to collaborate on relevant STEM workforce issues and actionable solutions, two further events were held in Dubbo with similar success.

Building on stakeholder feedback to strengthen our impact

The release of the 2019–22 Evaluation Report provided a timely opportunity for Generation STEM to draw on the evaluation findings and participant feedback to enhance its overall impact. Survey data indicated that 72% of students feel that what their parents and family think has a slight to big impact on their subject selections. In response, the team trialled various strategies to engage with parents and families. This included holding an information session at a Western Sydney library, and parent-focused booths at the STEM CPP showcase and a large community event with almost 10,000 attendees during National Science Week. Parents and families were also a key target audience for the #WithSTEMYouCan campaign.

As a result of teachers identifying a greater need for support with implementing the program at their school, the team has focused on developing resources to support teachers in incorporating inquiry into their programming and engaging with diverse learners. This work also provided an opportunity to explore how these resources and tools could play a key role in Generation STEM's legacy resources.

Transitioning from growth to sustainable impact

The development of Operational Plan 3 provided a timely opportunity for Generation STEM to reassess its vision, ensuring a strategic focus on maximising long-term impact. A Generation STEM Consultative Council workshop in late 2023 identified four initiatives that will be prioritised over the next four years:

1. **Enhancing industry engagement and capability** to actively participate in STEM education programs.
2. **Addressing misconceptions of 'STEM'** through the WithSTEMYouCan campaign, dispelling misconceptions about what STEM is, its benefits and who it might be suitable for.
3. **Engaging parents and families** as key influencers of student decision-making in subject selection and career pathways.
4. **Advocating for evidence-based practices** in STEM education through Evidence X and CSIRO Education's broader impact and evaluation work.

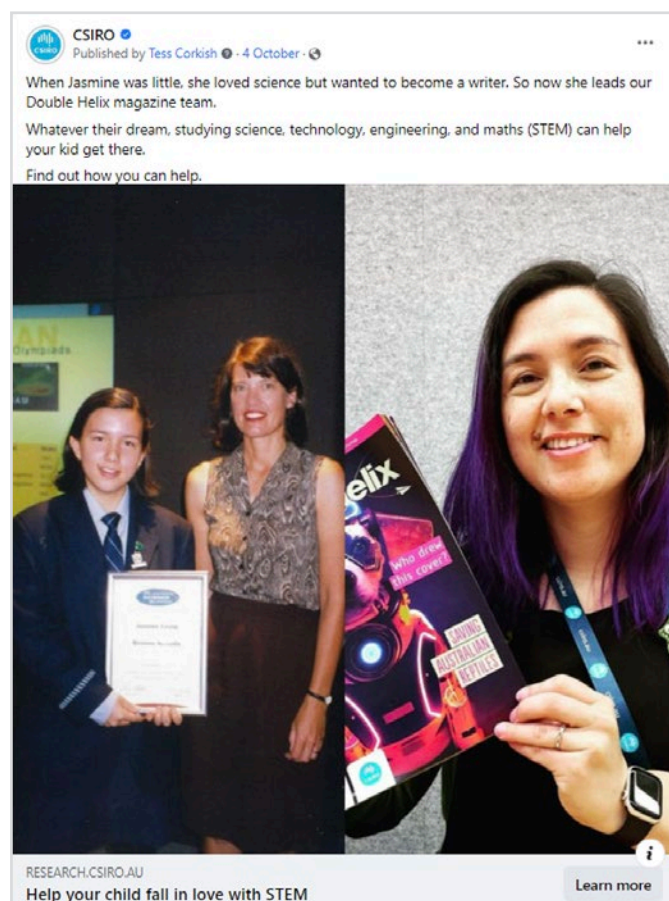
While work is underway for many of the above initiatives, they will be elevated as part of a STEM capability mission, forming a key part of Operational Plan 3 alongside strengthening and deepening our program impact and an increased focus on Generation STEM's legacy.

Expanding our presence through targeted communication strategies

#WithSTEMYouCan campaign

In May, Generation STEM launched a campaign with the aim of demystify the relevance of STEM and to engage with parents, industry and students. Building on Generation STEM's 2021 #WithSTEMYouCan campaign, the movement showcased STEM professionals from diverse backgrounds and experiences and generated engaging content to inspire, educate and appeal to a wide audience. A key focus of the campaign was to highlight the significant role of parents, carers and families in encouraging children to explore career paths based on passions and capabilities.

To amplify the message that 'With STEM You Can', a brand identity, posters, paddles and t-shirts were created and used across Generation STEM activities, during National Science Week and at other CSIRO Education events.



Key campaign elements

66 organic social media posts, including memes, 'then and now' photos of CSIRO scientists and STEM educational content and 'With STEM I Can' videos contributed by industry professionals

> **Received 636.79K impressions and 20.59K engagements**

Two paid social media campaigns on Facebook and Instagram targeting people aged 15-16, parents with children aged 9-17, and STEM professionals in NSW

> **Reached 962.10K accounts, resulting in 1,907,929 impressions and 9,255 link clicks**

12 new articles for the #WithSTEMYouCan campaign website including articles about what STEM is, the diversity of STEM careers and how parents can engage their children in STEM

> **14.37K views of the website content**

Encouraged the use of the #WithSTEMYouCan hashtag by industry, schools, Councils and as part of National Science Week

> **Hashtag used 93 times by industry, schools, Councils and CSIRO social media accounts, reaching over 3 million users**

Proactively sought media coverage of the campaign and promotion of campaign activities

> **Coverage by several media outlets**, including *EducationDaily* and *Education Today*, and a live interview with Ruth Carr, Director of CSIRO Education and Outreach on 2GB's Life and Technology segment

