

ISSUE

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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 Department of Defence.

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 was expected to be released mid-year but with recent portfolio changes this has been further delayed.

Initiatives such as the Teacher in Residence program with Flinders University and the University of South Australia (Mawson Lakes) will continue to be supported.

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



ADVANCED TECHNOLOGY PROJECT

ENGINEERS IN THE CLASSROOM

Lockheed Martin is a global security and aerospace company that employs about 112,000 people worldwide and is engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

The company is passionate about STEM outreach and provides an Engineers in the Classroom program to selected schools. Lockheed Martin has been working with Golden Grove High School for the past two years with Jarrod Hart and other engineers conducting sessions on engineering for Year 9 science classes. The principle of this school-based initiative is a one-on-one connection between Lockheed Martin engineers and students and teachers.

The sessions involve information about engineering as a career and how Jarrod and the other engineers actually became engineers. Students also learn about famous engineers and different household items that have been engineered by Australians, including the Hills Hoist and the Sydney Harbour Bridge.

Students get to experience what it means to be an engineer by working in small teams on an aerospace engineering task. One task is to construct a 20cm high support out of newspaper to hold a cork board. To meet the requirements, students have to develop a model that can hold the cork board for the cheapest cost.

To test their models, weights are added to the students' design to see how much weight it holds. The students then have the opportunity to make

any design changes before completing a report analysing their designs.

"It was fun and challenging to think of a structure that would be cost effective to hold a particular weight," said one student, Tyler.

This initiative is designed to identify, develop, inspire and channel students into careers that draw their foundation from science, technology, engineering and mathematics courses.

"This program provides an opportunity for Lockheed Martin engineers to engage with students in the local community and demonstrate the importance of science, engineering and mathematics within industry," said Jarrod Hart, from Lockheed Martin.

"Our engineers get to see first-hand how young minds can work together as a group to solve problems. Being an ambassador of their profession, passing on their knowledge and experience obtained throughout their career is a rewarding exercise that continues to join different generations together through STEM."

Lockheed Martin engineers have also worked with Salisbury East and Valley View High Schools.

A big thank you from the Advanced Technology Project to Lockheed Martin and all the engineers involved for supporting our schools with this fantastic program: Jarrod Hart, Steve Roehrs, Victoria Smith, Thomas Schneider, Thomas Davis, Simon Inverarity, James Hogarth and Michael Niedbala.

HENLEY HIGH TEACHER REWARDED FOR EXCELLENCE

Simon Brooks, an Advanced Technology Project teacher at Henley High School has been rewarded at the prestigious 2015 South Australian Science Excellence Awards held in the newly opened Panorama Ballroom at the Adelaide Convention Centre on 13 August 2015.

Simon was the winner of the Early Career STEM Educator of the Year – School Teaching award.

“STEM education is an extremely important part of developing students’ critical thinking skills,” said Simon. “The problem-based learning environments allow students to problem solve and create innovative solutions to a range of activities.”

Simon is known and now formally recognised as an innovative teacher who inspires students to study science, technology, engineering and mathematics (STEM) subjects. He has set a fantastic example in his achievement as an early career STEM teacher and for his contribution to the Advanced Technology Project.

As a STEM educator, Simon is inspired by seeing students developing creative projects that no other students have imagined before.

Now in its eleventh year, the SA Science Excellence Awards showcase the critical importance of science and research to the development of industry and our society. The awards acknowledge the achievements of talented individuals, including recent PhD graduates and early career science, technology, engineering and mathematics (STEM)



Simon Brooks with Tony Harrison, DECD Chief Executive

professionals and teachers, who make an outstanding contribution to society both nationally and internationally.

The Science Excellence Awards are the most prestigious of their kind in the state and complement the national Prime Minister’s Prize’s for Science. They showcase the critical importance of science and research to the development of industry and society as a whole.

The Early Career STEM Educator of the Year award recognises individuals from the schooling sector who are making an outstanding contribution to education and inspiring students to further study in the STEM disciplines.

STUDENTS BUILD AND RACE ELECTRIC DRAGSTER



Mr Toni Nash with students from the Western Region.

During two half-day STEM workshops for Year 9/10 students from Seaton High School and other Western suburbs high schools, students were given the exciting task of making an electric dragster to race on an eight metre track.

