

ISSUE

06

MARCH
2015

Program Update

The South Australian Advanced Technology Project is a joint initiative of the Commonwealth and state governments that aims to increase the number of students studying science, mathematics and technology (STEM). The Advanced Technology Program is funded from the Commonwealth by the Defence Materiel Organisation.

Future funding of industry school pathway programs depends on the release of the Defence White Paper which details future defence projects and budgets. The Defence White Paper is expected to be released mid-year and while we are hopeful that a positive decision will be made to continue to fund our program there are no guarantees.

During 2015 the program will continue to be supported by DECD in some form. Initiatives such as the Teacher in Residence program with Flinders University and the University of South Australia (Mawson Lakes) will continue and teachers and schools will still be supported.

The Advanced Technology Program continues to receive excellent feedback from schools and industry and we continue to see improvements in our schools in the way STEM curriculum and programs are delivered and the results achieved.



Apollo15LunarRover

ADVANCED TECHNOLOGY PROJECT

Automotive Partnership at Hallett Cove R-12 School

Contact from a young engineer at Automotive Safety Engineering with Hallett Cove School has resulted in a budding school-industry partnership that is providing exciting opportunities for students and teachers.

Automotive Safety Engineering (ASE) is a leading safety and engineering company based in Lonsdale. The company tests and designs street furniture such as bollards and light poles, performs automotive engineering tests on features such as airbags and bull bars, as well as structural engineering testing on the likes of cranes and bridges.

Managing director and chief engineer Grad Zivkovic founded ASE in 1994 and is probably most well known as the inventor of the cargo barrier.

As is common practice in many schools, Hallett Cove School has a road science topic in Year 10 as an introduction to Newton's Laws and this theme continues as an application in Year 11 physics.

When contact was made through one of the young engineers working at ASE, physics-trained deputy principal, Harry Stassinopoulos and physics teacher, Steve Blenkinsop leapt at the invitation for a visit.

What they saw excited them. The brilliance of Grad with the enthusiasm of his team of young engineers in an environment reminiscent of the TV show, Mythbusters is tailor-made to inspire students. Grad's willingness to promote science and technology made a class visit easy

to organise and in no time, a class of Year 11 physics students found themselves seeing the environment at ASE first-hand.

Grad and his team fired off airbags (incredibly loud), dropped hundreds of kilograms onto cargo barriers and rammed a crash test dummy into a 60-tonne block of concrete to test a seat back (it failed).

As applications of Newton's Laws in car safety the demonstrations were classic, but as effective was the ability for students to see engineers in action. The methodologies employed in safety engineering were evident as the team discussed projects such as designing light pole impact barriers and testing roof bars for Australian Design Rules (ADR) vehicle compliance.

Hallett Cove School students are looking forward to the next visit and hearing about new projects at ASE. These include designing wheels for Martian rovers (pictured above) and testing show rides. Last year, students visited the Royal Adelaide Show, where they wore accelerometers on rides to collect data for analysing motion and forces.

Hallett Cove School would like to thank Grad Zivkovic and his team at ASE for inspiring students to be the next generation of world leading engineers and the ATP for the funding to cover transport and cover for teachers to take these excursions and plan Australian Curriculum tasks centred on these activities.

Mr Steve Blenkinsop
ATP Manager
Hallett Cove School

Advanced manufacturing and design in action for students



Now in its third year the Defence Industry Pathways Program (DIPP) involves students in advanced manufacturing, CAD design and developing high level employability skills for defence industries.

Since 2014, three DIPP programs with this particular focus have been completed, with 38 students successfully completing the semester long program.