Sparking conversations about STEM

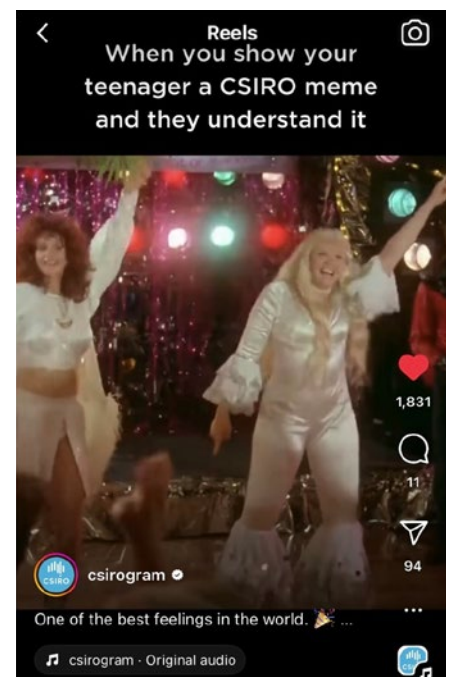
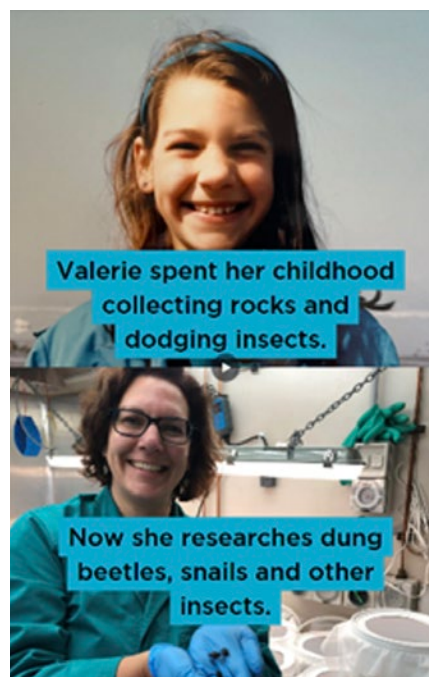
The paid social media campaign received positive engagement from parents sharing memories and stories about their kids' interest in STEM.

My kids love that magazine! Their grandad had given them a subscription as a Christmas present when he was alive. Great magazine!! Well done!!

My 7 yr old daughter decided a few years ago that she wants to be an entomologist. It's been a few years now and she hasn't changed her mind....it will be interesting to see if she actually ends up studying insects when she's older 🤔🤔

My daughter loves everything outside: sport, the air, bugs, rocks. She had a mind blown moment this week when she learned that people that like rocks can do it for a job that pays lots of money.

I was a Double Helix nerd! Now I'm a certified PhD nerd!