Students recorded their race times and the dragster weight and then had the opportunity to build an electrical system and test it on the track.

This term, the program was run by Seaton High Learning Technologies teacher and assistant principal, Toni Nash. “Students were able to calculate information such as terminal speed, torque generated by the motors and acceleration from the results of their testing, he said. “The fastest dragster clocked a speed of 2.35m per second!” he said.

The workshop was attended by some 30 students and teachers who were highly engaged in the challenges and had a lot of fun testing their creations on the race track.

INNOVATION CHALLENGE



Valley View Secondary School students were pipped at the post at the recent Innovation Challenge, run by the UniSA Connect program.

The Innovation Challenge Portfolio is designed to increase STEM engagement in schools and increase awareness of STEM activities in the wider community.

It’s an invitation-only event for schools with an impressive prize of an all-expenses-paid one-week trip to Washington DC in the United States of America for the winning team of six students and their teacher. The trip will include visits to local landmarks including the Smithsonian Institution, the world’s largest museum and research complex.

There were four challenges for participating students:

- Science Challenge: Design, manufacture and test a vehicle that can collect multiple water samples from a wetlands water environment for water quality testing
- Technology Challenge: Design, construct and program an Arduino vehicle to follow set instructions accurately using equipment supplied and 3D printing technology
- Engineering Challenge: Design and construct a delivery device to be attached to a remote- controlled drone, in order to deliver items to various warehouses
- Mathematics Challenge: Create and mathematically justify a suburban housing estate design, balancing population with environmental aspects.

On judging day students also had to complete an ‘unseen’ challenge that incorporated science, technology, engineering and mathematics.

The winners were students from Roma Mitchell Secondary College. Valley View Secondary School – the ATP lead school from the northern region – came a very close second.

2015 SOUTHERN SCIENCE EXPO



In August, 26 groups of students from eight southern secondary schools, including Aberfoyle Park, Unley High, Reynella East College, Seaview, Blackwood, Hamilton Secondary College, and the Australian Science and Maths School participated in this year's annual Science Expo.

The expo was held again this year at the outstanding TAFESA campus at Tonsley.

Students worked in teams on projects that involved the design, construction and testing of a wide variety of contemporary engineering solutions. Students also presented to almost 400 primary school students.

Projects included:

- Year 8: a wind turbine design and testing. Based on findings from preliminary investigations using STELR, students went on to design and manufacture wind turbine blades using Autodesk Inventor and MiniUp 3D printers.

- Year 9: energy efficient house design, construction and testing using thermal imaging and temperature probes
- Year 10: forces and collisions. Collection of data using Vernier accelerometers and analysis of high-speed video – 240 fps!
- A Rube Goldberg machine: a device that is deliberately over-engineered to perform a simple task in a complicated fashion, usually including a chain reaction
- Coding and iPad App design using Pythonista.

Primary school students had the opportunity to see and try the projects and were involved in judging the projects for the People's Choice Award. The winner of this award was Unley High School with their Rube Goldberg Machine.

The Innovation Award was judged by an 'expert' panel, comprising representatives from industry, tertiary institutions and DECD. The winner of this award was also Unley High School with their Rube Goldberg Machine.

BLACKWOOD HIGH SCHOOL SHOWS STEM LEARNING TO LOCAL PRIMARY KIDS

Throughout Term 2 this year, Blackwood High School has hosted an enthusiastic group of students from surrounding primary schools including Blackwood, Hawthorndene, Belair, Bellevue Heights and Coromandel Valley.

For the third year running, Blackwood High School has coordinated the STEM Primary School program put together by Thomas Oliphant, Coordinator: Innovation in Technology and Rogan Tinsley, Coordinator: Innovation in Science.

Each year these younger students are engaged through a STEM program that exposes them to sustainable and alternate energy systems and product prototyping through the use of 3D printing and advanced technologies.

At the end of the program a STEM primary school showcase is held. This is a huge success with students presenting their innovative projects to a large group of parents, teachers, principals and guests from a range of industries.

This year, feedback from both parents and students was outstanding. "The program inspired creativity in the participants. It was very well organised, enjoyable and well explained. The students showed a high level of intelligence and innovation in their projects and presentations," said one parent of a primary school child.

