

PROJECT REPORT

STEM-based education for students, teachers,
parents and community

20
22



Make, Integrate, Explore (MIE) Lab January - December 2022

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I enjoy interacting with the students. I'm there to teach them but often I learn so much from them too. Young people have lots of great ideas and knowledge.

-program presenter

INTRODUCTION

The MIE Lab project is a UniSC initiative which has been running since 2019 and targets prospective undergraduate students from low SES backgrounds (Indigenous Australians, Australians from low socio-economic status (SES) backgrounds and/or Australians from regional or remote areas) in schools and communities which are part of the UniSC HEPPP School University Partnerships Clusters in SDI Quartile 1 and 2 schools.

Programs have multiple relevant and meaningful touchpoints, providing numerous opportunities for participants to acquire Science, Technology, Engineering and Maths (STEM) skills and knowledge about careers. This enables the program to increase the level of complexity and difficulty with each iteration, helping participants to remember more because they are experiencing the learning rather than just simply observing it.



MIE Lab is an evidence-based initiative which translates research into programs designed to successfully alter male and female perceptions of STEM careers and university pathways. The program provides opportunities for direct exposure to STEM activities and experiences, with a view to garnering interest in STEM subjects at school, future transition into tertiary studies at UniSC and STEM occupations.

The project will be re-named MindSET-do in 2023 - to reflect the work that we do in changing mindsets about STEM.





My TWO highlights were writing the code and wiring the components. Our presenter was really good!

-year 6 student

PRIMARY SCHOOL

2200

students

38

low SES schools

125

teachers

The Primary program engages students in Years 4-6 by providing a series of hands-on, career and technical education (CTE) lessons in primary schools, which are delivered by UniSC preservice teachers/students. Students in the classroom learn skills that are relevant and useful for their future education and careers, and UniSC preservice teachers become familiar with the Australian Digital Technologies and Design and Technologies curriculum. This develops the skills needed to use technology and other STEM resources in the classroom, enhancing student engagement and learning, and increasing preservice teacher and/or UniSC student employability post-study.

The lessons align with the Australian Curriculum which enables schools to integrate the lessons into units of work and term overviews. This ensures that the lessons are delivered in schools at a time when they align most appropriately with the STEM curriculum being delivered in a term.

Primary lessons offered are:

Year 4 - Serious Game Design - using Scratch

Year 5 - Microdrones - for an environmental application in the community

Year 6 - Arduino - controlling light





I liked learning new things about sustainable neighbourhoods. Thank you, it was amazing!

-year 8 student

SECONDARY SCHOOL

225

students

5

low SES schools

13

teachers

The Secondary program focuses on inspiring and motivating low SES students to have positive capability beliefs and attitudes to higher education as a viable post-school option. This program is designed to also educate students, teachers, parents, and community about other pathways into STEM careers and university studies which are not the 'pure' sciences, and is focused on students in Years 7-10, in low SES schools, who are not already on a university trajectory.

The program provides professional development to UniSC student presenters to become familiar with the education curriculum and develop skills needed to use technology and other STEM resources in the classroom. This enhances student engagement and learning, and also increases UniSC student employability post-study. All resources to the programs are available online. The professional development is also open to teachers to increase their learning.

Secondary lessons offered are:

Year 7 – Self-Driving Cars - with Arduino

Year 8 – Developing a Sustainable Neighbourhood - links to United Nations SDG's

Year 9 – Brain, Health & Wellbeing - links to the psychology curriculum

Year 10 – Citizen Science – linked to STEM research projects at UniSC





I loved having such an experienced teacher explaining everything and giving us a chance to learn.

-robotics club participant

COMMUNITY



The Community Program has been developed in consultation with regional communities to provide STEM inspiration to the broader community. It targets prospective undergraduate students from low SES backgrounds of any age, by offering experiences in STEM with experts and local industry.

Code Club

A 6-week program, providing step-by-step activities for students in Years 4-6 to create games, animations and websites, while learning the key concepts of programming at the same time.

Robotics Club

An 11-week program to give primary school students the fundamentals of building and coding robots, to compete at the RoboRave competition on the Sunshine Coast. In 2022, 3 primary clubs for students in Year 5 and 6 were facilitated at the UniSC Moreton Bay, Sunshine Coast and Fraser Coast campuses, and 1 high school club for students in Year 9, 10 and 11 was held at UniSC Moreton Bay.

NOBURN Citizen Science Project

A first of its kind citizen science project involving Australian communities in data collection and predictive modelling of bushfires, garnering interest in the science behind bushfires and creating awareness of the fire-susceptibility of our forests.