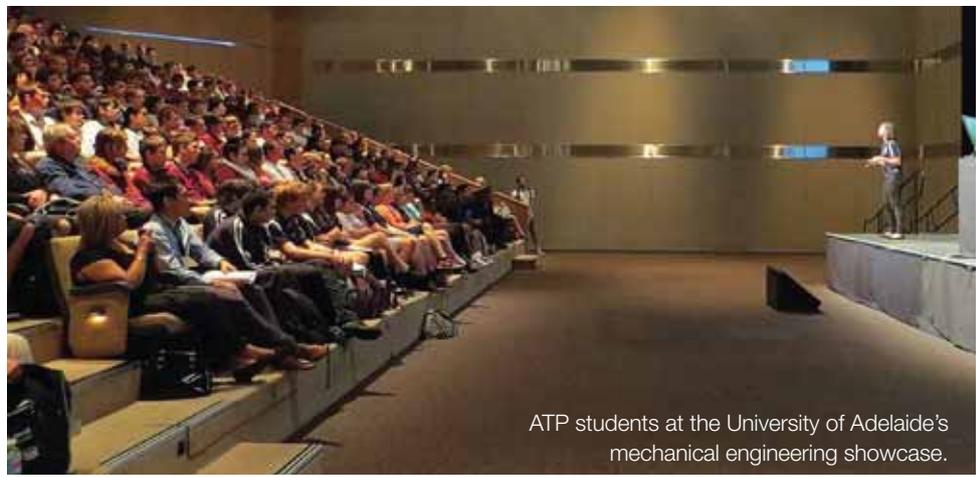
The criteria for selection have focused on the student's science, technology engineering and mathematics (STEM) abilities and their aptitude to be independent and resourceful. In addition, students need to demonstrate confidence and interest in using new technologies to design, test and manufacture solutions to a set design brief.

DIPP is a collaborative approach that includes TAFESA, ASC (formerly Australian Submarine Corp), Department for State Development and the Department for Education and Child Development.

Students attend a one-day per week semester program at TAFESA in the Advanced Manufacturing Centre at Regency Park and on completion receive a SACE Stage 1, 10-point Technology unit. Students have been designing solutions to a maritime brief, which has included a submarine and an air warfare destroyer.

The solutions are modelled in a computer aided design (CAD) industry standard package, tested and then 3D Printed. Each student gets to take home printed solutions to their CAD modelling designs. In addition students complete investigative and design written tasks to comply with their SACE requirements.

DIPP7, the fourth program with this focus commenced in February 2015 with 15 students from nine schools selected via an application process. The program is co-delivered by Eddie Grzeskowiak, a teacher from Le Fevre High School and Anthony Tonkin, TAFE lecturer in advanced manufacturing at Regency TAFE.



ATP students at the University of Adelaide's mechanical engineering showcase.

University ingenuity on show

The University of Adelaide's mechanical engineering showcase MechExpo celebrated its 20th anniversary last year with the addition of other engineering and technology-related degrees in a free public exhibition at the Adelaide Convention Centre.

Ingenuity 2014: An Exhibition of Engineering, Computer and Mathematical Sciences took place last year with more than 300 ATP students attending the expo.

The expo featured more than 240 examples of engineering and technology ingenuity in South Australia.

"Ingenuity 2014 was a great opportunity for high school students from across the state to actually see how they might be involved in helping solve many of the complex challenges facing our society," said Professor John Beynon, Executive Dean of the Faculty of Engineering, Computer and Mathematical Sciences.

Our ATP students interviewed the university students about their projects, and experienced the sorts of things they would be doing if they study engineering and technology-related degrees at the University of Adelaide.

Ingenuity 2014 brought together the knowledge and skills of students from Adelaide University's Faculty of Engineering, Computer and Mathematical Sciences.

Some of the highlights of Ingenuity 2014 were: the design and build of a 3D Metal Printer; a Submersible Thermal Glider Robot and the design and build of an AUV (RoboSub). This project, sponsored by the ASC and Babcock is a submersible robot that is capable of operation without continuous real time input from a pilot.

Our students, along with other visitors, had the chance to talk with the university students about their innovative solutions to contemporary issues and challenges of the future.

"Ingenuity 2014 gives Adelaide the opportunity to see the future of engineering and technology in one large exhibition," explained Professor Beynon.