Leveraging communications to amplify our reach

Showcasing program highlights and opportunities

Developed 14 new blog posts

Published the 2019–22 Evaluation Report

Published two newsletters sharing stories and opportunities with our supporters

Proactively shared news stories and content across a range of channels

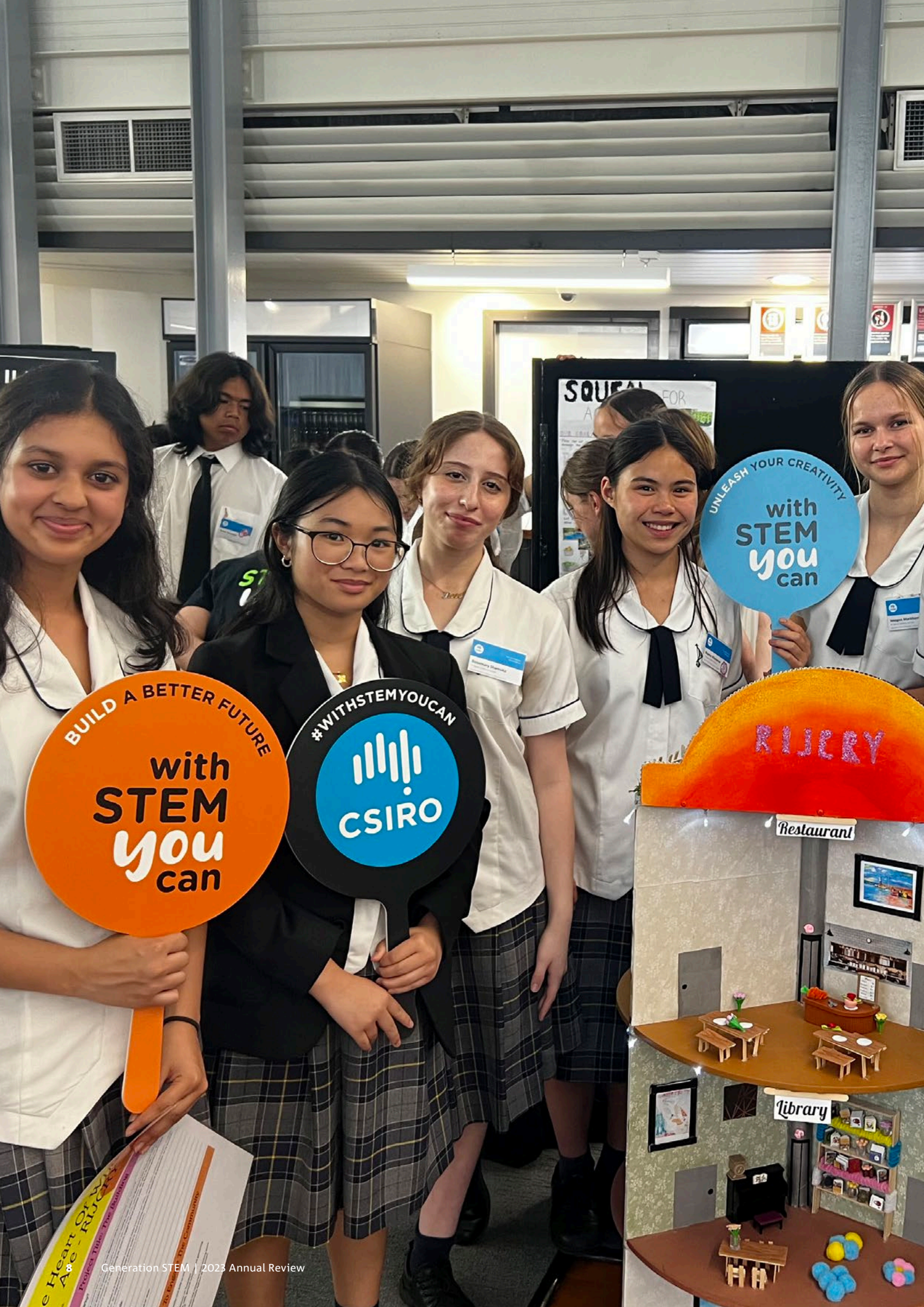
Increased awareness of Generation STEM

13,238 visitors to the Generation STEM website

113 program enquiries (excluding direct email)

100+ new email subscribers

Enhanced media coverage with 25 articles, comprising media stories, press releases, and reshared content across key industry newsletters. Outlets include University of Newcastle, University of Technology, Sydney, The Girls in STEM Toolkit, *Education Today*, *EducationDaily*, *Science meets Business*, *2GB*, *Seven West Media*, *CSU News*, and *FST Media*



BUILD A BETTER FUTURE
with
STEM
you
can

#WITHSTEMYOU CAN
CSIRO

UNLEASH YOUR CREATIVITY
with
STEM
you
can



Program delivery

Focus Area 1 STEM Community Partnerships Program

Building on the growth from previous years, 2023 focused on enhancing STEM Community Partnerships Program’s (STEM CPP’s) regional reach and ensuring it was sustainably embedded in schools. The program expanded to Dubbo, Queanbeyan-Yass and Albury, incorporating learnings from the program’s implementation in Western Sydney while adapting for regional schools’ engagement. Schools outside Sydney comprise 21% of participating schools (compared to 9% in 2022).

STEM CPP has completed its fifth year of implementation and is starting to see increased traction with schools, especially those who have engaged in the program for more than a year. The average number of participating students per school has risen from 29.7 in 2022 to 44.3 in 2023. A key contributing factor is the program’s expansion to Stage 4 classes (Year 7 and 8), enabling teachers to implement the program flexibly across year groups and providing an opportunity to engage and influence students earlier in their educational journey. The response to the Stage 4 expansion was extremely positive, with 30% of total participating students for 2023 being in Stage 4. Some STEM CPP schools opted to engage only Stage 4 classes.

2023 highlights

3,639 students
(56% increase from 2022) from 85 schools

4,136 student-industry interactions including 51 site visits held and 56 students participating in virtual work experience

1,000+ students
and 46 classes in Stage 4 (new for 2023)

8 end-of-year showcases
held to celebrate student work

3 careers expos held in Western Sydney, Queanbeyan and Orange, with over 500 students attending

Life of program highlights

7,500+ students
participated

Expanded from 1 to
6 regions
Queanbeyan, Central West,
Dubbo, Albury, Central Coast,
Western Sydney

121 total schools
participated, including 76 who have
participated for at least 2 years

Bringing STEM to life for students

The reputation of STEM CPP and the sustainable industry relationships fostered over the previous four years have allowed the program to offer students increased access to real world STEM via site visits, careers expos and virtual work experience. These activities provided students with the opportunity to experience STEM in action and see examples of how they can pursue their STEM interests as a career.

Students and teachers reported a change in enthusiasm for STEM after these activities. Teachers also noted that students used topics explored during site visits as springboards for discussion in STEM lessons. The experiences helped teachers to frame their inquiry projects by using the site visits to spark interest and provide a hook for students. This insight into real-world STEM brought projects to life for students and enhanced motivation and engagement, including those less engaged at the beginning.

“We got to see every part of [the business] processes. It wasn’t just a case of stand and watch and listen to the guides. It was ‘put your hands in’. We actually got to touch the nurdles that they put into their plastic.

There was something for the really intellectual, high-brow kids. But then, those kids that are more hands on, they got to see the processes. [They got to see] that you don’t have to be the best at Maths or getting great results. It’s any kid – any kid can work in STEM.” – Teacher

Providing opportunities for students in regional NSW

The program’s expansion into regional areas provided new and exciting opportunities for students in the Central West, Dubbo and Queanbeyan-Palerang and Yass Valley areas. Students engaged in site visits at Taronga Western Plains Zoo, CSIRO’s Parkes Observatory (Murrumbidgee) and OzFish, as well as virtual work experience throughout the year. In November, combined careers days and showcase events were held in Orange and Queanbeyan, with Queanbeyan-Palerang Regional Council playing a pivotal role in organising and making the Queanbeyan event a success. The combined event format was adapted from the careers expo model delivered in Western Sydney, considering the greater distances regional students need to travel to more central locations. Almost 200 students presented their projects to industry professionals and community members while also participating in engaging workshops and activities from local STEM industries.

The team found that face-to-face interactions are far more important with regional stakeholders than those in metro areas and, as such, visited the regions more frequently. In 2024, the team will travel to regional areas more often, delivering events such as School Information Sessions and Council-Industry Workshops in-person instead of virtually, a change to the model used in Western Sydney.

“STEM-based skills are crucial for our local area. They are essential in creating opportunities for our young people to thrive in regional areas and compete with the rest of the world.”
– Central West Industry Collaborator

Engaging parents and families about STEM

A key focus in 2023 was extending our impact through engaging with key influencers in students' decision-making. The team trialled various activities that provided information to parents and families of STEM career options and strategies for engaging their child with STEM outside of school. This included developing targeted communications for parents, an information session at Carnes Hill Library and interactive booths at the Australian Botanic Garden Mount Annan Community Day during National Science Week and the Macarthur showcase.

