QUT's STEM School Engagement program

How QUT is helping build a future with STEM.

QUT's STEM School Engagement program engages school students across a diversity of background, gender, academic level and geographical location. Our leading combination of cross-disciplinary, project-based and hands-on learning experiences has become a catalyst that brings the STEM curriculum to life. We encourage students' curiosity about STEM and its employment pathways, and also support teachers' passion for real-world STEM learning, equipping them with additional knowledge and tools to positively influence their students' attitudes to STEM.

The program is a building block of QUT's STEM pipeline mission to create multiple STEM touchpoints with students and teachers to contribute to the uptake of STEM courses and QUT enrolments. The use of undergraduate and postgraduate students as 'Student Ambassadors' to design, lead and deliver the program, is critical to transforming beliefs about participation in higher education and STEM studies.

QUT recognises the value of broader STEM experiences beyond the classroom. Our community engagement activities provide access to the Science and Engineering Centre (SEC) and The Cube to enable learners of all ages to become actively engaged in STEM education.

THE STRATEGY - WHAT IS IT?

Since the program's inception, QUT's vision has been to create real-world STEM opportunities for school students and increase participation in STEM studies. Our program seeks to bridge the gap of the secondary-tertiary interface by bringing the STEM school curriculum to life through emulating the University's cross-disciplinary problem-based learning approach to curriculum design. It addressed a need to support teachers' delivering a STEM-rich curriculum, by matching the skills and capabilities of QUT STEM undergraduate and postgraduate students. Since 2013, QUT has engaged more than 327,928 school students, teachers and parents in initiatives that reflect the University's ambitious and forward-thinking strategic direction in STEM. This has positioned QUT as a leader in STEM school education.

The strategic vision is focused on action, evaluation and continuous improvement to make changes and meet its strategic goals to -

- Improve student awareness and aspiration towards STEM subjects, study and careers
- Break down barriers to enrolment for disadvantaged students in higher education
- Build teacher capability and confidence to deliver STEM in schools
- Contribute to increased enrolments in QUT STEM degrees
- Reaffirm QUT's position with secondary schools as a leading university of choice for tertiary study in STEM
- Maximise benefit to community by integration of education, research and public engagement in the STEM disciplines

THE CONTEXT

With an estimated 75% of the fastest growing occupations requiring STEM skills, QUT identified the critical need to invest in STEM education and infrastructure, with a strategic vision to create positive change by educating people about the STEM fields and making STEM more accessible to the public. To achieve this vision, QUT implemented a range of initiatives, including the redesign of STEM course content and delivery; a focus on interdisciplinary research leading to new knowledge and innovation; the multi-million dollar investment in the construction of a new premier STEM facility, the Science and Engineering Centre (SEC); and with it, the implementation of the QUT STEM School Engagement Strategy which enabled significant scaling-up of STEM-related touchpoints throughout primary and secondary school increasing the accessibility of university to these students.

In 2010, the Australian Government introduced the Higher Education Participation and Partnerships Program (HEPPP) - providing funding to Universities to undertake activities and implement strategies that improve access to undergraduate courses for people from low-SES backgrounds and improve their retention and completion rates. The HEPPP aims to encourage and assist providers to meet the Commonwealth Government's ambition that, by 2020, 20% of domestic undergraduate students must be from low-SES backgrounds. Between 2008 to 2016, QUT has been a key contributor to the national program, increasing overall undergraduate low-SES enrolments by 55%, 89% in indigenous enrolments, and 48% in enrolments from regional and remote areas.[1]

QUT's unique ecosystem approach to proven student engagement and impact in STEM is structured around four pillars that support excellence in STEM education.

Policy and pedagogy

Our school engagement programs are closely aligned with the National STEM School Education Strategy, HEPPP and the national education curriculum, ensuring that our goals and achievements are benchmarked against national policy.

Real-world context

QUT's established and successful industry and community partnerships shape our core programs and connect our students to groundbreaking real-world STEM research. Student Ambassadors deliver highly engaging hands-on learning experiences that ignite students' enthusiasm to tackle real-world challenges and teach them a broad range of skills required to meet the needs of tomorrow's workplace.

Practice and delivery

QUT has built successful partnerships with schools across Queensland. Our unique program of individual and multi-school workshops connects students with inspirational STEM learning experiences. Employed to lead and deliver the program, Student Ambassadors use their expertise to bring STEM concepts to life, adding context to school students' current understanding.

Aspiration and mentorship

Our Student Ambassadors, graduates and industry partners play a vital role in inspiring high-school students about the possibilities of STEM. Direct interaction with these role models through hands-on learning opportunities and peer-to-peer mentoring builds student interest in STEM and curiosity about career pathways.