"I think it's a great idea to have local primary schools involved in activities like this. It was good to see the kids enthusiastic about what they had been



Primary schools students enjoying the Blackwood STEM experience

doing. Well done!" said Julie McClements, CSIRO Scientists in Schools program.

One student commented that they learned about energy and the different types of energy, how to design an object and print it out on the 3D printer, how to use a laser cutter safely, and how to work together and design something as a constructive team. "I really enjoyed the project stage and being given the freedom to express ourselves and do what we want," said another student.

The program is so successful it has become an annual event in the Blackwood High School calendar.

3D PRINTING AT THE ROYAL ADELAIDE SHOW

For the second year running, the 3D Printing Competition was held this year at Adelaide Royal Show.

Held for the first time last year, in 2015 the number of schools involved increased and entries doubled.

The Advanced Technology Project, in collaboration with the Royal Adelaide Show, run the competition which includes all secondary schools in South

Australia, not just ATP and/or government schools.

Due to the growing interest of the competition a 'Functional' category was included this year along with Sculpture and Mechanical Moving Object for both junior and senior groups.

The standard of entries was excellent and items entered included a lock and key, vase, train and even a motor that worked.

Winners

Sculpture

Years 8 & 9

1st Prize – Kaitlyn Gale

Reynella East College

2nd Prize – Emma Gawronski

Blackwood High School

3rd Prize – Jackson Millington

Blackwood High School

Sculpture

Years 10, 11 & 12

1st Prize – Lynn Tran

Roma Mitchell Secondary College

2nd Prize – Aaron Markham

Heathfield High School

3rd Prize – Zaynab Al Hakeem

Roma Mitchell Secondary College

Functional Object

Years 8 & 9

1st Prize – Ella Uhl

Reynella East College

2nd Prize – Jonathon Allan

Reynella East College

3rd Prize – Cameron O'Connell

Blackwood High School



'Lighthouse' by Aaron Markham, Heathfield High School - 2nd place Sculpture, Yrs 10, 11, 12

Mechanical Moving Object

Years 8 & 9

1st Prize – Tom Lowe

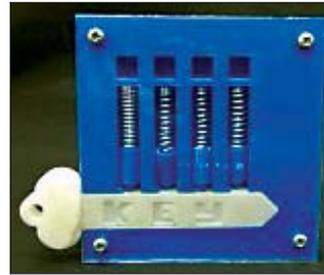
Seaview High School

2nd Prize – Will Tuck

Seaview High School

3rd Prize – Willem Thompson

Seaview High School



'Lock and Key' by Tom Lowe, Seaview High School - 1st place Mechanical moving object, Yrs 8 and 9.

Mechanical Moving Object

Years 10, 11 & 12

1st Prize – Silvio Iuliano

Norwood Morialta High School

2nd Prize – Hitarthi Pandya

Roma Mitchell Secondary College

A number of certificates of merit were also awarded this year.

Function Object

Years 10, 11 & 12

1st Prize – Connor Menz

Heathfield High School

2nd Prize – Maryam Entazami

Roma Mitchell Secondary College

3rd Prize – Martin Weber

Heathfield High School

ABERFOYLE PARK HIGH SCHOOL STUDENTS WIN AT THE 2015 SINGAPORE INTERNATIONAL SCIENCE CHALLENGE

Year 11 Aberfoyle Park High School students, Brandon Smart, Mansa Sukheja and Liliya Naydonova were awarded first place for Physics and for best overall Scientific Poster at the Singapore International Science Challenge in July 2015.

Individually they also won medals for Creative Communication, and Design and Build Challenges. The students returned with a total of 10 medals between them.

Australia's theme for National Science Week 2015 is Making Waves, the Science of Light, (based on the International Year of Light).

Working with the theme of light, Brandon, Mansa and Liliya worked closely with physics teacher, Donna Riordan to investigate the images formed from differently shaped pupils. They used a laser cutter to precisely remove a specific area for each shape which was then used as the aperture for a pin-hole camera – a modified 35mm SLR camera.

They also sought advice from Professor Rod Watkins at Flinders Vision (Flinders University), who gave them a tour of the facilities and the opportunity to examine each other's retinas using a fundus camera.