Queensland Mental Health Week

An annual awareness initiative that promotes individual and community mental health and wellbeing, boosts awareness of mental illness, and celebrates the contribution of the mental health and community sectors.



Sunshine Coast



Moreton Bay



Fraser Coast





I enjoyed being able to collaborate with others who are also interested in STEM, in engaging activities.

-STEM Regional Girls Day participant

EVENTS



The Events program brings together a culmination of activities and events to further support the pursuit of STEM interests in students, teachers, families, and the wider community. This program offers a suite of ongoing annual STEM events and competitions which target prospective undergraduate students in Years 6 to 12.

The program also targets parents as adult learners in, encouraging them to participate in events and actively engage in their child's learning experiences.. The program works with schools to develop and provide rich and engaging learning experiences to their students that align directly to curriculum, whilst building student aspirations regarding STEM Education and STEM Career outcomes. MIE Events partners with various UniSC staff and industry members to deliver engaging and educational content to the wider community.

On campus days and one-off multi-school challenges and competitions aim to foster a love for collaboration and lifelong passion for STEM. These activities are designed to provide students with the opportunity to experience what life is like at university, through interacting with academic staff, university students and networking with industry.

On campus STEM activities include:

- Dream Big
- Maths Modelling Challenge
- Science and Engineering Challenge
- STEM Regional Girls Day
- National Science Week
- Superstars of STEM





Our findings indicate that whilst males and females have similar STEM skills, females have lower expectancies for success, achievement task values and ability beliefs, which may impact their future STEM-related subject and career choices.

-Natalie McMaster

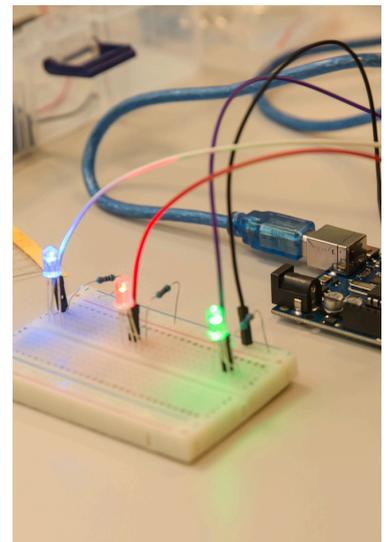
RESEARCH

The MIE Lab Research Team consists of academics from UniSC and Edith Cowan University. The team works on a variety of STEM-related projects in the areas of: careers, gender stereotypes, engagement, expectancies for success and societal factors.

The project's success has been reflected in a new [Q1 journal publication](#), showcasing the progress and results of the team's efforts. The study concentrates on Year 6 students who participated in MIE Lab lessons that presented electrical circuitry and C++ coding, using Arduino UNO microcontrollers, breadboards, and light-emitting diodes (LEDs).¹

The paper emphasises the importance of increasing primary school students' aspirations for STEM-related subjects, as well as promoting equal engagement in STEM subjects among both males and females at a young age.

In 2022, the team embarked on a longitudinal study with 10 QLD Government schools. The aim of the study is to explore whether early, inquiry-based, hands-on experiences with STEM activities and STEM subjects have positive effects on expectancies for success, task values and STEM education and career choices among students in the long-term, especially for girls.



¹McMaster, Natalie, Carey, Michael D., Martin, David, A. & Martin, Janet. (2023). Raising primary school boys' and girls' awareness and interest in STEM-related activities, subjects, and careers: An exploratory case study. *Journal of New Approaches in Educational Research*, 12 (1), p. 1-18, <https://doi.org/10.7821/naer.2023.1.1135>





I enjoyed the challenge of the activities and getting to figure them out with my peers.