Parents were highly engaged in the face-to-face activities, with many surprised and excited by the diversity and range of careers available in STEM. After the Carnes Hill information session, 86% of attendees stated that their understanding of STEM and its relevance to the real-world had increased, and all agreed that they would recommend the session to other parents and carers. It is clear from interactions and analysis that parents and families want more information about STEM and its importance to their children. The team will continue to build on and learn from these activities and explore more ways to effectively engage with this cohort, especially those less involved with their children's educational journey.



Parent booth at Macarthur showcase event

Reflecting on evaluation findings

Recommendation	What we did in 2023	Further improvements to progress in 2024
Teachers from both new and existing schools identified a greater need for support with implementing the program at their school.	<p>Gained a deeper understanding from teachers about the specific supports they needed e.g examples of final projects from previous years</p> <p>Developed additional resources such as lesson plans to help scaffold delivery. Delivered additional teacher professional learning on implementing inquiry in the classroom.</p>	<p>Additional resources, case studies and teacher professional learning sessions will be offered to schools to further develop teacher capabilities and support with curriculum alignment and planning. Case studies will highlight examples of how other schools have approached the program as well as strategies for implementation.</p>
STEM CPP can adopt a more targeted approach to maximise its reach to students that will increase the number of students in the STEM pipeline.	<p>Selected schools were invited to participate in a pilot to target less engaged students. Bespoke teacher professional learning sessions, teacher relief for site visits and 1:1 planning support were the key areas of need identified.</p>	<p>A pilot will be run with a focus on encouraging teachers to include students who are less engaged in STEM in the program. In addition, school recruitment will focus on targeting low ICSEA³ schools to increase impact and interest in STEM. Additional support will be provided to teachers from these schools to support with implementation.</p>
Explore ways to maximise positive engagement from mentor and teacher relationships.	<p>Consultation and research undertaken to understand best practice in fostering sustainable mentor partnerships such as ensuring there is a shared commitment to the relationship, training is undertaken for both parties to understand their responsibilities, and ensuring flexibility to suit individual partnerships.</p>	<p>Elements of the partnership process and engagement will be refined, with the aim of improving our understanding of partnership readiness, ensuring consistent approaches and facilitating more meaningful connections. The team will provide more support both prior to, and during partnership to improve the experience for both parties.</p>

³ Index of Community Socio-Educational Advantage is a scale that provides an indication of the socio-educational backgrounds of students.

CASE STUDY

Condobolin High School

In 2023, students from Condobolin High School, a new STEM CPP school from the Central West, were busy tackling local community challenges.

The school has a very low ICSEA score (3rd percentile) and 52% of students are Aboriginal and/or Torres Strait Islander. Adam Quinn, a new teacher who relocated from Western Sydney, had been recommended STEM CPP by a participating teacher in his previous locality.

He decided to introduce the program to bring evidence-based, best practice learning methods into the school and offer the same opportunities to regional students as Western Sydney students.

Year 9 and 10 science students took part in the program, with a small cohort from year 8 also attending the end-of-year Showcase and Careers Event in preparation for 2024. A total of 39 students engaged with the program in 2023 (18% of whole school).

To deepen the connection between in-classroom inquiry projects and industry, students visited CSIRO's Parkes Observatory (Murriyang) and were connected to a mentor from Kingston Resources, who visited to school to discuss local STEM careers, sparking enthusiasm among the students.

One of Adam's highlights was seeing formerly disengaged students actively participating in science. "I'm reaching students that I wouldn't normally because it's not the typical 'Here is the homework.



Write this in your book' type of learning. This approach allows me to connect with more kids and build relationships."

In 2024, Condobolin High School plans to expand the program school-wide, with a focus on an inquiry project within the school, helping the students see the tangible connections to STEM in their own environment. There are also plans to work more closely with the team to integrate the inquiry project into lesson planning.

What teachers said:

"So, these are kids that normally wouldn't engage at all. This is a kid that tells the teacher to [expletive] every second day, and he just couldn't believe that I'd say, "Yeah, go ahead." [in reference to designing and conducting experiments in class for their inquiry project] So, he's been super engaged with science since then which is really good ... He's taking biology next year and I couldn't believe that."

Focus Area 1

Deadly in Generation STEM

In 2023, Deadly in Generation STEM delivered a range of student and teacher activities to strengthen the engagement of Aboriginal and/or Torres Strait Islander students in STEM and fostering culturally safe learning environments.

On Dharawal Country, the program expanded to include a teacher professional learning program and reflection sessions, and extended its impact into the Shoalhaven. The team delivered three professional learning sessions based on CSIRO's Inquiry for Indigenous Science Students (I²S²) program, which aimed to equip educators with the tools to deliver Indigenous STEM inquiries to their students. For the first time, the team organised a successful four-day camp attended by 17 students and 5 ambassadors. The immersive experience not only heightened students' understanding of Indigenous STEM knowledges and sparked curiosity into local STEM pathways, but enabled students to foster meaningful relationships within their community.

Due to recruitment challenges, Deadly in Generation STEM had a slower start to 2023 in the Moree region. With the recruitment of a proud Kamilaroi Yinarr (woman) in July, the latter half of the year focused on rebuilding connections with local community stakeholders, Cultural Knowledge Holders, schools and teachers and leveraging insights from the Illawarra. This culminated in a full day in-school workshop, providing students and teachers with an opportunity to get a taste of what the program can offer.

