



## STEM CPP CASE STUDY

# Seven Hills High School

This case study describes the implementation of the STEM Community Partnerships Program (STEM CPP) at Seven Hills High School, focusing on 2023. The STEM CPP aims to create strong partnerships between local schools and industry, with the goal of highlighting local STEM careers and opportunities and providing avenues for students to develop their STEM skills in an engaging and rewarding way.

### Context

Seven Hills High School is a co-educational government school located in the Seven Hills suburb, Blacktown City Council, and Greater Western Sydney region of Sydney. In 2023, the school offered years 7 to 12 and had 38 teaching staff. Student enrolments total 451, with 55 per cent being male students. Seven per cent of students were Aboriginal and/or Torres Strait Islander and 20 per cent have a language background other than English. The School's ICSEA<sup>1</sup> value is 967, which is lower than the median of 1,000 for schools in Australia. The school first became involved in the STEM CPP program in 2021 and is currently involved in a number of other STEM programs and activities, including: an on-site Vocational Innovation Centre, Girls' Tech Day (hosted by Amazon Web Services), Future Space Program/Young Space Explorers Forum, Gifted and Talented Science Day at WSU Parramatta, Streamwatch (citizen science program), ParkLife Metro presentation on opportunities in infrastructure, Games Club (critical thinking and problem solving), and a STEM Club.

STEM CPP was originally part of an extra-curricular activity (in 2021 and 2022) at the school but is now a part of the iSTEM elective subject (2023). The school took part in most aspects of STEM CPP including the student inquiry project, student showcase, and industry mentor.

### Case study questions and methodology

The questions that this case study sought to answer included:

- What outcomes did STEM CPP contribute to for students, teachers, and the school?
- What factors contributed to the program's success?
- What barriers and issues were experienced?

This case study is based on semi-structured, face-to-face interviews with the lead teacher implementing the program at the school and a school leadership team member and CSIRO program team feedback.

In addition, two students responded to the STEM CPP evaluation survey; although this very small sample size, a few results have been included to provide some student voice in the case study. The industry mentor did not respond to requests for an interview.

### Findings

Based on feedback from the two educators (interviews), two students (surveys), and program staff (feedback), it was clear that a number of changes and outcomes occurred as a result of STEM CPP, with many directly attributable to STEM CPP, and others that were likely part of larger trends that the program implementation coincided with. The following two pages summarise the key findings in three areas: observed changes, what worked and facilitating factors, and barriers and issues. Evidence for these are outlined in the Appendix.

### Conclusion

When asked about the counterfactual (i.e., what would the school be doing if they had not participated in STEM CPP), School staff stated they would probably be doing something similar but that it wouldn't involve a focus on local issues and a community connection. The connection to real-world STEM and community issues appears to be the primary benefit of the program, despite some challenges with the school and industry mentor connecting. Some changes were somewhat anticipated, such as STEM CPP students involving their peers (not involved in STEM CPP) in their inquiry projects.

### Acknowledgements

This case study was prepared by Christopher Banks, Impact & Evaluation, CSIRO Education and Outreach. The I&E team would like to thank all those who volunteered their time to participate in the interviews and surveys openly and honestly.

<sup>1</sup> ICSEA is the Index for Community Socio-Educational Advantage, which provides an indication of the socio-educational background of students attending that school. The median ICSEA value in Australia is 1000.












## STEM CPP outcomes

The outcomes that STEM CPP seeks to achieve or contribute to are:

1. Students have increased knowledge and understanding of STEM
2. Students have increased interest in STEM
3. Students have increased confidence in STEM
4. Students increase their transferrable skills
5. Students have increased awareness of STEM pathways and careers
6. Teachers have greater confidence and skills to teach STEM through inquiry-based learning methods
7. Council and industry develop challenge scenarios that reflect their local needs
8. Schools, councils and industry engage more with one another
9. Students have an increased aspiration to study STEM
10. Students have increased awareness of available STEM education pathways
11. Schools develop a culture that promotes and supports students to study STEM
12. Students are more engaged with community issues
13. More students choose to study STEM after Year 10
14. More diverse students choose to study STEM after Year 10
15. More high potential students choose to study STEM after Year 10
16. Council and local industry increase investment in activities that promote and link students with STEM-related careers
17. More students pursue NSW-based STEM education pathways post school
18. More students are STEM literate in their education and careers post-school
19. More students are employed in STEM roles




