Health of Australian Science and Space to Grow

The recent Health of Australian Science Report* by Chief Scientist Professor Ian Chubb, looks at secondary school enrolments, research funding, trends, teaching, the workforce, international collaboration, research and higher education (some excerpts are on the back page). Professor Michael Holland, President of Science and Technology Australia (STA) commented: ‘The comprehensive report provides the evidence needed to drive policy decisions that can shape Australia’s science system strategically so as to meet the nation’s future economic and social needs. Decision makers, including politicians, education providers, the science sector and industry leaders now have information they need to make strategic decisions about how they each contribute to a strong science system.’


Space to Grow’s Professional Learning model fits ideally with the report findings on what is needed to effect positive change. The project provides the training and resources for teachers to update and reinforce their classroom teaching techniques, as well as exposing them to strategies such as ‘backward faded scaffolding’, jigsawing activities and demonstrations. Participating teachers ‘learn as a student and think as a teacher’, which expands and improves their teaching methods, develops software and IT skills and provides the content knowledge necessary to feel confident and eager to transport the learning directly into the classroom. These approaches have proven to be a successful model for both teachers and students in generating further enthusiasm and engagement in the classroom through the resource materials, experiments and activities.

Students discover an increase in relevance to the ‘real science’ projects, which stimulates deeper thinking and greater interactive class discussions. They can also collaborate with other project groups, even internationally, on authentic scientific study and their student-led research can be published in peer-refereed journals such as the Publications of the Astronomical Society of Australia. This increased engagement should also be reflected in better learning outcomes, as previously demonstrated in our education research studies (see page 3). Students can then view the world with potential changes to wider subject choices and increased higher educational options.

Educational Research also benefits from the data analysis which underpins the project. Dr. Lena Danaia, Space to Grow’s Research Fellow, recently had an article outlining the project accepted into Astronomy Education Review, which can be downloaded from: http://aer.aas.org/resource/1/aerscz/v11/i1/p010106_s1
Meet the Space to Grow Team

Dr John Hedberg is Millennium Professor of ICT and Education, and Head of the School of Education in the Faculty of Human Sciences at Macquarie University. His previous posts include Professor of Learning Sciences and Technologies at Singapore’s Nanyang Technological University as well as Associate Dean of Education and Director of the emlab (educational media laboratory) at the University of Wollongong. John has been an invited keynote speaker at conferences nationally and internationally on educational technologies and was the second person to be honoured as a pioneer in educational technology outside of North America in the Educational Media and Technology Yearbook. With his background in ICT use in learning, and designer of open and distance learning programs, he is a valuable addition to the Space to Grow team.

More recently John’s projects have involved virtual world exploration and conducting workshops on the evaluation of these e-learning environments, such as how students design serious learning games. His research on ICT in learning diversely includes the use of a mobile phone as a social software tool for orienteering tasks in geography, designing learning objects for small screen display, using cognitive tools to develop a mathematics problem-solving repertoire, internet literacy and the production of multi-modal artefacts (particularly in History and Science).

John has developed and delivered his own video, television, radio and audio programs for professional education. Over forty media and computer-based teaching products were under his instructional design, including multi-award winning CD-ROM products and interactive multimedia, such as Ask the workers…. He further developed several on-line postgraduate subjects to teach the design of computer-based learning environments using IT. Other post-graduate teaching encompassed strategic planning for technology implementation in schools, cognitive strategies, interface design for learning and the implementation and evaluation of technology-based learning.

Having also written and edited on the policy aspects of new technologies in education, adult learning and interactive media, he currently serves on the Editorial Advisory Boards of the Journal of Interactive Learning Research, ALT-J (UK) and Distance Education.

Happenings in partner schools

★ Lauren Inwood from Denison College, Bathurst High Campus has entered in the Australian Museum’s Sleek Geeks Science Eureka Prize competition for star cluster research – read more in our next edition.

★ MacKillop College Year 11 Physics class recently participated in Space2Grow where the girls had the opportunity to operate the remotely-controlled Faulkes telescope and take 4 photos of objects on space. The students received 3 black and white photos from different coloured filters of each object and then learnt how to merge them together to produce a colour photo. This class took a photo of 2 different Spiral Galaxies, an Open Star Cluster and a Globular Star Cluster below - Contents reproduced with permission

Images L-R: NGC 5194 and NGC 5195 (M51, Whirlpool galaxy), NGC4254 (M99), NGC4755 (Jewel Box cluster), NGC6093 (M80).

★ Sandra Woodward from Oakhill College has been nominated for the 2012 Australian Institute for Teaching and School Leadership (AITSL) Awards for Secondary Teachers.

★ Entries close 31 July 2012 for the National Excellence In Teaching Awards (NEiTA) for honouring exemplary teachers in Australian schools and early childhood centres – see http://www.neita.com/
The role of teachers and students in our educational research

Your input is vital to the educational research underpinning Space to Grow which investigates the impact of the project on both students and teachers. To allow us to make improvements, and study the impact of our materials and approaches adopted, we need information and feedback from both students and teachers, plus we also need responses from students and teachers who do not use the project materials to use as a ‘baseline’ comparison.