2023 highlights

88 students

engaged across the Illawarra and Moree regions

38 teachers

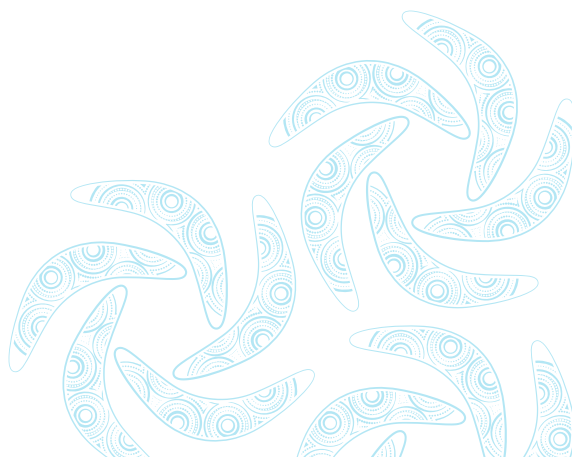
and teacher support staff attended teacher professional learning sessions

First camp held

in the Illawarra, with positive feedback from all participants and stakeholders involved

Overall, participant feedback has been extremely positive, highlighting how the program can increase teachers' confidence in embedding Indigenous science in the classroom to support students to understand and embrace Indigenous contributions to STEM; and provide engaging experiences for students to connect and learn with local Cultural Knowledge holders, Indigenous STEM professionals and their peers.

The team's collaborative efforts across the two regions and ability to embrace diverse perspectives and knowledges have laid the foundations for an even more cohesive program in 2024. This approach will ensure that the program can continue to deepen its impact, while remaining responsive to the needs of local communities.





CASE STUDY

Connecting traditional Indigenous knowledge with modern science



Over four life-changing days, 17 Aboriginal students from year 8 to 10 from seven schools in the Illawarra region participated in a STEM experience on-Country.

From astronomy to coding drones to bush medicine, dancing and bush regeneration, the camp fuelled students' curiosity while bridging the gap between Indigenous knowledge and local STEM opportunities. Under the guidance of local Cultural Knowledge Holders, Aboriginal STEM experts and mentors, the students engaged in hand-on activities centred around the theme of "Caring for Country".

The experience helped students to learn about science, but also took them through a personal journey of discovering their Indigenous identity, feeling proud of who they are and the different paths and careers they can achieve in their future.

What community members said:

"I decided to participate because the next generation matter to me. I know a few of them are passionate about science but are a bit shy. I want them to know that if I can do it, they can do it."
– Aunty May, from Gunaikurnai and Dharawal Country

For some students the biggest learning was discovering that Aboriginal and Torres Strait Islander peoples were the first scientists in Australia and that their knowledge has carried through time and is still used today. Students also valued the opportunity to build connections with other students, Cultural Knowledge Holders and mentors.

After completing the program, the students wanted to know more about culture and return to future camps as ambassadors. As ambassadors at the 2024 camp, students will be invited to run an activity and share their STEM stories and experiences, to support and inspire the next intake of Indigenous students.

What participants said:

"I've learnt how important Indigenous science is, as like the foundation of science we have today." – Student

"It was like, alright, I'll just go along and see how it goes. But after the first time, meeting people and understanding a bit more about my culture, and the STEM side of it, I grew to love it. And now [I'm doing] two sciences for my Year 11 electives, and I've moved up heaps in science, and that's what I want to do for a job and a uni degree." – Student ambassador⁴

⁴ Quotes taken from: Cherry, Kate. Deadly in Generation STEM Insights: 2023. Unpublished; 2024.



Reconnecting on Kamilaroi Country

As part of re-engaging with the community, schools and teachers in the second half of 2023, Wee Waa Public School and Wee Waa High School participated in an in-school workshop to provide a taste of Indigenous science and its relevance to their local area. Over a full day, 66 students from year 3 to 8 participated in two-way science activities led by a local Indigenous CSIRO Scientist and Cultural Knowledge Holder on water filtration and spear-throwing.

The workshop demonstrated how inquiry-based learning aligned with the student's learning goals and curriculum. Students learnt about the deep connection and respect Aboriginal and Torres Strait Islander peoples have with their Country and environment, the importance of waterways in the region, natural resource management practices and how tools like woomera and spears were designed, crafted, and skilfully used. The students were excited to apply scientific principles to their hands-on experiments and draw conclusions from their observations.

Feedback from the workshop has been very positive, with teachers wanting to learn more about the teacher professional learning program, and how to embed Indigenous knowledges in their school programming through hands-on inquiry projects.

The value of reflection

In the Illawarra, Deadly in Generation STEM trialled an extended reflection session with the teachers from partnering schools engaged in the teacher professional learning program. The session provided an opportunity for teachers to reflect on their implementation of the program thus far and to engage with a local Cultural Knowledge Holder to improve and deepen their connection to the community and inspire planning for 2024. The format proved highly successful, with teachers noting their increased confidence and engagement with integrating and valuing Indigenous Knowledges in the science classroom.

The feedback and insights provided have also been essential in developing key features of the teacher professional learning program for 2024. These include expanding the program into primary schools across both regions, staged delivery of expectations and learning through multiple touchpoints, webinars, face-to-face delivery and reflection sessions.

What community members said:

"It was an honour and privilege teaching the kids and [to] share what I know with the students and watch them learn new techniques during the workshop. Everyone was engaged from start to finish [...] Helping to facilitate the workshop was a great learning experience for myself too. It gave me the opportunity to see how cultural knowledges and science are linked."
– Clinton Lamb, Cultural Knowledge Holder

What teachers said:

"There was a lot of student engagement. The whole class loved it, but then I got to do a reflection on the lesson and they sent it to the deputy and the deputy said he can't believe that a year seven student could relate that information to the topic of physics and explain how the science of it worked. He was very impressed with that."

"Just from that one lesson... the excitement, the engagement, the curiosity was amazing!"⁵

⁵ Quotes taken from: Cherry, Kate. Deadly in Generation STEM Insights: 2023. Unpublished; 2024.