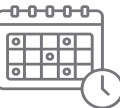
## Observed changes

	KEY CHANGE	STEM CPP DIRECT OR CONTRIBUTION TO OUTCOME <sup>2</sup>	OUTCOMES CONTRIBUTED TO:	DESCRIPTION
	More girls are interested in and engaged with STEM	Contribution	2, 9, 14	There was a reported increase in the number of young women interested in STEM at the school, although this was not directly attributed to STEM CPP, but rather an overall trend that STEM CPP contributed to.
	STEM is seen as cooler	Contribution	9, 14	Over the past few years, STEM has been seen as less nerdy and uncool by students, with the diversity of STEM opportunities becoming more widely known (e.g., the creative side).
	There has been a broadening view of STEM	Direct	5, 10	STEM CPP directly contributed to increasing awareness of the variety and diversity of STEM careers, how useful it is in everyday life, and what is involved in STEM. This was reported by both educators and students.
	Increased interest in STEM electives from students, including previously un-interested or lower academically	Contribution	2, 9, 15	The iSTEM elective, which STEM CPP was a part of in 2023, has seen more interest and uptake from a range of students, compared to the high achievers involved in the extra-curricular STEM CPP opportunity in previous years.
	Increased peer connections and students involving friends in their STEM projects	Direct	2	Due to the individualised nature of STEM inquiry projects, some students engaged their friends (not doing STEM CPP) to assist, who in turn were exposed to STEM. In addition, some former STEM CPP participants informally mentored current ones.
	Increased value placed on STEM due to (open) inquiry projects	Direct	7	It was reported that students placed more value on STEM because of the investment they placed in their individualised inquiry projects and the connection to local issues.
	Increased recognition of school and students	Direct	11	The inquiry projects and student showcase allowed the school to publicise the work of students through multiple communication channels, which led to more opportunities to recognise and celebrate students' work.
	Students developed more resilience, confidence, and teamwork/ collaboration skills	Direct	3	The undertaking of the inquiry projects (and the group work) led to increased collaboration skills and resilience and presenting the outcomes of projects contributed to increased confidence.
	Skill transfer to other subject areas	Direct	4	It was reported that some student skills and capabilities (like resilience) gained through participation in STEM CPP were employed by students in other subjects.

## What worked and facilitating factors

	Authentic and real-life STEM connected to community	The community-driven inquiry projects and the real-world application of STEM was a key driver of engagement and interest in STEM among participants.
	Structure of program and fitting in with existing curriculum	Educators at the school valued the clear structure of the program, which fit seamlessly into existing curriculum and built on previous inquiry-based project work by students.
	Support of CSIRO program officer	Educators felt supported by CSIRO program staff and valued the flexibility and willingness to make things work.
	CSIRO brand and confidence it will be a good program	The high-profile and respected CSIRO brand and reputation helped the program to be accepted by the school and parents.
	Showcases that made students feel special, more engaged, and less introverted	The student showcases, particularly in-person ones, made students feel special and provided opportunities for recognition and connection without the pressure of a public presentation/speech.
	Excursions and engagement with wider community	Educators reported that students were engaged during excursions and highly valued the opportunity to speak directly with industry professionals.
	Support of school leadership team, who trusted teachers to get on with it	The educators reported that the school leadership supported STEM programs like STEM CPP and trusted them to deliver them without interference.