We get this information through the two questionnaires that we ask students and teachers to complete - the Astronomy Knowledge Questionnaire (AKQ) and the Secondary School Science Questionnaire (SSSQ). The AKQ helps us identify how much the students actually learn as a consequence of undertaking the projects. The SSSQ provides us with information on how students perceive their experiences in science both before, and during, their involvement in the project. We also ask that you, the teachers, complete separate versions of these questionnaires as they contain questions on the professional learning approaches used feedback on your perceptions and experiences during the project.

The success of conducting this research depends very much on students and teachers completing both the pre and post questionnaires. Completing them is critical as it allows us to compare the data and determine whether or not the educational materials impact upon students’ knowledge outcomes and their perceptions of science. We can then provide summaries of your students’ responses in a report format for use as an assessment or other professional purposes.

To date, the preliminary findings indicate that the educational projects and approaches adopted within Space to Grow appear to be having significant positive impacts on students’ learning. There have also been significant differences in students’ perceptions of the science they experience during the project compared with what they had been doing before. The graph represents a random sample of student mean scale scores for the pre/post occasion AKQ. The red line shows the highly significant increase in students’ mean score for the items that map directly to the content of Space to Grow projects. The blue line shows there has been no change in the students’ mean scale score for those items not covered by the projects. This difference helps us attribute the change to your efforts to engage students in the science targeted by Space to Grow materials - well done! Read and see more preliminary findings in Space to Grow: LCOGT.net and improving science engagement in schools recently-published article in the Astronomy Education Review’ at http://dx.doi.org/10.3847/AER2012007

Where do you access and complete the teacher and student questionnaires?

Questionnaires can be completed online directly from the data collection section http://physics.mq.edu.au/astronomy/space2grow/questionnaires/ of our Space to Grow website. If your school experiences problems with Internet connections, you can also print them from the same website link and return the completed questionnaires to our Project Manager who will arrange for them to be processed.

When should you complete the questionnaires?

You will be directed to complete the pre-questionnaires in Project 1. You also need to complete the post-questionnaires available from the same link as above, regardless of the stage at which you exit the Space to Grow materials. If there are other classes in your school who are undertaking the same content but are not using the Space to Grow materials, you should also direct them to complete the questionnaires. We can then supply feedback to any teacher whose class has completed them.
Excerpts from the Health of Australian Science report*

Surveys commissioned for the report in secondary school students and commencing university students both nominated teachers as the most influential factor in determining a student’s interest in and attitudes toward science. The most interesting and stimulating styles of teaching and learning were student-led research, practical activities and study of real-world examples within the student’s sphere of experience.

Time and resource constraints, confidence and training limited much of secondary school teaching to a more didactic approach. It is necessary to better interact with students at school in order to maintain existing science students’ interest and attract new students to science, improve science literacy and increase supply to university science courses. Science-related study prepares a student for a lifetime of critical thinking and promotes a drive to find evidence and develop an understanding of how our society fits into the broader picture of the world. These help prepare students for employment both in the research sector and in the broader economy and are invaluable for the development of a prosperous Australia. Scientific thinking promotes innovative inquiry, central to the creation of new and more efficient industries and business models that will lead Australia to success in building an innovative economy.


Feature Teacher - Ross Cutts invites discussion

Ross Cutts, Physics teacher and IT Manager at McCarthy College at Emu Plains, has always been keen on Astronomy as a subject that can generate interest in the wider sciences. With over 20 years’ experience, including Physics teaching stints at University of Western Sydney and the Australian Catholic University, he is well known in the science teaching arena. As well as being an avid pushbike-rider around the local Blue Mountains area, Ross instigates and maintains blogs and Mc Moodle sites, while looking out for new and unusual ways to inspire students. Not one to miss an opportunity, his enthusiastically organised the uplift and relocation of a decommissioned radio telescope from Narrabri in north western New South Wales to St. Columba’s College at Springwood in the Blue Mountains.

Together with four other teachers armed with angle grinders, Ross spent a busy few days dismantling and hauling it aboard military-strength transport. Rust treatment, reassembly and crane-lifting of the telescope dish followed - students can now monitor and record solar activity as conditions allow. Eager to reacquaint with Space to Grow, Ross recently completed training and was impressed with the portability of project’s teaching resources into the classroom with aspects of interest to both the creative and thinking students. He opines that the overall contents dovetail very well into the topics of Space, the Cosmic Engine and Astrophysics option. A big bonus is that students are have the opportunity to ‘image’ their chosen targets on the Faulkes Telescopes - a feature out of the normal realm of high school science experience. This is also one way students can take ownership of their learning and promote further discussion.

McCarthy College’s Year 11 Physics class is already curious and excited about Space to Grow and will be using it to familiarise themselves with the Astrophysics concepts in preparation for their Year 12 work. Ross also has plans for the school’s Gifted and Talented group to have ongoing Space to Grow content. Teachers won’t miss out on discussing Space to Grow either, as Ross is already generating interest outside the CEO Parramatta group. For the conversations to be teacher-driven and controlled, he invites other teachers to share their thoughts and experiences when he sets up the blog. Watch out for further details on our website of where you can follow and contribute to the online chat.

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