



ARC Linkage SPACE TO GROW Project Newsletter Edition 14 – December 2012

Sandra Woodward – NSW’s representative in the Australian Secondary Teacher of the Year



Space to Grow’s first ‘Feature Teacher’, Sandra Woodward from Oakhill College in Castle Hill, represented NSW in the AITSL Australian Secondary Teacher of the Year on December 6. She is ‘very humbled’ by her nomination, however she finds her passionate love of teaching is naturally infectious, particularly when news of their science activities and results are transmitted by the students to fellow students and staff. Always open to new ideas and innovative teaching approaches, *Space to Grow* has benefitted from Sandra’s enthusiasm, with several teachers becoming involved through her support, despite their minimal astronomical knowledge prior.

Using *Space to Grow* helped two of her Year 11 Physics students with investigating NGC6101 and having their findings accepted into the Publications of the Astronomical Society of Australia (see Edition 11). Sandra is particularly proud of their research efforts and also an author herself on *Using Smartphone Camera Technology to Explore Stellar Parallax: Method, Results and Reactions* ([Astronomy Education Review V10, I1](#)).

“ ... good communication skills and responding to students’ enthusiasm on their wavelength, which makes science fun and interesting.”

Sandra has been instrumental in organising Oakhill College’s Science Fair over the last 3 years, combining demonstrations by special guests and research project displays, some of which are interactive, by Years 8, 9 and 10 students. They carry out their investigation and then communicate their research in a method of their own choosing. These projects are being trialled as being part of the assessment mark, so students have also become more involved in the scientific and demonstration process. As well as instigating and running a science club and astronomy classes, other methods that Sandra has used to engage science and physics students has been class competitions, special visitors to school, excursions, encouraging students to note topical science news, a ‘hands-on’ science discovery emphasis rather than text-book lessons where possible, and advertising these activities and results for wider school and public viewing.

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Macquarie University AAstro research group is ‘world-class’



The Macquarie University AAstro research group, of which *Space to Grow* is a key component, has been awarded the highest world-class ranking of 5 in the 2012 ‘Excellence in Research for Australia’ report. Macquarie University AAstro is the only 5-rated astronomy research group in Sydney, placing it alongside the Australian National University, University of Adelaide, University of Queensland, Swinburne University and the University of Western Australia in ranking.

Image: Prof. Jim Piper, Vice-Chancellor (Research), giving his address at the official launch of the Macquarie University AAstro Research Centre, 2011



Tricks or Treats? ... student engagement ideas

While there is no 'one' solution that will work for all students all of the time, our Feature Teachers share their thoughts on how they see students engage (and disengage) in science and Space to Grow. Their comments show the passion of teachers to teach and learn is a crucial element.

Quote: 'Science is really refined questioning. Hollywood's Special effects animation have taken so much liberty in generating computer graphics for science fiction, that the foundations of science and maths can now be visually exciting. *Hunting the Hidden Dimension* is great for numeracy and geometry - students discover the geometry in nature, and then go back and discuss it. "Be careful not to lose them in the math" by being selective in how it is presented to foster curiosity and a sense of achievement.'



Engaging practices:

- Allow them to do their own investigations
- Relate the content to students lives – make it real and relevant to them personally
- Walk the room and ask individual students to give their response keeps them on track
- Hands-on experiments and practical work allows them to discover things for themselves
- Captivate, amaze and give them manageable bits of work so they can figure out what it all means
- Keep them enthused – change delivery if you see students 'drifting' through tone or body language
- Put things into a real context and why it is important, rather than 'learn this' to tick a topic or test box
- They like using the software, to manipulate the data to obtain a result themselves (in *Space to Grow*)
- Try to ensure that there is something available for all levels, so each one has a sense of achievement
- I let them know that I don't know it all – we are learning together and they are enjoying lessons more
- Set up a relationship first, then they trust you to know they will have fun, even if there are boring bits
- Special visitors help to inspire them, and they can develop their own connection with the topic rather than always thinking entirely within the boundaries of the classroom
- Storyboarding in groups so they know what they are trying to work out. Team them up in order to play on the individuals' combined strengths overall, whether that is artistic, literacy or numeracy skills
- Competitions – individual and groups, so you are encouraging what they know, not what they don't (and it sometimes helps if there's a chocolate treat or two in the mix!)
- It's hard to 'read' students – it's only when our work becomes a topic of general discussion I know they're really interested. Exploration of the topic through questions is good, even if that sets my timetable back, as it helps keep up their enthusiasm and the time can be eked out somewhere else



Images: Upper top right - Lauren Inwood presenting to Xavier College students on real science investigations of NGC2215. Publication of a paper on her research results is imminent.

Above L-R Oakhill College Halloween science "Ghostly flames", pumpkin head bucket oozing 'brains' of dry ice, water and detergent, glow sticks in different water temperatures to show varying reaction rates, students 'in the spirit' of Halloween science. Images courtesy of Fiona Shand)

Disengaging students:

- Reading - text books/material/traditional worksheets
- Pre-determined concepts that science is difficult - they don't want to set themselves up for failure
- Mathematical comparisons in observing the functions of numbers is a hard topic for students to grasp
- A turning point away from enthusiasm seems to be in Years 9 and 10 (Year 7 they are particularly keen, less so in Year 8). If they can stay enthused in 9 and 10, they may come back in Years 11 and 12, depending on their skillset... I'm not sure if this may apply across all subjects and not just science.