"Engineering and technology will underpin the advancement and future prosperity of our world. Opportunities like this give school students, industry and the general community an opportunity to engage with our students and see the results of their creative abilities and skills."

Unley High School's Year 10 Challenge

Last term, Unley High School's Year 10 students undertook a week-long, intensive problem-based learning activity.

Problem-based learning involves students investigating a messy, real-world problem using a hands-on approach.

It is characterised by there being no one 'right' answer with students working as self-directed, active investigators. All other lessons were suspended as students worked in small teams with teacher mentors to solve the problem. The methodology used in problem-based learning mimics that used in many STEM tertiary courses and careers.

The theme was 'Feed the World' and students explored ways in which they could tackle the growing food crisis in various locations around the world.

Aquaculture, hydroponics, developing more energy-efficient growing methods and reducing waste were some of the areas researched and developed as teams of students came up with their own solutions that were presented to a panel of community experts at the conclusion of the week.

STEM Educational Leadership Program

In November last year fourteen teachers from the 2014 STEM Educational Leadership program presented their STEM case study to peers and educational leaders.

The STEM Educational Leadership program provided a range of activities to build STEM knowledge, teaching practice and leadership capacity of a group of early career STEM teachers.

Teachers were identified by their school as having leadership potential and that involvement in the program would benefit them professionally.

The program provided a unique opportunity for the teachers to gain an insight and broader knowledge of a wide range of school sites and innovative STEM practices.

Some of the STEM case study presentations included:

- motion commotion – developing a multi-disciplined learning approach to STEM
- exploring student perceptions of STEM and STEM careers
- advanced technologies and enrolment strategies.

The afternoon not only provided a final celebration and acknowledgement of the year's work for the group of aspiring leaders, but was a great opportunity to refine presentation skills. This highlighted the significant professional growth of all participants.

Mr Brenton Evans
Coordinator
STEM Educational Leadership program

Teacher in Residence @ Flinders University



Adam Wallace (right) with Associate Professor Gunther Andersson in the surface analysis laboratory at Flinders

In 2014 an exciting new collaboration began which gives senior secondary science, technology, engineering and mathematics (STEM) teachers the opportunity to build capacity through direct contact with academics.

The Advanced Technology Project and Flinders University have partnered to give academics and teachers reciprocal insights into their respective curricula. It is helpful that teachers have the opportunity to develop connections with the university, which is of great benefit to engaging students and raising their achievements.

In Term 2 Adam Wallace, a physics teacher, from Unley High School spent time at Flinders University as part of this initiative. He was specifically interested in finding ways to encourage the transition of STEM students to university by improving the continuity of course content and delivery.

Adam said one of the major outcomes of his residence will be closer liaison between Flinders University and Unley High's science programs, which may include presentations by science academics to Year 11 students at the school.

Also proposed is setting up a 'taster' day for Year 10 students, which would offer a series of workshops in different science disciplines to assist students in choosing their subjects for the following years and beyond.

Femia King from Aberfoyle Park High School thought her time at Flinders University was a fantastic opportunity to collaborate with the university on providing authentic experiences for her students in STEM.

Femia's placement centered on 3D Printing and she had the opportunity of a tour of the facilities and met Baxter the robot. She also had conversations about the use of 3D printing and scanning and the parameters that must be in place for this to function effectively in a classroom. Femia discussed with university staff how they are currently using 3D printers for first year engineering students and explored the many possibilities for authentic and accessible integration of other digital technologies.

She also took an interactive tour of the biomedical engineering lab, heard about the numerous innovations being developed for various medical industries there and sat in on a circuitry workshop.

Femia is now working with the science communication officers in developing a program utilising the cross-industry focus of the Tonsley campus.

This initiative is seen as a great success by Flinders University and the teachers involved. There has been a great deal of interest from teachers for a placement this year.

ElectroScience Workshop – Year 9 students build dragster

In late 2014 two half-day science, technology, engineering and mathematics (STEM) workshops were held for Year 9 students from Seaton High School and other high schools in the western region.