2023 learnings

What we learnt in 2023

Camp participants valued meeting Cultural Knowledge Holders, mentors and Aboriginal STEM professionals, the variety of activities and creating connections with other students. However, it took some time for participants to feel comfortable to establish relationships, and to process and reflect on the STEM content presented. Participants would have preferred more reflection/down time and a longer camp.

Bringing back the ambassadors from the 2022 Deadly in Generation STEM Immersion Days worked well as participants enjoyed seeing how the ambassadors continued their STEM journey and the friendships and connections they maintained after the experience. There is an opportunity for ambassadors to have a stronger role throughout the camp.

Teachers identified building community connections with local Cultural Knowledge Holders and Elders as an area they lacked confidence in.

Teachers reflected that the I²S² resources were incredibly useful, and that the volume of content was valued, but that some links and resources were outdated or unavailable. Sourcing materials for some inquiries was identified as a challenge.

Teachers shared that a community of practice and connections with other schools and educators would help them to implement and localise inquiries.

Further improvements to progress in 2024

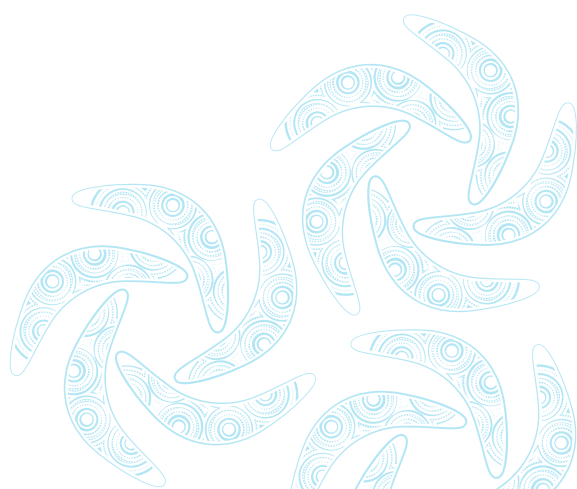
Allocate time on the first day of the camp for participants to build rapport with Cultural Knowledge Holders, mentors, and other students. Provide greater opportunities to immerse in Indigenous science and culture and allow more time for activity-based reflections and smaller group yarning cycles, so that students feel more comfortable to build connections and participate in activities. Extend the duration of the camp from four to five days.

Involve ambassadors in more activities earlier on in and throughout the camp and providing opportunities for them to share their STEM stories to excite and motivate current participants.

Involve Cultural Knowledge Holders in the professional learning and/or reflection sessions to support teachers and schools to build on connections.

Update content and resource links in collaboration with other CSIRO programs. New Indigenous STEM resources will be developed for use by current and future CSIRO programs.

Support schools in developing and sharing localised examples of activities and connecting in with other schools across NSW and Australia through webinars and formation of communities of schools.



Focus Area 2

Generation STEM Links

Generation STEM Links had a tremendous year, exceeding targets for new placement requests and positioning the program as a highly sought-after internship program in NSW.

A key focus was increasing the number and diversity of businesses taking on student interns, especially outside of Sydney, while maintaining a high-quality experience for businesses and students. Through a multifaceted approach involving leveraging industry networks, a strong presence at face-to-face events, and conversations with industry highlighting the program's success stories, the number of businesses engaged with Generation STEM Links almost doubled. There were 57 participating businesses in 2023 compared to 31 in 2022.

2023 also saw strong interest from regional businesses, with almost 60% of new placement requests outside of Sydney, of which half were from the Hunter region. This was aided by the recruitment of a Newcastle-based Industry Engagement Manager in early 2023 and the strong connections developed through the Hunter industry-education collaboration work. The increase in businesses, especially those in regional NSW, naturally led to a greater diversity of STEM sectors participating in the program, with mining, advanced manufacturing and agribusiness among the most common. Planning is underway to continue to drive participation from more regional businesses in 2024.

2023 highlights

40 placements completed
with a further 33 confirmed or underway

100 new placement requests (56% increase from 2022)

83% of student interns offered
ongoing employment

50% of industry collaborators
have applied for
**two or more
student interns**

Most commonly sought STEM backgrounds:
engineering, environmental science,
computer science and IT, data science

92% of student interns
are from underrepresented groups in STEM⁶

⁶ 54% of student interns include female students, Aboriginal and Torres Strait Islander students and students from culturally and linguistically diverse (CALD) backgrounds. A further 38% are students residing in locations with low socio-economic status. Some of the Aboriginal and Torres Strait Islander students, female students and students from CALD backgrounds also reside in locations with low socio-economic status. These students are included in the 54%.

The program's distinctive features have fuelled its growing success in NSW. No other program provides a high-quality, facilitated internship offering across all STEM industries where the students are paid for their work. Further, the feedback from businesses has also been positive, with 100% of supervisors (n=17) surveyed indicating that they would recommend the program to other businesses. Anecdotal feedback suggests that businesses value the high calibre of participating students, the facilitation support provided during recruitment and throughout the placement and the \$2,500 financial contribution to businesses.

What partners said:

"We were searching for young talent, directly communicating with universities but without luck. I believe working with CSIRO gave us a way of attracting the talent professionally and credibly [...] Our collaboration has led to the employment of a graduate who has joined our horticultural team. We've been able to invest in young individuals to develop their skills and provide shareholders with valuable advice for their business."
– Adam Signor, Purchasing Manager at Yenda Producers

What participants said:

"No other graduate programs fitted the bill. There were a lot of gaps and questions. I wouldn't be the right fit for structured programs with no independence and responsibility [...] Yenda is a great region, and the Yenda Producers' Co-operative is a supportive workplace for me as a student. They provide me with independence, which suits my learning style. I would recommend Generation STEM Links to other students seeking their next step."
– Kate, University of New England student

Fostering collaborations for a stronger regional STEM workforce

Generation STEM Links ran three engagement workshops in Newcastle and Dubbo. These workshops aimed to strengthen collaborations between tertiary education, local businesses, and government organisations in the Hunter and Orana regions. Participants generated ideas for community-led initiatives that could help overcome challenges and build a strong local STEM pipeline and junior workforce.

