



ENGINEERS
AUSTRALIA

sySTEMic Collaboration

A case study of the 2018 pilot year

The **sySTEMic** collaboration model is in response to the **2017 Engineers Make Things Happen report**, which highlights the critical need for industry and education collaboration for the future benefit of the community.

STEM in Australia: A Background

If Australia is to become an innovative nation, our engineering capability must expand. This should be done by reducing reliance on skilled migration and producing a greater number of home-grown engineers.

Mathematics and science are the tools used by engineers to solve real world problems. For engineering, participation in high school STEM subjects is a vital means to an end - but research has shown that there is a looming crisis: The percentage of students studying STEM is still dropping (Source: 2017 Engineers Make Things Happen Report).

In addition, there is direct connection between the low numbers of women in engineering and severe degrees of difficulty in attracting young women with required Year 12 advanced mathematics and physics backgrounds.

Furthermore, there is an education gap between Indigenous and non-Indigenous Australians. The proportion of Aboriginal and Torres Strait Islander 17–24 year olds participating in post-school education, training, or employment is 40 per cent, compared to the non-Indigenous rate of 75 per cent in 2012-13 (SCRGSP, 2014).

SUBJECT	Young men	Young women	Cohort
Advanced Mathematics	MODERATE	SEVERE	HIGH
Intermediate Mathematics	LOW	MODERATE	LOW
Physics	LOW	SEVERE	MODERATE
Chemistry	MODERATE	MODERATE	MODERATE

Figure 1.1 (left): The number of young women studying STEM subjects is alarmingly low.

Source: 2017 Engineers Make Things Happen Report

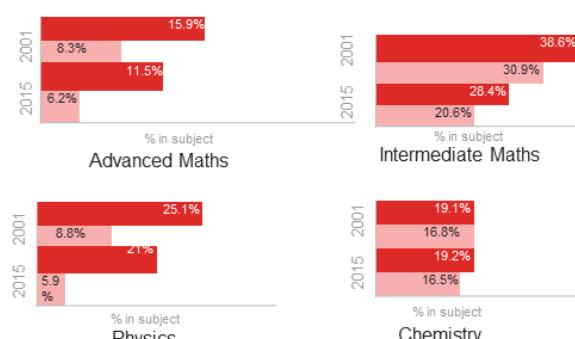


Figure 1.2 (right): The percentages for STEM subject participation in the Northern Territory.

Source: 2017 Engineers Make Things Happen Report

What is the sySTEMic Collaboration?

The sySTEMic Collaboration involves the establishment of long-term partnerships between industry, schools and tertiary education providers, aiming to increase the number of young people achieving a post-school STEM-related qualification while helping to prepare students for the world beyond school at a time in their lives when they are making decisions that will influence their career path.

Other aims include increasing the number of young people achieving a post-school STEM-related qualification and strengthening their employment prospects in the pipeline of STEM-required industries.

The pilot has a particular focus on encouraging and supporting young people from groups that are under-represented in STEM such as Indigenous young people, women and those from disadvantaged backgrounds.

The Northern Territory Government, through the Department of Education, is a major supporter of the sySTEMic Collaboration pilot. Reasons for their support include:

- Ensuring future generations of young Territorians have the skills for the 21st Century;
- The types of jobs that will be available in the future will require science, technology, engineering and mathematics (STEM) skills;
- Partnerships between schools and industry provide opportunities for students to engage with the world of work and better understand the relevance of their learning to jobs and career pathways.



Figure 2.1 (above): Students in the sySTEMic Collaboration cohort undertaking a tour of the Larrakeyah Barracks.

The sySTEMic Collaboration Model

The **1:2:4 model** is designed to facilitate growth in future years, for example: 1:2:8, 1:2:16, 1:2:32 etc.



- 1 TEACHER
2 INDUSTRY PARTNERS
4 STUDENTS**

Figure 3.1 (below): Financial Partner Territory Generation at the sySTEMic Collaboration launch.



Industry Involvement

The sySTEMic collaboration enlists the support and expertise of industry to help prepare students for the world beyond school at a time in their lives when they are making decisions that will influence their career path.

11 local NT businesses committed to be a part of our sySTEMic collaboration pilot, their support ranging from mentorship of the students, hosting site visits and excursions, and financial sponsorship. There are three categories of industry involvement:

Financial Partners	Industry Partners	Industry Associates
Supported the sySTEMic Collaboration by donating sponsorship money and / or consumables (eg. uniforms for the students). Financial partners were also offered the opportunity to act as an Industry Partner or Associate.	Worked with the students from the beginning of the program. They supplied two or more mentors, hosted a site visit (for both teachers and students) and worked with the students during a problem-solving day.	Hosted a one-day excursion for the students where they could get real world, hands-on experience in a STEM industry.

The sySTEMic Collaboration Model

Students and Curriculum

In conjunction with the NT Department of Education, a cohort of Year 10 High School students was chosen as the pilot group.

17 students were successful in applying to be part of the pilot year of the sySTEMic Collaboration, and included seven females and three Indigenous Australians.

Each student participated in two immersive site visits, a problem solving day where innovative skills were required, and excursions to a mine site, a defence barracks, and a university campus.



Figure 3.3 (above): sySTEMic Collaboration off-site excursion to a workshop at Charles Darwin University.

An innovative curriculum was very important for the sySTEMic Collaboration to succeed.

The teaching program created for the sySTEMic Collaboration is now listed under pre-approved Learning and Assessment Plan (LAP) for the South Australian Certificate of Education (SACE), which the NT falls under.

This listing signifies that program is considered best practice as it meets all the assessment and design criteria set out in the course outline.

For more information, [you can follow this link](#).