The students were tasked with making an electric dragster and racing it along a 16-metre track. Students had the opportunity to build an electrical system and test it on the track and were also able to calculate terminal speed, torque generated by the motors, and acceleration.

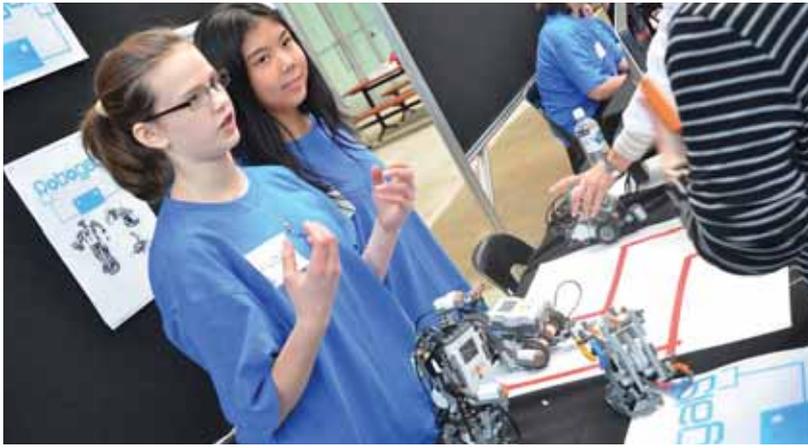
The workshops were attended by 45 students who were highly engaged in the challenges of the workshops and had a lot of fun testing their creations on the race track. The event was supported by Nigel Stone from Wennig Designs and Dave Symonds from Aztronics. Many thanks for their help and support in running the workshop.

Mr Toni Nash, Learning Technologies Assistant Principal Seaton High School



Students working on their dragsters

Southern Science Expo 2014 – science ignited



Students explaining their projects to industry representatives



Malcolm Sievers and Alana Baker from Hamilton High School with their awards

Last August, more than 130 science, technology and mathematics students were immersed in research relating to the design, construction and testing of a wide variety of contemporary engineering solutions.

The students presented the results of their work to more than 200 Year 6 and 7 primary school students, parents, teachers and industry representatives at the third Southern Science Expo, held for the first time at the new TAFE campus at Tonsley. Among the attendees on the day were: Annabelle Digance MP, State Member for Elder; Corey Wingard MP, Member for Mitchell and Davie Speirs MP, Member for Bright.

The secondary students demonstrated their work in a huge variety of areas, including:

- 3D printing
- robotics
- water purification
- remote sensing using autonomous vehicles
- Python coding – iPad Apps and games
- body armour
- fixed wing and multicopters
- software-defined radio
- ground-based UAVs

These students had their scientific passions ignited by the opportunity to interact with more than 30 hands-on exhibitions.

They also judged the People's Choice Award for the best display based on presentation, the ability of the students to explain the science/maths/technology/behind the display, and how interactive the display was.

The winner of the People's Choice Award was Unley High School with their data logger display and the runner-up was Hamilton Secondary College with their C2C display. Each school also nominated one exhibition for judging by the expert judges based on the level of innovation. Hamilton Secondary College C2C display also took out this award.

Robotics and STEM at Underdale High School



Funding provided by the Advanced Technology Project has enabled the Underdale High School to purchase NXT robots and software resources so its students had access to these valuable tools to support and engage students in STEM education.

The robotics program has grown from a lunchtime club in the science labs for selected Year 8 students to a four-week unit for all Year 8 classes. A Year 9 robotics course was also held for the first time in 2014.

The school now runs all courses in a designated STEM room, which has space for students to design, build and store their robots and computers with the relevant software.

The Year 9 robotics course includes a series of challenges where students design, build, programme and test their robots to meet certain criteria. Challenges include, building a hexapod, drag racer, Segway, mechanical arm and manoeuvring through an obstacle course.

Students are taught key mathematical concepts needed for their robots to function, as well as increasing programming skills as the challenges become more complex. The interest and enthusiasm of students undertaking this course has created strong links to all the school's STEM-related subjects.