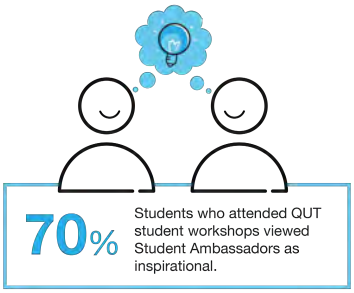
The program's success is due to four key drivers that underpin its delivery and create QUT's unique point of difference in this space.

Institutional support

Through a multi-million dollar commitment from QUT's Vice-Chancellor in 2012, and the Australian Government, Department of Education, Higher Education Participation and Partnerships Program (HEPPP) funding since 2010, QUT's school programs have been established to deliver fully funded (no cost) experiences to school students.

The fully-funded nature of the program is an ongoing equity-based initiative of the University, with a primary focus on counteracting financial or social disadvantage for students who attend low socioeconomic schools, especially in non-metropolitan areas.

Access to curriculum mapped workshops.



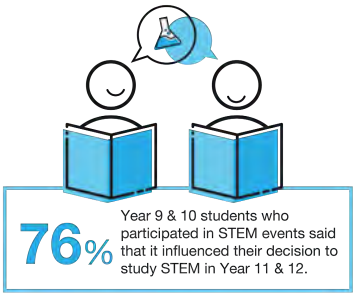
70% Students who attended QUT student workshops viewed Student Ambassadors as inspirational.

Student Ambassadors design, lead and deliver workshops mapped to the national curriculum both on campus and in-schools.

On-campus workshops can be accessed by schools across Queensland for students in years 7-12. Delivered in a dedicated education space, the workshops focus on extending students' STEM knowledge by applying it to design, build, test and evaluate solutions to real-world problems.

Schools in QUT's HEPPP catchment can access in-school workshops for years 3 – 12. Demand for the Extreme Van program has increased by more than 40% over the past three years alone.

Aspiration and Inspiration activities.

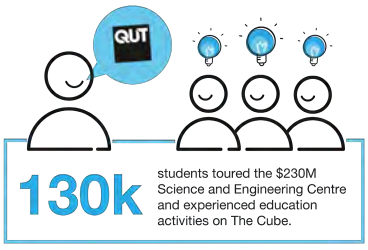


76% Year 9 & 10 students who participated in STEM events said that it influenced their decision to study STEM in Year 11 & 12.

QUT has a long history of delivering innovative and collaborative events that are proven to play a vital role in overcoming negative perceptions about studying STEM. Working with industry, government, professional associations and community groups to deliver initiatives that correlate with the known critical timing touchpoints, these one-to five-day immersion events directly influence a student's decision-making process about a future in STEM.

QUT has seen a marked increase in both participation rates and the number of students choosing a STEM-related degree.

Citizen science and public engagement.



130k students toured the $230M Science and Engineering Centre and experienced education activities on The Cube.

The Cube, one of the world's largest interactive digital learning environments, was launched publicly in 2013. Since then, on a daily basis people from all walks of life and all generations learn from, and are inspired by, their Cube experience. It provides an exploratory and participatory educational experience, making STEM visible and accessible to all.

QUT's biannual Robotronica event showcases the latest in robotics and technology to educate the public about future opportunities and challenges presented by technology and artificial intelligence. Ambassadors play a role in helping to deliver the school student-focused activities.

> "Our year 10 enrolment in chemistry has almost doubled for 2018 and a higher proportion of our students are choosing to study STEM subjects."
>
> **HEAD OF SCIENCE, TULLAWONG STATE HIGH SCHOOL**

> "We have seen a significant increase in our students studying STEM in the senior school due to our long standing partnership with QUT."
>
> **HEAD OF SCIENCE, KELVIN GROVE STATE COLLEGE**

> "Thank you to the wonderful work of the ambassadors leading our geology workshops and Meet the Scientist sessions. Their contribution to the program was a real highlight! They communicated their scientific knowledge and encouraged even the littlest of our visitors."
>
> **PUBLIC PROGRAMS OFFICER, QUT**

HOW IS THE PROGRAM SUCCESSFUL?

QUT's innovative, sustained approach to students' STEM journey

The frequency and timing of STEM engagement activities has a significant impact on students' initial perceptions of STEM and students' decision-making process for senior subject selection.

QUT delivers a broad range of STEM-related experiences targeting students of all ages. From free visits for primary school students to the awe-inspiring Cube, through to curriculum-aligned events for students in grades seven to 12, QUT's program of touchpoints aims to challenge perceptions and be a catalyst for curiosity about a future in STEM.

PRIMARY (PREP to Year 6)

Break down the barriers to STEM – Students need to develop a self-belief in their ability as a STEM learner. Developing a curiosity about STEM will help overcome common barriers of lack of interest and the perception that STEM subjects are too difficult.

JUNIOR SECONDARY (Year 7 & 8)

Build positive perceptions of STEM – Students' perceptions of maths and science are set by the time they reach senior school. Positive primary school experiences in these subjects is a predictor of future passion for STEM.