## Barriers and issues

	Difficulty connecting with industry mentor, who wasn't based locally	Educators reported difficulties connected with the industry mentor due to timing issues and also because they were not based in the local area of the school.
	Virtual offerings were not engaging	Educators indicated that students were disengaged with any virtual offerings and preferred face-to-face connections.
	Students wanted more time talking with people	Educators had predicted that students would be most engaged with hands-on STEM activities but students seemed more interested in discussions with STEM professionals.
	Timing of activities	Educators reported difficulties aligning school and class schedules with opportunities offered by the program.



# Appendix: Evidence for findings<sup>3</sup>

## Observed changes

### More girls are interested in and engaged with STEM

*...my first year I had one or two girls, and now getting a few more.*

*And more girls I think are picking it [STEM] now, than initially.*

### There has been a broadening view of STEM

*I think a lot of [students not engaged with STEM], even though they don't normally do STEM or they didn't necessarily have that interest...seeing how it works and getting the interest that it's beyond just coding and robots. You can be creative and still have a part in STEM. And I think it's just opening it up...it's not just coding, it's not just building a robot. It's all this stuff. It's all of the stuff behind it. It's being creative, it's being artistic.*

*...it [STEM CPP] adds that extra...community level. It connects them in...it makes it...authentic...I think in some way it shows them where things can go. So, it's not just, oh, we've come up with this idea and nothing's going to happen with it... because they get to speak to these people: industry experts or [people] in different fields. And they [the students] realise that they don't just have to be a computer person or an engineer to be in tech, to be in STEM. STEM's a really big field. So, it opens that up, I think. Because some of them, they kind of like it. It's a little bit fun to play with a robot for a little while, but then as it gets harder, then they think, maybe not. But them being able to show this whole range of things, and it's all about solving problems and coming up with solutions, and it's not just about writing code and creating your robot. It's actually much bigger. So, I think isn't that ideal?*

### STEM is seen as cooler

*[STEM] has evolved...a lot more people who I didn't think would be picking the subject have picked the subject...we're very broad in who we have in the class.*

### Increased interest in STEM electives from students, including previously un-interested or lower academically

*It's [interest in STEM elective subjects] increased. Yes. Especially this year...since we've implemented this elective [iSTEM that involves STEM CPP]...the numbers have been growing.*

*...we modify the [inquiry] project so they can still do it. They might do something slightly different or something that they can do. But yeah, they're still working in the groups and they're still contributing. And they're still building those skills. And they are getting that understanding of STEM.*

### Increased peer connections and students involving friends in their STEM projects

*And some...[participants] are drawing their friends into it [inquiry projects] as well. Who may not be in the [STEM CPP] class, but they're seeing what they're doing [inquiry project], so they're bringing in an interest into their friends to do it. Whereas if we just ran it in class, we didn't have any of these external things, it'd just be what we did in class, there wouldn't be that aspect of, oh, come and sit with me at lunchtime because help me with this. And then they start getting their interest and they come along and they're building their confidence as well.*

*...there's one student and she's brought in a friend who... doesn't do the class, but she's been doing a lot of work on the [inquiry] project. [I have taught her]...for three years and she's barely said a word. And now they're both going for captain...they didn't feel like they had that ability to be a leader and to be able to voice their opinion and be able to stand up and talk to people and tell people things. But because of the STEM [CPP program]... they've now found that confidence...[and]...a voice...*

*And some of our Year 10s who had done it [STEM CPP] in Year 9, they actually were helping the [Year] 8s and 9s with their ideas, their projects, their presentations for the showcase. So even though they weren't participating, they still came along and spent a lot of their own time prepping the younger students.*

### Increased value placed on STEM due to (open) inquiry projects

*I think because they can value it [inquiry project], because they value it and they take ownership of it and it builds their confidence up...they do really want to talk to people. And are happy to do the showcases the way it is. Because they spend a lot of time [developing] projects. And they're really proud of it.*

*It's just giving them [the students] that option...trying to... increase that engagement by saying: 'Here are the options, but you get to pick', rather than just going: 'This is what we're doing. You're going to do this.'...we gave them the option of picking different categories. It just happened that the two that we showcased this year were the same themes of engaging the youth...so they've created something to make things better [in the community] based on what they've experienced.*

### Skill transfer to other subject areas

*Yeah, it [resilience] does [is useful]. Whatever they're facing, they've got that challenge. Or whether it's in an exam or in everyday life. Yeah, so I think the skill transfer is really, really important. Probably more so than the academics.*

<sup>3</sup> All quotes are from the semi-structured interviews with school staff.