Feature Teacher – Andrew’s dark skies



Andrew McKay took the long way round from Canada to the ‘great little town and community’ of Bourke in far western NSW. He feels privileged that teaching has allowed him to experience life in different cultures - China, Japan, Thailand and South Korea - and also meet his future Australian wife. A teacher for 20 years, trained in Mathematics, Physics, Chemistry and 7-12 English and currently studying his Masters in Mathematics, he does not view Bourke as being isolated. With its technological connectivity, it seems less isolated than being among 10

English-speaking people in his South Korean school at the time in a city of 2 million people, that had very little connectivity to the outside world.

Andrew wanted to bring science home in a way that would really have an impact on his students. His experience with asking his students in Canada to keep track of the Space Shuttle and Space Station movements via binoculars and telescope, particularly when ‘docking’, reinforced his theory on engagement. He ponders how they could not be amazed when they look through the telescope at our moon’s craters and ‘not start a lifelong love affair with one of the easiest sciences of all’ in Bourke’s dark night skies, and intends to have night-viewings regularly twice a month. He was interested to learn that the ‘dark spaces’ *in* the skies are well known in Aboriginal Astronomy, so he intends to incorporate some of the local community’s knowledge into his school lessons next year.

The school telescope isn’t limited to night viewing – further interest has been generated by setting up the telescope with a filter at lunchtime to watch the solar activity of late, which has seen growing interest – see our related ‘Solar Eclipse’ article on the back page.

Training sessions – linked DECW/CEO Bathurst and ‘Reconnection’ CED Parramatta

Two linked training sessions were held between Bathurst and Dubbo for the DEC Western and CEO Bathurst regions on Star Cluster Photometry (SCP), including experiments on simulating stellar dust and the Inverse Square law. CED Parramatta’s ‘Reconnection’ for 2011-12 participants at the Aengus Kavanagh Centre (AKC) went deeper into the Physics of the metallicity in stars, and how this is represented through spectrographs, plus ‘manual’ computing of the light values in the SCP spread sheet.



Images L-R, Top row: Bathurst High School participants, Bathurst High School showing Dubbo linked in (screen on left), milk/dust experiment, Bottom row Left, centre: some of the participants in Dubbo, right: Stars and the light spectrum explained by Michael, AKC. Images courtesy of L Danaia, A Marceau, C Dow

Sandra Woodward – NSW’s representative at AITSL

From front page

Sandra advises that a big factor in successfully engaging students is using good communication skills and responding to students’ enthusiasm on their wavelength, such as incorporating Hallowe’en themes, which students embraced with gusto. Sandra acknowledges her mentor, Dr. Anne Ridley at her first teaching post in Loreto Kirribilli, as showing her how science could be presented in similar interesting and enthusing ways for teachers, and therefore, students.

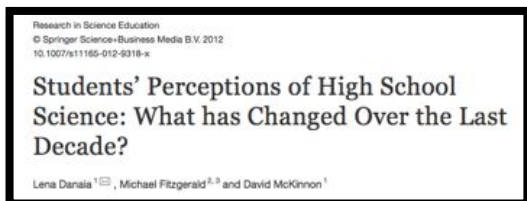
Her Year 11/12 students are completing the *Space to Grow* projects to cover astrophysics this year, 4 of whom are currently working on their own project and Year 8 students have requested images for printing as room posters. A side group of Year 8 students are creating a galaxy tuning fork and students are now building and classifying their requested images to work out what is missing. They will then request those missing types of galaxies with the final aim of compiling one document of images as the galaxy tuning fork.

Solar Eclipse, as viewed from Bourke



Andrew McKay, Acting Head Teacher of Science and Maths at Bourke High School, had been looking for ways to engage students in science, so he also took on the role of coordinator for the school’s astronomy club and upgraded the school telescope. He was pleased with their reaction to the Solar Eclipse on November 14: “The kids loved the eclipse - awestruck really. The eclipse glasses I bought for the school were a big hit. I actually tore a set apart and taped the filter onto the Ziess optical lens of my digital video camera and zoomed in to 60x and got this shot (centre). The other two were taken through the telescope with a 14.1 megapixel Kodak camera held to the 20mm eyepiece of our little 130mm telescope. (The one on the right was taken when it was partly cloudy, so it gave a nice effect).”

Physics and Astronomy – research, news



What do students really think of science? Research by *Space to Grow* team members Dr Lena Danaia, Michael Fitzgerald and A/Prof David McKinnon compares data from three different Secondary Schools Science Questionnaire surveys, including our project. Link onto [Students’ Perceptions of High School Science: What has Changed Over the Last Decade?](#)

The Australian Academy of Science announced [The Physics Decadal Plan 2012-2021: Building on Excellence in Physics](#) presents the Australian physics community’s strategic vision for the 10 years from 2012–2021. The Plan will ensure that the process of strategic investment in teaching and research in physics in Australia continues for the next 10 years, allowing Australia to build on present excellence, to remain a strong member of the world’s physics community and to enjoy the associated intellectual, economic and social rewards.



‘Chrome’ users can navigate their way around 100,000 stars in the Milky Way at <http://workshop.chromeexperiments.com/stars/> which allows you to click and zoom on our closest stars and read further information.

Edited by Carolyn Dow Project Officer T 9850 8675 F 9850 8674 Email: cdfaulkes@gmail.com Skype: [cdfaulkes](https://www.astronomy.mq.edu.au/space2grow)
<http://www.astronomy.mq.edu.au/space2grow>