

In2biotech Roadshow

North West Victoria

29 Nov – 2 December, 2011



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In2biotech Roadshow

Year 3

North West Victoria

29 November – 2 December 2011

In 2011 **In2science** in conjunction with **Get into Genes** ran a biotechnology-based outreach program (**In2biotech**) to engage students in science through interaction with Peer Mentors from the **In2science** program. The roadshow went to schools in NW Victoria. The **In2biotech** program is offered to government schools and is free of charge.

As regional schools do not have access to the **In2science** Peer Mentoring program on a weekly basis, a roadshow was deemed the best method of allowing students to interact with Peer Mentors as science role models. **Biotechnology and climate change** were selected as themes for this roadshow. Teachers often find it difficult to incorporate biotechnology into their classroom teaching, citing lack of equipment and expert knowledge as limiting factors. Students and teachers alike need to know about the ways in which biotechnology is being used to help Australia adapt to climate change, especially in light of the recent discussion relating to the carbon tax. Students in Year 9 and Year 10 were targeted for involvement as these are students making decisions about areas of future study at VCE and beyond, though a year 7 group was involved at one school due to years 9 and 10 not being available. The program was also aimed at teachers to introduce them to the topic and build their interest and confidence in this area of science.

Materials for the **In2biotech** workshop were developed utilising some activities and research examples that are presented as part of the **Get into Genes** program.

The North West region of Victoria is known for agriculture with fruit production including grapes for the a particularly prominent industry. This meant that many students were able to contribute their own experiences to the discussions during the session.

Trip summary

Eight schools were invited to participate in the incursion. Three schools accepted the invitation and were visited:

Chaffey Secondary College
Red Cliffs Secondary College
Irymple Secondary College

Three other schools were keen to participate but due to school exams and other events were not able to participate. These were Ouyen P12 College, Charlton Secondary College and Birchip Secondary College. The above schools were keen to be involved in the activity and were extremely grateful of the visits indicating these types of activity are rarely offered to the more remote and smaller schools. At each school there was a very warm welcome and support. School students seemed genuinely interested and exited about the activity.

Approximately 2.5 hours was spent at Chaffey SC and Irymple SC which included set up time, presentation, 1.5 hour workshop, plenary and pack up. Three sessions were conducted at Red Cliffs SC lasting the whole school day.

Comments were extremely positive from teachers, students and Peer Mentors about the **In2biotech** experience.

The feedback quoted in this report comes from **evaluation forms** completed at the end of the workshop, by students and teachers.

Trip leader: Emily Cook, Coordinator In2science, Swinburne University of Technology.

Attending students (Peer Mentors):

Shainie Jesurasan, Masters in Biotechnology/MBA (La Trobe University),

Joshua Wayman, Masters in Biotechnology/MBA (La Trobe University),

Samuel Hawthorne, Final Year Bachelor of Science (Monash University).

Itinerary:

date	AM (session time)	PM (session time)
Wed 30/11		Chaffey Secondary College (13:30-15:30)
Thurs 1/12	Red Cliffs Secondary College (8:50-3:30)	
Fri 2/12	Irymple Secondary College (8:40 – 11:00)	

(Approximately forty minutes spent setting up and packing up prior to and after each school workshop)

Activity Aims:

- To engage high school students from regional schools in a hands-on science/biotechnology workshop that supports school-based learning
- To allow students to interact with role model science Peer Mentors
- To raise students' aspirations in science particularly agriculture and biotechnology
- To promote links between the schools and the seven In2science universities
- To empower teachers with new curriculum areas, though interaction with university students and access to equipment not readily available in schools.

Predicted Outcomes for Schools:

- Teachers with a greater knowledge of biotechnology applications for climate change mitigation and ideas for teaching biotechnology in the classroom
- Students with a greater awareness of climate change and applications of biotechnology in agriculture
- Scientifically motivated and enthused students, and
- Teachers able to interact with young scientists and update their skills (especially valuable where non-specialists are teaching science).