### Increased recognition of school and students

Recognition in the community. As I said, the achievements, they get put on Facebook and on the website. And I think the kids get the recognition. Not just from their parents, but from anyone who likes our page and then it goes to other people. I think that is important.

And [the inquiry projects and showcase]...goes on our Facebook page. And you know, it gets promoted in the community. And a lot of the kids are on our Facebook page so they see what they've [the participants have] done. So, it improves their confidence and I think it's really important.

### Student's development of more resilience and confidence, and teamwork and collaboration skills

And I think that also draws more students in too. It gives them more interest and...it builds that resilience because I think one of the biggest things with STEM is it teaches them that failing is okay. Like it's fine for things not to work, because that's what happens.

I think through [STEM CPP], they [students] develop more persistence and resilience...at the beginning, if they read something and they can't do it, they'll give up quite easily. Or say it's too hard or want you to help them. But I think through the programs, with STEM CPP and the fact that you've got to problem-solve and you've got to do your research and have an evaluation and change things around, and [the teacher's] not giving them all the answers or anything, they have developed that area a lot better. And that they're probably a little bit more persistent and resilient...

...a lot of projects are group-work based...You have to discuss with each other and work together and collaborate and argue their point if they want to do something one way, they've got to justify why they want to do what they want to do. So, I think that all helps.

### What worked and facilitating factors

#### Showcases made students feel special, more engaged, and less introverted

And the way the showcase is run as well, it makes it much easier for those students who might be a little bit more introverted, they don't have to stand in front of everyone and present. It's that booth, that table, and they can come and say, 'Oh, so what's with your project and what's happening?'...they're so more willing to go and participate, because they don't have to stand in front of 300 people and present their idea. It's just small groups come up and talk to them. They still talk to 300 people, but just in different ways. It's not as scary for some of them.

I've got some students who wouldn't even say two words... in class. And now they're going out and they're presenting at showcases and then putting their hand up for things now, where they wouldn't have before. So even if we just stuck to what we did in class, they wouldn't have been [as engaged].

### CSIRO brand and confidence it will be a good program

It [working with well-known CSIRO 'brand'] makes it easier, and you know, you get the benefits of – it goes both ways. Publicity and the CSIRO is a good company.

...you get more [working with CSIRO] I guess...the parents are more willing to support their students, the children doing it. Staff are more supportive of you taking students out and taking time away from their [regular classes] – because it's the CSIRO. It's not just some [unknown organisation].

[CSIRO is] a bit more prestigious than some unknown – or not as well known – [organisation]

### Support of CSIRO program officer

She's been great...she's always following up. Makes sure I get things in when they're due. And always chasing. And it's never a 'no', it's like...'no, that's fine.' Yeah, so really flexible and really good. She was great when we went out to EY. And organising all that.

### Structure of program and fitting in with existing curriculum

...we'll keep doing it [STEM CPP], because...I do like the structure...I may change it for different...cohort[s], I might make it a specific – here, we're going to work on this one.

...with the [iSTEM] elective running, we were able to pick that one [STEM CPP] up pretty quickly without having to create our own stuff from scratch.

...it [STEM CPP] was quite structured. There was...ready-made sort of resources. So, it wasn't having to create things from scratch. It...fitted in with the [iSTEM] program really well. So, I could run it as part of one of the units, so I didn't have to try and do it as an extracurricular or...try and fit it in somewhere and try and squeeze it in. I could just run it...because there's problem-solving project-based units, so we could fit it in without having to do too much extra work.