MIDDLE (Year 9 & 10)

Build awareness and ignite enthusiasm for STEM – 60% of senior school students are likely to make decisions about their broad area of study before Year 10.[2] Developing knowledge of STEM disciplines helps students see the relevance to future career pathways.

SENIOR SCHOOL (Year 11 & 12)

Harness and foster enthusiasm for STEM – Over 60% of students will choose their course or degree in Year 12, and 73% decide which university.[2] Maintaining interested students' passion for STEM subjects in these years is vital for recruiting the next generation of STEM professionals.

BUILD → ATTRACT → RETAIN

> "My STEM journey with QUT started when I attended the 2013 STEM Camp. The camp brought my school subjects to life and I fell in love with the concepts of engineering. I was inspired to know more and attended the Engineering Link Project at QUT in Year 12. I met real engineering students who challenged my traditional perceptions of what an engineer did and looked like and I knew I wanted to be one of them.
>
> As a Student Ambassador, I was able to give back to high school students just like me, delivering Power of Engineering events in Brisbane and Caboolture and STEM camp.
>
> I believe in the impact of QUT's STEM experiences for school students and look forward to sharing my journey with the next generation."
>
> **QUT GRADUATE ENGINEER**

STEM Ambassadors play an important role in driving student interest in STEM subjects

Each year, QUT selects and employs over 100 current undergraduate and postgraduate students as STEM Ambassadors, who inherently deliver the program's activities in a scientifically literate way. Students are selected for their ability to communicate STEM to all ages.

The Ambassadors act as role models and peer-to-peer mentors for high-school students, inspiring this next generation about the possibilities of STEM. They engage directly with students in a range of activities, including facilitating workshops, and delivering presentations and campus tours.

QUT's Student Ambassadors' roles have evolved so that activities are now almost exclusively ambassador-led. Duties have expanded to include powerful personal narratives, embedded career information and assisting school students to navigate post-school pathways.

Ambassador skill and leadership development, through a combination of formal training, ongoing mentoring and support, is a key aspect of the role.

QUT has tracked Student Ambassador' outcomes for a number of years, to explore students' motivations for becoming ambassadors and to determine if the role positively influences students' retention and success.

Surveying Student Ambassadors engaging with students in low-SES regions, nearly all the respondents (96%) strongly agreed or agreed that the role contributed to graduate capability development; 92% indicated that the role assisted with their studies; and 93% considered that they had developed a greater sense of belonging to QUT as a result of their ambassador role.

The 2018 Student Ambassador study, provides insights into the role's value:

99% Being a Student Ambassador has enhanced my self confidence

95% This role has given me a greater sense of fulfilment

92% Through this role I've developed a greater sense of belonging to QUT

91% This role has enhanced my interest and enthusiasm for university

78% This role has enhanced my self-belief in my ability to perform academically

77% Being a student ambassador has helped with my uni studies

> "The opportunity to feel as though you are making a difference to children's futures … is incredibly satisfying. … [I've developed] much greater awareness and understanding of the challenges faced by low-SES children. … [I feel an] enormous sense of satisfaction encouraging children to get enthused by science and seeing that their interest in science has been sparked."
>
> **STUDENT AMBASSADOR [From first-in-family, low-income, rural background]**

> "The role has made me more confident in my abilities as a presenter/ communicator … this has influenced my academic success"
>
> **STUDENT AMBASSADOR**

> "As a similar program influenced me to attend university and study science, helping other people to have the same opportunity as me is fulfilling"
>
> **STUDENT AMBASSADOR**

1. Universities Australia (2018). Data Snapshot 2018. 2. Source: QUT Science and Engineering First Year Student survey 2018
3. Green, A. (2018). The influence of involvement in a widening participation outreach program on student ambassadors' retention and success. Student Success, 9(3), 25-36.

The Impact

Since 2013 we have delivered...

46%
females attended STEM activities

Provided access to opportunities for students and teachers across Queensland and Northern NSW

96%
Student Ambassadors strongly agreed or agreed that the role contributed to graduate capability development

83%
First year STEM students said a QUT STEM activity

INFLUENCED
their decision to study a STEM-related degree

Nationally we have contributed to
55%
increase in low-SES undergraduate student enrolments

Female engineering numbers have increased from 11% in 2011 to **20%**

Increase of OP1-5 students studying Science and Engineering Faculty degrees

OP1: 7% 2018, 3% 2017

OP 2-5: 30% 2018, 24% 2017

QUT FIRST PREFERENCES #1

BACHELOR OF IT #1

BACHELOR OF ENGINEERING #1

327,928
Unique STEM engagement experiences.

increased participation by
65%
of high school students and teachers over six years

118,623
students experienced
3,754
STEM workshops

153,012
students experienced
521
STEM events

887
Student Ambassadors employed to increase young people's engagement in STEM

62,277
hours of face-to-face contact with a Student Ambassador