Outcomes for students are aligned to the Australian Curriculum and include:

- Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies
- Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data
- Investigating how scientific and technological advances involving robotics, have been applied to space exploration, war, manufacturing and the wider society.

*Mr Jason Simmonds
ATP Manager
Underdale High School*

STEM Days at Le Fevre High and Seaton High

Students experienced 3D modelling and 3D printing once a week for a semester with Mr Anthony Tonkin (TAFE SA) as part of a STEM day, hosted by Le Fevre High in cooperation with the DIPPP 6 (Defence Industry Pathways Program) and TAFE SA Regency campus.

During the morning, students attended a lecture about buoyancy, the Archimedes Principle, hydrodynamics, stability principles and naval engineering and design, specifically regarding the shape and function of hulls.

In the afternoon, students put into practice the various principles they heard about that morning and produced boats of various shapes and designs, which they raced against the clock in a purpose-built water channel. Data was then analysed to observe correlation between the shape of the hull and performance.

The Naval Engineering and Maritime Science courses developed by Le Fevre teacher Thierry Herman keep on evolving, with the recent acquisition of a test tank that can hold up to 1.5 tonnes of water. The tank will be used to test buoyancy, stability and general hydrodynamics properties of prototypes and was acquired thanks to a BP grant.

Le Fevre High also hosted sessions which included students from Ocean View College and Findon High School as one of five schools in Australia to trial the 'Subs in Schools' program in 2015. As part of the Subs in Schools project Le Fevre's industry partnership is with ASC, whose naval engineers provided advice to students and teachers to assist in problem solving when designing a model sub.

Students attended lectures about physics and engineering principles related to submarine technologies and started building models of remotely operated vehicles (ROVs). They hope to progress to building a bigger model about the same size as small exploration ROVs, for example, the ones used to explore wrecks and inspect underwater infrastructure such as on oil rigs.

*Ms Sandra Moran
Assistant Principal,
Henley High School*

3D printing at the Royal Adelaide show

Last September, at the Royal Adelaide Show 3D printed objects created by secondary school students were 'on show' for the first time.

The Advanced Technology Project, in collaboration with the Royal Adelaide Show, ran a competition that included all secondary schools in South Australia, not just ATP schools.

Secondary students could enter in the categories of 'Mechanical moving object' and 'Sculpture', in both junior and senior groups.

The standard of entries was excellent and items such as a compass, transformer, maze and even a 3D printed spinning top were created.

The competition received excellent feedback and will be bigger and better in 2015 and your students are encouraged to apply. For more information, contact Pam Gerrard at pam.gerrard@sa.gov.au.

Winners

Sculpture Years 8 & 9
1st Prize – Heathfield High School

Sculpture Years 10, 11 & 12
1st Prize – Woodville High School

**Mechanical Moving Object
Years 8 & 9**
1st Prize – St John's Grammar School

**Mechanical Moving Object
Years 10, 11 & 12**
1st Prize – St John's Grammar School

STEM @ Aberfoyle Park High School



Students in a Raspberry Pi Workshop

Aberfoyle Park High School is embracing STEM in a big way, with a number of initiatives designed to spark students' enthusiasm for STEM subjects.

Programming Challenge for Girls (PC4G) at the University of Adelaide

Last November the Programming Challenge For Girls was held. The challenge is a non-profit organisation dedicated to introducing young women to computer programming. This event provides the opportunity for Year 9 girls who are interested in IT to have a go at computer programming using simple visual programming tools including Scratch and Alice. PC4G wants girls to experience the fun of programming, and engage them before they make their senior high school subject choices.

Problem Based Learning Expo at the Australian Science and Maths School

At the expo held in November last year, our students explained the research and findings from their investigations into energy-efficient house design. The comments from the judges on our students' work reflected our students' passion and confidence, good use of technology to gather and present data, and how clearly they'd explained solutions to practical problems.