Each of the students created their own project topic related to a relevant rural issue for their final presentations.

Topics included solar-powering their school, setting up hydroponics for a remote community, designing transportable adventure activities that can travel to remote communities, and house cooling designs.

The winners were awarded a scholarship to a STEM camp upon successful application.

Figure 3.4 (right): Students presenting their projects to an industry panel in October.



The sySTEMic Collaboration Calendar

30/05/2018	Teacher Preparation	The teachers met with Engineers Australia and upper management from the school to discuss the aims and model of the sySTEMic Collaboration.
7/06/2018	Teacher Site Visits	The teachers visited the sites of the eight industry partners (two teachers to each site) to see what the students would learn. They were accompanied by EA staff as well as an NT Government representative and upper school management.
20/07/2018	Mentoring Course	Mentors from the eight Industry partners were offered a mentoring course tailored by EA specifically for working with Secondary school students.
26/07/2018	Presentations at Taminmin College	A number of organisations (including EA) presented to the students in relation to working in the STEM field.
30/07/2018	sySTEMic Collaboration Launch	The Collaboration was publicly launched, with Government representatives including Ministers and the media invited to attend.
9/08/2018	Student Site Visits	The students visited the two sites in the 1:2:4 Model, meeting mentors and having hands-on learning about working in STEM industries. They also discussed potential problem-solving topic ideas with their mentors.
23/08/2018	Problem Solving Day	The students took part in a problem-solving exercise where they had to devise a tower that would bear weight and withstand the force of wind. They also presented where they were up to with their problem solving topic and spent time with their mentors to discuss their next steps.
5/09/2018	McArthur River Mine Excursion	The students participated in a full-school day excursion at McArthur River Mining.
18/09/2018	Larrakeyah Barracks Excursion	The students participated in a full-school day excursion at Larrakeyah Barracks.
18/10/2018	Industry Presentation / Panel	The students presented their work to date on their individual topics, receiving feedback from a panel of four industry representatives from different fields.
7/11/2018	CDU Workshop Excursion	The students participated in a full-school day excursion at the Engineering Department at Charles Darwin University.
22/11/2018	Student Presentation	The students presented their finalised solution to their problem with an audience of parents, Government representatives, educators, and their peers. They were judged by a panel of professionals representing our Financial Partners.
7/12/2018	Young Engineers Panel / Lunch	The students had lunch with members of the YEA Committee and had the opportunity to ask questions of a panel including current tertiary engineering students.
Ongoing	Mentoring	On-going throughout the sySTEMic Collaboration and will be able to continue after the project end.

Analysis and Feedback

Students learned to:

1. **Work collaboratively** to problem solve using an Engineering Design Process
2. **Develop** their creative and critical thinking skills, plus their personal and social skills
3. **Recognise** how engineering is used in the world
4. **Develop confidence** in pitching their ideas to an audience
5. **Discuss** their ideas with others and ask questions more

Figure 3.5 (below): Students partaking in an offsite excursion at the McArthur River Mine.



Partway through the pilot, we received the very rewarding news that **over 90% of the participating students had requested a STEM-related work experience placement** including placements with the industry mentors.

Feedback from students and industry partners has been overwhelmingly positive. One quote in particular by a student sums up the objective of the sySTEMic Collaboration, that regardless of any student's background, "**there is a place in engineering for everyone.**"



Figure 3.5 (above): Students in discussions at an offsite excursion to the McArthur River Mine.

Figure 3.6 (right): Students' STEM subject participation at Taminmin College from 2017-2019.

Other student feedback included:

"We learned that there are many ways to solve one thing, whether it is the best way or not but everyone just got to point out everything because if you are all quiet it's not going to do anything."

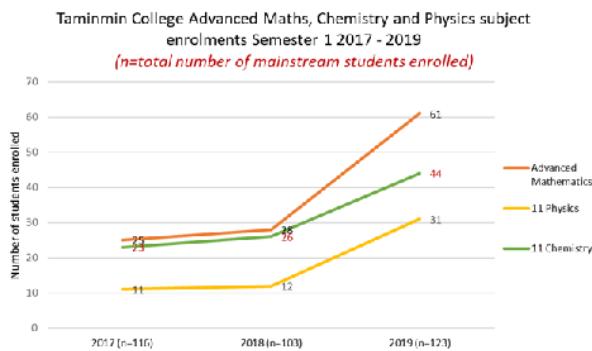
"We are getting much better at presenting in front of others."

"We discussed how some of our ideas were flawed and that we needed to adapt, improve and improvise to further enhance our ideas but also still try to keep our question simple."

"You need to trust one another to get the job done."

"The most valuable experience I had was that people had previous jobs with similar skills. Basically any job you have has transferable skills that will help you for other jobs."

"Learning about all the different types of Engineering areas are to help narrow down what you would study."



"We are committed to ensuring future generations of young Territorians have the skills to equip them for the workforce of the 21st Century and Engineers Australia is to be commended for instigating this program to help boost employment pathways to our vital infrastructure fields."

"We know that investing in STEM programs is crucial for preparing our children for the jobs of the future, as about 75% of the fastest growing occupations require STEM skills and knowledge."

"This is future focused real world learning coming to life through a wonderful partnership between Taminmin College and Engineers Australia."

"If the Territory is to produce innovative solutions to unique problems, it needs to encourage young people to choose Mathematics and Science as these are the basic tools used by engineers to solve our real world problems. Territory engineering companies are committed to helping build these opportunities."

Eva Lawler

Minister for Infrastructure, Planning and Logistics

Selina Uibo

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We would like to thank our financial partners for their contribution to the sySTEMic Collaboration in its pilot year