-Science & Engineering Challenge participant

SCHOOL ENGAGEMENT

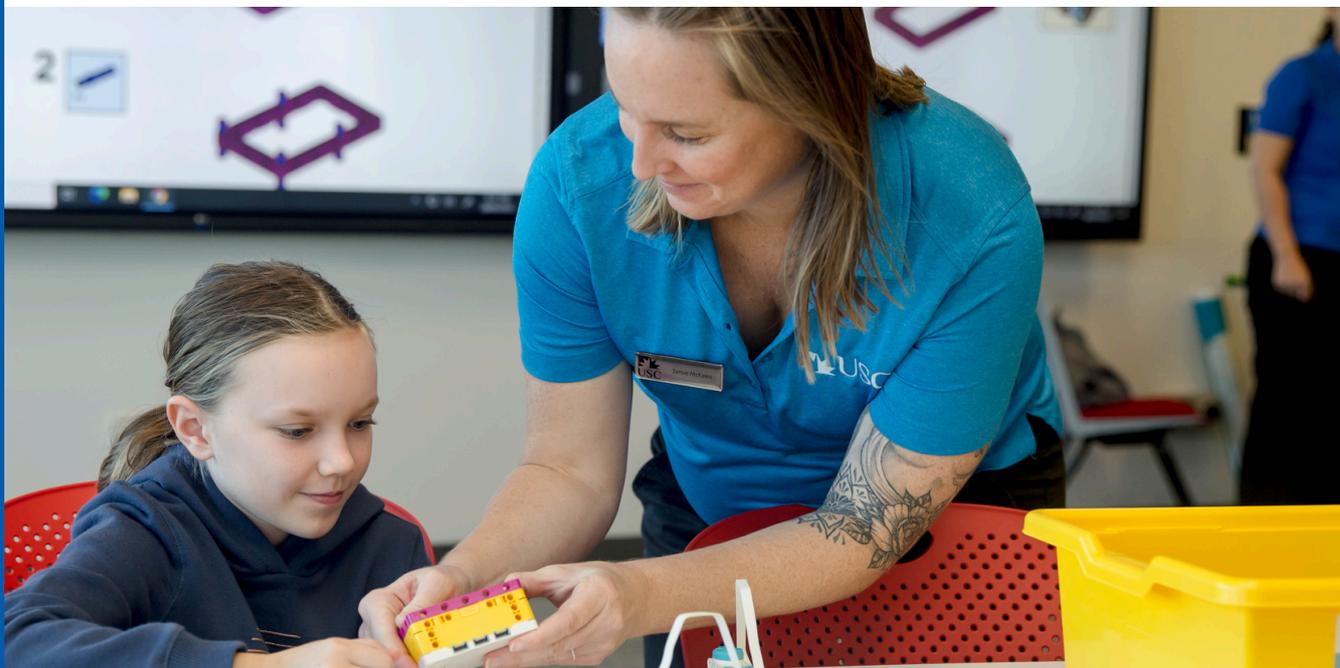
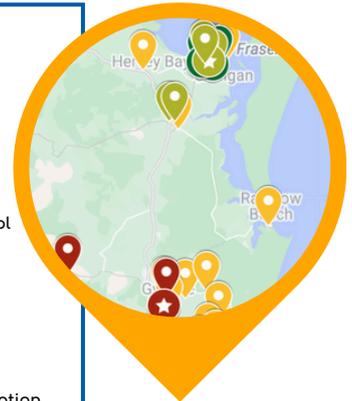
- Pacific Paradise State School
- Cooran State School
- Pomona State School
- Parke State School
- Gundiah State School
- Gundah State School
- Torquay State School
- Torbanlea State School
- Bauple State School
- Yarrilee State School
- Chatsworth State School
- Scarborough State School
- Kurwongbah State School
- Kilcoy State School
- Yandina State School
- Mary Valley State College
- Kenilworth State College
- Gympie South State School
- Kawungan State School
- Strathpine State School
- Kippa-Ring State School
- Humpybong State School
- Noosville State School
- Jinibara State School
- Pialba State School
- Bribie Island State School
- Pumicestone State School
- Wondai State School
- Tinana State School
- Woombye State School
- Lawnton State School
- Undurba State School
- Hercules Road State School
- Kilcoy State School
- Beerwah State School
- Golden Beach State School
- Caloundra State School
- Woombye State School
- Kuluin State School
- Talara Primary College
- Nambour State College
- Star of the Sea Primary School

Primary Schools



- Hervey Bay State High School
- Gympie State High School
- Caloundra State High School
- Meridan State College
- Aldridge State High School
- Beerwah State High School
- Pine Rivers State High School
- Noos District State High School
- Urangan State High School
- Gin Gin State High School
- Bray Park State High School
- Caboolture State High School
- Longreach State High School
- Calliope State High School
- Home-Schooled/Distance Education
- James Nash State High School
- Burnside State High School
- Goomeri State School
- Kilkivan State School
- Park Ridge State High School

Secondary Schools





I liked how I could tell the drone what to do and also learning how to work better with others in my class.