Raspberry Pi workshops

Our students from years 8-11 have continued to impress at the Raspberry Pi Programming Workshops held twice a week. Mr Chris Robinson has guided them as they use their iPads to access and program the Raspberry Pi using the Python programming language. In addition to programming, students have also been developing and prototyping their own circuits while learning about electronic components.

2014 Concept 2 Creation Expo

We have continued the C2C concept in our IGNITE program as a project based activity where small groups of students use a project management approach to develop a product or service from concept to creation. With the use of industry experience and assistance, the students have taken on a wide variety of challenges, including the Mars Exploration Design Challenge, Eco VOLT Challenge and the SA Power Networks Drone Challenge



Sheryl Mourin and Mathew Wallace from Aberfoyle Park HS with Rob Stobbe, CEO of SA Power Networks at the C2C Drone Challenge

Where are they now? An interview with Victoria Filsell

Every now and then, the Advanced Technology Project reconnects with previous students to see what impact secondary STEM had on their tertiary and career opportunities.

Meet Victoria Filsell, a student of St Patrick's Technical College in Edinburgh North. Victoria graduated in 2013 and is now studying a Bachelor of Science (Forensic and Analytical Science) at Flinders University. While at St Patrick's, she was awarded a number of honours including:

- Year 11 Defence Technical Scholarship 2012
- Year 12 Student of the Year (Applied Engineering) 2013
- Department of Defence Long Tan awards 2013
- Year 12 Australian Vocational Student Prize, awarded 2014

Victoria's passion for STEM has continued in her tertiary study, as discovered in her interview with Pam Gerrard from the Advanced Technology Project team.

Why did you choose to study at St Patrick's Technical College?

I've always had an interest in Design and Technology. I was at Trinity College and one of the teachers suggested I should study something like child care instead of technology. But that wasn't for me. So I enrolled into the Advanced Technology, Applied Engineering course at St Patrick's.

What was it like at St Patrick's?

The teachers at St Patrick's were focused on helping us achieve, particularly with the research project in Year 12. And the Applied Engineering course allowed me to achieve my ATAR and gave me a direct entry into university.

What made you select Flinders University?

Flinders is the only university that offers a degree in forensics. I want to be a mechanical forensic specialist, which is the person that analyses vehicles that have been in a road accident.

What are your plans after university?

Like I said, I really want to be a mechanical forensic specialist, possibly for the SA Police or Forensic Science SA.

What differences have you noticed between studying at high school and studying at university? What do you like most about it?

There are more choices on assignments at university, but I think the biggest difference is that students genuinely want to be here. I really like how independent the learning is and that you need to be organised and motivated.

If you know of a previous student that would like to reconnect with the Advanced Technology Project, contact Pam Gerrard at pam.gerrard@sa.gov.au.



New NAMIG funding means support for schools

NAMIG (formally known as Northern Advanced Manufacturing Industry Group) has become a familiar part of education and STEM for schools in the north.

This group formed the Concept2Creation program with many associated projects and support provided to schools.

NAMIG, DECD and the Department for State Development (DSD), have recently entered into a new agreement to provide targeted funding to NAMIG for the next three years.

There will be a particular focus and support for the new eight DECD STEM focus schools. The STEM focus schools will develop a range of approaches to STEM and tools that will be shared with schools to increase young people's participation in STEM subjects and career pathways.

The Advanced Technology Project would like to congratulate NAMIG's general manager, Teresa Janowski, who last year received the Future Innovators Award for the STEM Sista program.

STEM Sista is a personal development program for girls, designed to predominately target three key aspects:

- Understanding yourself and others
- Emotional quotient and financial quotient
- Personality profiling and personal presentation.

The aim of the STEM Sista program is to develop young women who realise they can be more and do more and ultimately achieve the goals they set for themselves in STEM-related careers.

The award was presented to Teresa at the Women In Innovation Awards SA, which recognises women for their achievements in innovation.

For more details about NAMIG and Concept2Creation visit www.concept2creation.com.au/