The initial spark for their research was the examination and comparison of the different shaped pupils in animal eyes.

As part of the 2015 Singapore International Science Challenge, these young people competed in three challenges, and were awarded:

- Distinction for the Creative Commons Challenge
- Best Creation for the Creative Communications Challenge
- Best Presentation for the Creative Communications Challenge
- 1st Runner Up for the Build and Design Challenge.



Brandon Smart, Liliya Naydonova and Mansa Sukheja from Aberfoyle Park High School.

DEFENCE PROGRAM ENGAGES MORE STUDENTS IN STEM

The Defence Industry Pathways program (DIPP) has a focus on advanced manufacturing and design and developing high-level employability skills for young people seeking to enter the defence industries.



Brandon McKelliff and Simon Lieu from Fremont Elizabeth with their finished models.

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

Students are selected based on their 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.

One day per week, students attend TAFESA in the Advanced Manufacturing Centre at Regency Park. On completion of this technology program they receive 10 Stage 1 credits towards their SACE. Students have been designing solutions to a maritime brief, which has included a Collins-class submarine and Hobart-class destroyer.

The solutions are modelled in a Computer Aided Design (CAD) industry standard package, tested and then 3D printed using a full colour powder printer. Each student takes home printed solutions to their CAD modelling designs. They also complete investigative and design written tasks to comply with their SACE requirements.

DIPP8 is the fifth program with this focus and commenced in July 2015 with 13 students from eight schools including Seaton High, Pasadena High and for the first time, Murraylands Christian College. 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.

Freemont success

Right from the start of the DIPP program, Fremont Elizabeth City High School has had students involved. The first trio of students to successfully complete the program are now in their final year of school and are on a university pathway. They have chosen SACE Stage 2 subjects such as maths studies, chemistry and physics with a goal of starting an engineering degree at university. ATP has helped these students to attend this program by providing funding for travel.

Simon Lieu and Brandon McKelliff graduated from their DIPP7 advanced manufacturing course in July 2015. They had to reverse engineer, design and 3D print a 'Collins Class' Submarine and an Air Warfare Destroyer. "These students excelled in the program, going far above and beyond the requirements" said Anthony Tonkin, TAFESA lecturer.

Anthony commented that these two students were the top of the class in terms of how they had extensively and accurately remodelled the basic design, adding such fine detail to the models.

"Brandon, normally a reserved student, was one of two students who addressed the graduation ceremony, which included important stakeholders from the Department for Education and Child Development, TAFE, ASC and students' families.

As a result of the program, Simon now wants to become a naval architect, and he has definitely developed a name for himself among these important stakeholders. Both of these students have bright futures ahead of them," said Anthony.

Last month, Harry Dunstall, formerly the CE of the Defence Materiel Organisation and now a General Manager within the Capability Acquisition and Sustainment Group (CASG) and Corrina Tierney on behalf of Industry Skilling & Pathways Programme team were presented with 3D printed models of an Air Warfare Destroyer and Submarine.

These models were printed from the designs produced by Simon (AWD) and Brandon (submarine) and in fact were so well received that they will now have pride of place in the display cabinets in the foyer to the CASG executive area in Canberra.

Harry said that both the students and the models are "amazing".

FREMONT-ELIZABETH CITY HIGH SCHOOL CHARGES AHEAD ON STEM

In 2014, Fremont-Elizabeth City High School trialed a standalone Year 8 STEM class. Both students and teachers found the trial class to be so successful that the program has now been extended to run across Years 8, 9 and 10, with 48 students involved in 2015.

Choosing to study a STEM subject is not automatic for any student. Louise Minney, STEM, Science and Humanities teacher from the school explained that at the start of the year, students submit a written application outlining why they are interested in STEM. "Students are selected not just on academic ability, but on passion, interest and career aspirations," she said. "These classes operate when students would normally be studying science, therefore the Australian Curriculum Science content is woven into broader project-based learning units that incorporate the additional elements of technology, engineering and mathematics. These projects come from various ATP-supported programs, the most significant being Concept2Creation."