Activity sequence

The program started with a 20 minute PowerPoint **presentation** to introduce the students to biotechnology and climate change. Workshop structure and safety considerations were outlined at the beginning of each session. This was followed by four **activity stations** each lasting approximately 20 minutes. Students wore lab coats, gloves and safety goggles for some workstations. The activity stations each introduced students to an aspect of biotechnology and its applications and was led by a peer mentor.

The stations were:

1. Biofuels



Here students made biodiesel using vegetable oil, methanol and potassium hydroxide as a catalyst. They considered how burning biodiesel can produce energy. Students then worked together to create a list of 'advantages' and 'disadvantages' of using biofuels. This activity generated much discussion and argument.

2. Dairy Cows



At this workstation students looked at the ways the quality of milk produced from dairy cows can be improved through selective breeding and analysis of bulls' phenotypic traits. Students looked at the role of variation in animal reproduction and inheritance and compared genotype and phenotype.

3. DNA – get it out!



Students extracted DNA from wheat germ, using common kitchen ingredients and chemicals such as wheatgerm, meat tenderiser, bicarbonate of soda, washing detergent and methylated spirits. For many students this was the first time they had 'seen' DNA and they gained a sense of achievement and excitement as they precipitated DNA in the final step of the protocol. Many were amazed that the DNA was so long and stringy.

4. Gel electrophoresis



Students learned how to load DNA into an agarose gel and how different-sized fragments of DNA are separated by electrophoresis. Students enjoyed using equipment that was not available at school. They learned how to accurately use a micropipette, which measures volumes as small as one microlitre. At the end of the session students observed how the different coloured dyes moved at different rates through the gel, which acts like a 'molecular sieve' according to the size of molecule that makes up the respective colours.

In all activities the students were encouraged to think about how the different applications of biotechnology can be used in solving the problems associated with climate change.



During all activities students were encouraged to ask questions and engage in discussion. Students were given activity booklets containing information and questions and the teachers were provided with an answer booklet for follow-up activities.

Summary of school visits in North West Victoria

In2biotech session at Chaffey Secondary College



Twenty Year 7 students attended the session at Chaffey Secondary College School, and in addition to the two staff members whose groups participated, many others popped in for part of the session.

All the students indicated they had no prior knowledge of biotechnology before the session though 80% of students commented that they had some or a lot of interest in science.

The whole session was extremely well received with 100% of respondents rating both the introduction and the activities *'interesting'*.

At each workstation a Peer Mentor lead students through the activity. The aim was to spark students' interest in applications of biotechnology for mitigating the effects of climate change.

School students filled in evaluations on the day and their feedback was very positive. Following are some of the comments from students:

"It would be cool if we could do that more :)"

"It was interesting and I learnt a lot"

"I found it very interesting because I didn't [know] anything about DNA but now I know heaps"



Fifty per cent commented that they were more interested in studying science beyond Year 10 after the session. Gel Electrophoresis was the most popular workstation amongst Chaffey students with 33% rating it their favourite activity.

At the end of the session the teacher commented that Biotechnology could be incorporated into the curriculum as part of the year 8-10 electives. This was despite her comment that she only knew *'a little'* about biotechnology before the session.

In2biotech session at Red Cliffs Secondary College

129 Year 9 Red Cliffs Secondary College students took part in In2biotech along with ten year 10 flying start students who were commencing an introduction to VCE biology that day.

Over 90% per cent of students commented that they had some or a lot of interest in science.

Students were engaged and inquisitive with all willing to ask questions during the workstations, not only about the scientific activities they were undertaking but also about the mentors' university experiences and their fields of study.

Their teachers rated all aspects of the workshop as being '*excellent*' and commented specifically on the level of student engagement, stating that *all* students had been engaged, not just those usually interested in science.

Again the activity stations were the most popular aspect of the program with 85% of students finding them '*interesting*'. Red Cliffs students enjoyed the DNA Extraction the most, with 33% of the students selecting it as their favourite.