There was high engagement across the events, with over 90% of attendees stating that these workshops met or exceeded their expectations. Many attendees voiced their interest in further engagement to progress the initiatives developed.

Generation STEM Links will continue to work with local stakeholders to develop the following ideas:

- industry toolkit to support businesses to engage tertiary student interns, and
- student-to-grad toolkit to support students before and during placements.

In 2024, the team will continue to support and encourage local initiatives that came out of the workshops, such as the University of Newcastle's Innovation Festival and a student mentorship program in the Orana region.



"[It was a] great opportunity to share expert knowledge, experience and insights with a solution focused approach. Looking forward to next steps. Please count me in to support and continue working on this great work." – Industry participant at the Newcastle workshop

CASE STUDY

How internships helped Halocell find and retain STEM talents in Riverina



Halocell is a solar technology company based in the Wagga Wagga Activation Precinct that focuses on the commercialisation of innovative solar cell solutions for defence, agriculture and manufacturing. Halocell recruited two university students, Alexandra and Drew, through Generation STEM Links.

For Halocell CEO Paul Moonie, finding local students with technical expertise was the first challenge, and retaining young professionals in the region was the other. “We must show the younger generation that you can do science in Wagga,” he said. “There are STEM operators that can give them local experience.”

Initially uncertain about recruiting interns and their potential, Paul was pleased to find that the students exceeded his expectations after completing the internships.

Participation in Generation STEM Links was mutually beneficial: students gained workplace skills, while senior staff at Halocell gained experience in project and staff management.

For Paul, offering ongoing employment to both Alexandra and Drew at the end of the placement was an easy decision. “We can work around their studies,” he said.

Halocell took on two more interns, who completed their placements in December 2023. These students were also offered and accepted ongoing employment with Halocell.

Evidence X and data insights

Evidence X

Evidence X aims to bridge the evidence gap within the STEM ecosystem. In 2023, Evidence X was focused on a co-design process with key audiences and stakeholders to establish a blueprint for the initiative. The co-design was led by the consultancy Portable.

The key activities included:

- Commencement of the co-design phase of Evidence X
- Discovery phase involving experts and stakeholders
- Finalisation of a problem statement
- Obtained CSIRO Human Research Ethics approval for the co-design process.
- Launch of an Expression of Interest for participation in the co-design phase.
- Planning for stakeholder interviews and workshops (to be held in early 2024).

The following problem statement was developed as part of the discovery phase:

The problem statement is a design hypothesis, which will be used in the co-design process to test and focus solutions on a clear and agreed problem.

The next phase of the project comprises four sprints, each focusing on engaging with key stakeholders and experts around a priority goal of Evidence X, such as the most desirable way to collect and share evidence. As of 23 January 2024, over 140 expressions of interest to be involved have been received from individuals representing a variety of sectors, including Federal and State Governments, private sector, philanthropic organisations, TAFE and universities, and educators.

Data analytics

In collaboration with a Catholic Education Diocese, a data analytics project is being conducted to identify factors that predict or influence students' taking STEM subjects in upper high school and performing well in those subjects. After an initial focus on traditional predictive analytics approaches, the project entered a more sophisticated stage in 2023. Data scientists from CSIRO's Data61 applied a Bayesian network analysis approach to the dataset and identified more accurate and likely causal relationships among the dataset's variables. The final results will be made available in early 2024.

Evidence X aims to bridge the evidence gap within the STEM ecosystem by providing current, accessible, and practical information for the design, implementation, and evaluation of STEM programs. The initiative also seeks to establish uniformity in assessing the success of these programs, working towards the development of a prototype STEM Evidence tool to inform interventions.

Program insights

In 2023, the monitoring, evaluation, and learning (MEL) of Generation STEM built on the findings and plans of previous years. Evaluation tools were refined and expanded, and new approaches were implemented, including for the Deadly in Generation STEM student camp. The three programs achieved a number of outcomes, and the MEL processes helped uncover the key factors of ‘what worked’ and some of the barriers and issues that programs faced.

STEM Community Partnerships Program

Outcomes

- Increased student interest, confidence, resilience (e.g., statistically significant increase in self-reported ‘Interest in learning about STEM’ amongst females (n=102)).
- Increased student knowledge of STEM education and careers (e.g., statistically significant increase in self-reported ‘Awareness of the type of STEM jobs I could work in’ (n=200)).
- Increased student transferable skills (e.g., high proportions of students self-reported that they were more confident working in a team (92%, n=194) and more confident in their problem solving (93%, n=196)).
- Increased student engagement in STEM (such as through community-focused issues and real-world science) (e.g., 76% of students (n=146) reported increased interest in STEM from completing community focused inquiry projects).



What worked

- Real-world, community-focused inquiry projects, STEM industry experts, and excursions that engaged students and broadened their views of STEM.
- Showcases that promoted students’ inquiry projects and also built student confidence and resilience.
- A program that was structured enough to allow educators to take part in the program easily and seamlessly, but also flexible enough to adapt to individual school environments.
- A supportive CSIRO program team and passionate and skilled educators that allowed the program to flourish.
- Expansion of the program to Years 7 and 8 was highly valued (based on school case studies).



Barriers and issues

- In some schools, there were issues connecting with industry mentors, often because they were not based locally.
- Some educators felt that there was a lack of ‘next steps’ for students in Years 9 and 10 who had completed the program.
- The digital communication platforms used by CSIRO were not compatible with some educators day-to-day work.



Deadly in Generation STEM

Student camp

Outcomes

- Students built connections with local Aboriginal knowledge holders, and reported increased wellbeing, and improved awareness and interest in STEM and culture.
- 100% of students agreed they knew more about local organisations and people to ask about cultural knowledge.
- 100% of male students and 88% of female students connected with a new mentor to share their STEM interests with.
- Overall, students experienced the most positive change in their level of awareness of Indigenous STEM knowledges, local Aboriginal knowledges, and different STEM related jobs and STEM subjects.