Earlier this year, 20 high-achieving Year 10 students from Fremont-Elizabeth chose to enter the UniSA Innovations Portfolio Challenge (see page 2). They competed against seven other schools but in the end, despite their admirable performance in the last secret challenge, the students came a very close third.

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In May, Year 8 STEM students participated in the Engineers without Borders (UniSA Connect) program.

At the Mawson Lakes campus the students were given a guided tour and then looked at water filtration as a challenge. Louise Minney explained that “Groups of students were assigned a country (New Zealand, Cambodia, Ethiopia and India) and had a budget to buy materials such as containers, funnels, sand, gravel and cheesecloth,” she said. “Students built and tested a water filtration device and compared the effectiveness of each country’s device. Some very ingenious designs and very entrepreneurial students surfaced during this challenge.”

Students also had a go at geospatial science. “First they were taught how to use a GPS and were sent out in teams to find ‘geocaches’ hidden in the university grounds,” explained Ms Minney. Students swapped a trinket they were given for another trinket found in the geocache boxes. They also watched a short video showing how a group of geospatial scientists worked with a slum community in Nairobi to map their home. The resulting map helped the government to place extra resources such as police stations and schools in critical locations.

TEACHER IN RESIDENCE PROGRAM EXPANDS

The Teacher in Residence program, which started with Flinders University in 2014, has now expanded to include the University of South Australia.



Nathan with Deb Turley, Manager of UniSA Connect, University of South Australia.

College spent time with Sandy Walker, an Associate Professor in Product Design, at Flinders University.

Lisa had the opportunity to attend a workshop at Flinders@Tonsley, where secondary students were invited to participate in a design challenge.

“By meeting with lecturers, tutors and marketers at Tonsley, I have not only built professional working relationships but also links to industry, training and research in a business and tertiary setting – essential for 21st Century pedagogy,” said Lisa.

Above all else, the Teacher in Residence program has given me release time in order to gain a wider perspective and a greater focus on real opportunities for students in terms of study, training and research. I realise the importance of creating employment through innovation and entrepreneurial endeavours that also meet the needs of the community and bolster the economy – ethically and sustainably.”

On the other side of Adelaide, Nathan Holdinghausen, a teacher from Gleeson College was attending the same program at the Mawson Lakes campus of the University of South Australia.

Nathan had the opportunity to learn more about Hairy Mushroom Engineering (HME), which was founded in late 2014 to help address the shortage of engineering and electronics kits available for secondary schools. HME is

Student comments showed their appreciation of the day:

“I got a 3D printed whistle”

“I learnt how to use a GPS”

“How many people in the world live with unfiltered water?” (This was promptly answered by another student – “2.8 billion.”

Probably the most significant comments were about the university itself:

“Can we go again?”

“It was a huge day for me. I have never been to university in my entire life.”

“I want to go to uni now!”

“How can we get into university?”

Thanks must go to Nat and Celina from UniSA who organised each of the sessions, our patient tour guide who coped with the boundless energy and enthusiasm of the students, and Ana Marques-Britto (lab technician) who helped supervise the excursion.

operated by members of the Uni SA engineering faculty whose aim is to bolster students’ interest by changing the products created and practicals conducted in STEM subjects. The activities and services they provide cater to all skill levels, and options are available for complete customisation.

Nathan was also able to talk to university staff about some of the issues teachers face regarding the abilities of students entering a tertiary environment. Topics discussed included dropping specialist maths as a pre-requisite in order to raise student numbers and the lack of professionalism in some students’ communication (particularly when using email). Report writing was also acknowledged as one of the biggest areas needing improvement.

Nathan also attended a 3D printing workshop and a practical workshop, both of which are part of Science for Tertiary Learning program.

“The Teacher in Residence program has provided me with some fantastic insight into the opportunities available to students at UniSA, be it via their Connect programs or through full-time study. It is my hope that regular interaction between UniSA and the One+ campus will provide our students with access to more advanced resources that may further their passion for STEM subjects,” he said.



Lisa with Dr Nasser Asgari, Director of Studies (Electrical and Electronic Engineering), Flinders University

Both teachers commented that the university staff were extremely accommodating, making time and space for them to complete their activities.

The Advanced Technology Project would like to acknowledge and thank staff at both Flinders University and the University of South Australia for their support and contribution to this initiative.