### Excursions and engagement with wider community

...we did go to EY earlier this year, and the kids really enjoyed it... they really enjoyed talking to the people. It wasn't so much the hands-on activities. They liked talking to the people. And so I think more of that kind of stuff, connecting with companies.

...having more people being able to come in as well because that's what they [the students] really liked. That connection to that wider community to see what their ideas could do.

### Hands-off support of school leadership team, who trusted teachers to get on with it

*I mean, that support, if they [school leadership] come and have a look at what's going on in the classroom, and show interest in the students and their projects. And the showcase. And they'll publicise and promote. Yeah, so they're not against it, but they don't take a massive role.*

*Yeah. And we [the principal and teacher] trust each other. She's always, oh, got this excursion or this one. 'Yep, yep. Do it, do it.'*

### Authentic and real life STEM connected to community

*We've really only had the one visit, but it was quite a diverse group of people who were talking to them. So, I think that was really good. There was quite a lot of females, which was good. And also the fact that they weren't just all tech people. I think that really opens it up to them. It's like, okay, I don't just have to be this nerd. I can be creative or I can be something else. I think before they actually go and see it, before they have people come out to tell them, they think STEM and tech is such a small niche thing. They don't realise how big it is and how many different skills are required. So, they think if I don't like computers, and I can't code, then I can't be in tech. But you can, it's just there's different jobs and different roles. So, I think that's what they really liked, being able to talk to people on different things. And just seeing the different types of people...*

*Because having those outside programs makes it a lot more authentic and real life for the students. So, it doesn't matter how much we sort of say well, this is what happens in the real world, for them to actually have people come in to actually see what's happening. To have people from the outside come in and help, come in and evaluate their work when we do the showcases. That's what I think really works for them and makes it really authentic and gives them that buy-in.*

## Barriers and issues

### Students wanted more time talking with people

*So, we did a couple of excursions this year where they did like mock interviews with people in technology and they had a few hands-on activities. And I was sitting there thinking, oh, they're going to be annoyed because they didn't get enough time to play on the VR headset and whatever other technology. And then when I said to them, 'What was the best thing? What did you want more time with?' They're like, 'We wanted more time with the people.' So, that was really interesting, because I thought, these guys just want to play on the fun stuff. But no, they wanted to actually talk – they're like, 'No, I really liked talking to the industry people.' So yeah, they actually really like that.*

### Timing of activities

*I know it's not always the CSIRO's fault, because things come – you know, in the industry you move quickly and the short notice is – there were a couple of things we wanted to do but either the timing of it, because it was during our exams or something like that, or the short notice that could hinder some of the activities we got to do. So, they did miss out on a couple of things.*

### Virtual offerings were not engaging

*[STEM CPP]...offer a lot of online stuff, but it's not as effective, I don't think, because since COVID, they're [the students] just really over the Zoom stuff.*

*...they don't like the online Zoom. They like that real life in person thing.*

*And then especially after COVID, they'd [students] well and truly had enough of Zoom and screens.*

### Difficulty connecting with industry mentor, who wasn't based locally

*No, I think in terms of barriers...it's just us...not working with our industry expert. But if we had someone who was closer, I think that would be good, because – someone who could actually come out. Because that's what the kids really like. They like that person – they used to love it when the [Aware] group came out. So, they'd come and help. So having the people that could come and visit on a regular basis works really well with the students. Rather than just someone who's too far away for us to really connect with...maybe even connecting with – having more I guess expos or workshops where they can connect with other schools to work on projects. So even if it's like hackathon days or something, maybe at the beginning of the projects or towards the end to finish it off. Or coming up with some things.*

*But for us, that's been our biggest downfall. Because we haven't really connected with our [STEM industry] person. So, we did initially try to connect and then everything just happened with COVID. And they weren't someone local, so our kids really do well when people come out rather than on a computer screen.*

### Students' attitudes towards STEM before and after participation (n = 2)