What worked

Connections between students and Elders and/or Aboriginal knowledge holders was a highly valued aspect of the camp activity. When asked about their favourite activities, all students described activities led by the Elders.



Barriers and issues

Learnings following the camp included:

- ensuring opportunities for the students to form connections and rapport early on
- allowing students time to process and reflect on new information
- a more involved role for Student Ambassadors throughout camp



Teacher Professional Learning

Outcomes

- Teachers reported that the program supported them to deliver authentic Indigenous STEM inquiries more readily than other resources or programs they had accessed.
- Teachers described program resources as well aligned with the curriculum and curriculum outcomes, making them relevant and practical for teachers and easily adaptable to mixed ability classes.
- Many teachers agreed the opportunities provided by the program to observe and practice the inquiries made a significant difference to their levels of confidence to try them in the classroom.



What worked

Teachers reported valuing the comprehensive and flexible resources; opportunities to observe and practice the inquiries; engaging and experienced presenters; and opportunities to build their teaching skills and confidence, especially through face-to-face experiences with local Knowledge holders.



Barriers and issues

Some educators felt that the barriers to implementing Indigenous STEM inquiries were a result of broader system level challenges, such as time and resource constraints. Some educators also discussed a general lack of cultural capability across schools and the lack of confidence to engage with the community that accompanies this.



Generation STEM Links

Emerging outcomes



Generation STEM Links is increasing access for underrepresented students to engage in paid STEM internships, and increasing their skills, knowledge and confidence.

In addition, industry partners are:

- building their capability and improving their workplace culture and recruitment processes
- returning for multiple student interns
- impressed by their students, offering 80 per cent of students ongoing employment in their business.

The delivery of four workshops to strengthen cross-sector engagement between industry, tertiary, and other related stakeholders around Generation STEM Links objectives resulted in a range of tangible deliverables and actions.

What worked



Evidence highlighted that the program is achieving its outcomes when:

- a high quality and targeted recruitment, matching and onboarding phase sets the placement up for success
- a positive workplace culture enables a positive on-the-job learning experience, supporting improvement in both STEM and general workplace skills.

Barriers and issues



Feedback from participants highlighted it is important to ensure the program continues to monitor and support the following industry partner responsibilities:

- appropriate workplace supervision and direction for the student, especially at the beginning of the internship
- up-to-date training, safety, and standard operating procedures in the workplace
- enough work for the student to undertake to complete regular shifts.

Program management

Governance

The Generation STEM Consultative Council was appointed in April 2018.

The current membership is (as of 31 December 2023):

- Dr Ian Oppermann, Co-founder ServiceGen; Industry Professor, University of Technology Sydney
- Ms Elanor Huntington, Executive Director, CSIRO Digital, National Facilities and Collections
- Ms Gail Fulton, Director, CSIRO Science Connect
- Ms Gabrielle Trainor AO, Chair of the Construction Industry Culture Taskforce.

The team would like to thank for their involvement:

- Dr David Wright, Chair of the Council until October 2023
- Ms Chloe Read, Department of Education, who stepped down from the Council in August 2023
- Ms Leanne Nixon, Department of Education, who provided input to the Council at a workshop in November 2023.

A new nominee to the Council is currently being confirmed from the Department of Education and an additional NSW Government nominee is being identified. These nominees will be confirmed and onboarded in due course.

Appendices

This section details the characteristics of the student/schools that participated in Generation STEM in 2023.

STEM Community Partnerships Program

Number of students participated by year

	Year 7	Year 8	Year 9	Year 10	Total
2019–20			358	91	449
2021			757	365	1122
2022			1171	1150	2321
2023	278	818	1407	1136	3639
Year on year change	n/a	n/a	+20%	-1%	+56%

Number of schools participated by sector and year

	Government	Catholic	Independent	Total
2019–20	15	1	6	22
2021	27	12	8	47
2022	43	19	16	78
2023	44	22	19	85
Year on year change	+2%	16%	+18%	+9%

Number of schools participated by LGA/region and sector

	Government	Catholic	Independent	Total
Blacktown	2	5	2	9
Blue Mountains	1	0	2	3
Camden	3	1	1	5
Campbelltown	4	0	1	5
Canterbury Bankstown	8	2	0	10
Cumberland	0	1	0	1
Central Coast	2	1	0	3
Central West	3	1	2	6
Dubbo	1	0	1	2
Fairfield	3	2	0	5
Hawkesbury	1	0	0	1
Liverpool	2	3	3	8
Parramatta	3	2	1	6
Penrith	5	2	3	10
Queanbeyan	5	0	1	6
The Hills Shire	1	2	2	5
Total	44	22	19	85

Deadly in Generation STEM

Number of participants by region

	Illawarra	Moree	Total
Students	22	66	88
Teachers and teacher support staff	38	13	51

Generation STEM Links

	Total
Number of placements completed	40
Number of placements confirmed or underway (but not yet completed)	33
Number of new placement requests	100
Number of industry collaborators applied	41
Number of student applications	671
Percentage of student interns from underrepresented groups	92%

Number of completed placements by industry sector

Industry sector	2022	2023
Advanced manufacturing	5	10
Agribusiness and food	3	2
Gas and infrastructure	-	2
Mining	2	9
Professional and financial services	3	-
Sustainability	1	6
Technology	-	2
Design	-	3
Research and development	-	2
Other	1	4
Total	15	40

Number of completed placements by location

Location	2022	2023
Hunter	2	3
Illawarra	1	1
Riverina-Murray	3	5
New England	1	1
Sydney Metro	2	18
Western Sydney	6	12
Total	15	40

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