-year 5 student

IMPACT

Primary

95

PERCENT

enjoyed the lessons

EIGHTY THREE %

are more confident to participate in coding activities

87%

want to continue learning technologies at school

89 PERCENT

would like to do more lessons like these



60%

are more likely to attend university or TAFE in the future



48%



48%



4%



14%

Identified as Aboriginal or Torres Strait Islander

Secondary/Community

85

PERCENT

enjoyed the lessons

SEVENTY EIGHT %

are more confident when undertaking STEM activities

83%

persevered to solve challenges

71 PERCENT

are more aware of STEM career options



58%

would like to consider a STEM career



41%



53%



6%



6%

Identified as Aboriginal or Torres Strait Islander





I loved building things and doing interactive activities.

-Dream Big participant

IMPACT

Events

96

PERCENT

enjoyed the STEM activities



82 PERCENT

had increased confidence after the STEM activity

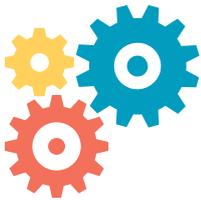


SIXTY SIX %

were inspired to learn about STEM careers



are likely to consider a STEM career



73%

are more likely to attend university or TAFE in the future



I enjoyed spending time with people from the grades above me, and seeing their perspective of STEM.

-Superstars of STEM participant





The highlight of the workshop for me was being able to test out the Town Planning game and hearing the research and thought behind it.

-secondary school teacher

PROFESSIONAL DEVELOPMENT

MIE Lab offers a range of professional development opportunities throughout the year for teachers, preservice teachers, library staff and community members who are interested in gaining skills and knowledge in teaching integrated STEM lessons.

During the workshops they learn how to develop students' growth mindsets to STEM subjects, develop confidence and skills in teaching about STEM career education and develop confidence and skills in teaching the Technologies curriculum.

A range of online modules have also been developed to accommodate those who are in rural and remote settings, or would prefer to do their learning remotely.

The online workshops currently offered are:

- Arduino Controlling Light Online PD
- Science Unplugged Online PD
- Serious Game Design Using Scratch Online PD



I can't wait to start assisting in schools and to utilise this learning during my teaching career.

-UniSC pre-service teacher





I love working with students delivering fun hands-on activities. I can see it translate into highly relevant skills for students' futures in STEM.

-program presenter

PRESENTER TRAINING

91%

of students agreed the presenters were encouraging

96%

of students agreed the presenters were good role models

UniSC students are given the opportunity to be trained as program presenters, learning how to deliver STEM education to school students, both in schools, on campus and in the community. UniSC students learn skills that are relevant and useful for their future education and careers, and become familiar with the Australian Technologies curriculum. They develop skills in teaching with technology, delivering integrated hands-on activities in STEM focussed lessons, and behaviour management skills.

This training and use of UniSC students as presenters in the program is highly beneficial for both the school students and the schools. It allows university students to gain valuable teaching experience, which can enhance their own understanding of STEM concepts, helping them develop key communication and interpersonal skills. It also provides school students with an opportunity to receive personalised instruction from a knowledgeable and relatable mentor, which can help to increase their interest and engagement in STEM subjects.

Additionally, this training helps to address the shortage of qualified STEM teachers in many schools, while providing university students with a means of earning some extra income. Presenters learn highly sought after employability skills, which promotes the development of wider STEM education.



I wanted to inspire students and support their STEM learning. As a presenter, I get to learn from the students, whilst improving my own skills.

-program presenter





I have been influenced in my own career choices by my teachers and friends. For students of this age, my goal is to encourage and inspire them to work hard.

-Casey Giulieri, HeliMods



RESOURCES

MIE Lab has developed a suite of online resources directly linked to local STEM careers and industry role models, including locally made videos and posters for the classroom.

Teachers can download the sets of posters to display in their classroom. The posters use local role models and are designed to consolidate messages to students about careers in STEM.

The posters include a QR code which links to the website and contains further information about the role model in an interview format.

Blog

The blogs are informal pieces which provide insight into opinions on STEM education.

Locally made videos and STEM career posters

The videos and posters display interviews with academics, educators and STEM professionals from local STEM industries.

Resources for parents/carers

The career resources are designed to help parents support and guide their children to consider STEM subject selection at school and STEM pathways at university.

Publications, News Articles and Research Papers

A range of infographics, published research papers and publications by the team are available on the website.

[Visit our resources page](#)



MIE Lab is a widening participation program developed by the University of the Sunshine Coast (UniSC) to increase participation in tertiary education in STEM fields.

It is partly funded by the Australian Government Department of Education, Skills and Employment under the Higher Education Participation and Partnerships Program.