Forty two percent said that they were more interested in studying science after the session with another forty four per cent saying they may be more interested.

Students commented:

"Interesting and fun to be involved."

"I learned a lot, thanks."

"Amazing ☺."

In2biotech session with Irymple Secondary College

The visit to Irymple Secondary College provided students the opportunity to learn a little more about biotechnology and it's applications to tackle climate change.

Teachers gave very positive



feedback during the event and invited the local press along with the assistant principal taking asking the mentors questions about their degrees and aspirations as well as about the aims and achievements of the In2science program.



When surveyed, 85% of the students said that they were now or maybe more interested in pursuing science at VCE after the session.

In a reversal of popularity the favourite workstation for Irymple students was 'How now dairy cow' with 37% of the preferences, closely followed by biofuels which received 30% of the votes.

The teacher who coordinated the session at Irymple SC was exceptionally proactive, not only during the session but also afterwards, asking questions about the activities so they could school continue them independently after the roadshow.

Students attending commented:

"It was fun and I learned a lot of new things."

"I'd like to see biotech used in the future."

"Really good. The activities were great."



Peer Mentors' contribution to the event

The three Mentors did a fantastic job during the visits and were professional, enthusiastic and very hard working throughout the roadshow. They ran the activity stations safely and with a high level of technical competency. They asked questions to determine students' prior knowledge and adapted their explanations accordingly. They demonstrated their passion for science and learning and engaged students in discussions about careers in science and what it's like studying science at university. They also took responsibility for preparing gels and equipment before each session and the staff member on the roadshow cannot praise them enough.

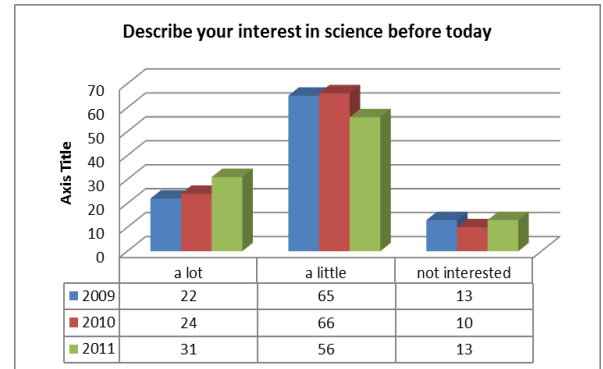
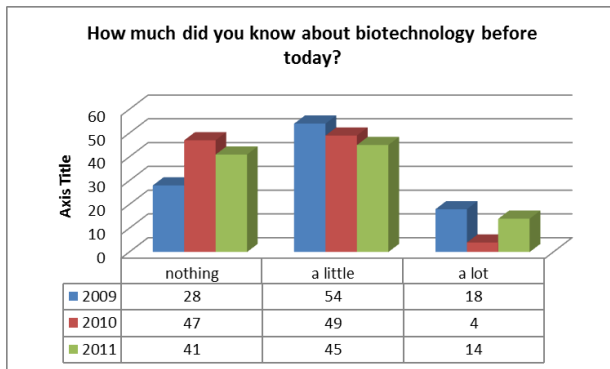
Shainie Jesurasan has completed 4 years as a Peer Mentor and demonstrated the ability to fine tune her presentations and to reflect maturely on her practice. This was Shainie's third roadshow and her experience was invaluable. The others had not previously participated in a roadshow but had vast experience as In2science Peer Mentor volunteers. Josh Wayman has undertaken four placements as an In2science Mentor and was able to use his experience interacting with students to challenge more able students to think deeply about complex concepts. Sam Hawthorne had just finished his first placement but demonstrated outstanding communication skills and a desire to try new things. All volunteers interacted effectively with the students and were reliable and conscientious members of the **In2biotech** team.

Mentors commented that the trip was a fantastic opportunity to share their passion for science with others as well as '*awesome fun*'. One mentor commented that participation helped increase self-confidence and improve communication skills as well as being a great way to connect with other mentors.

Summary Results

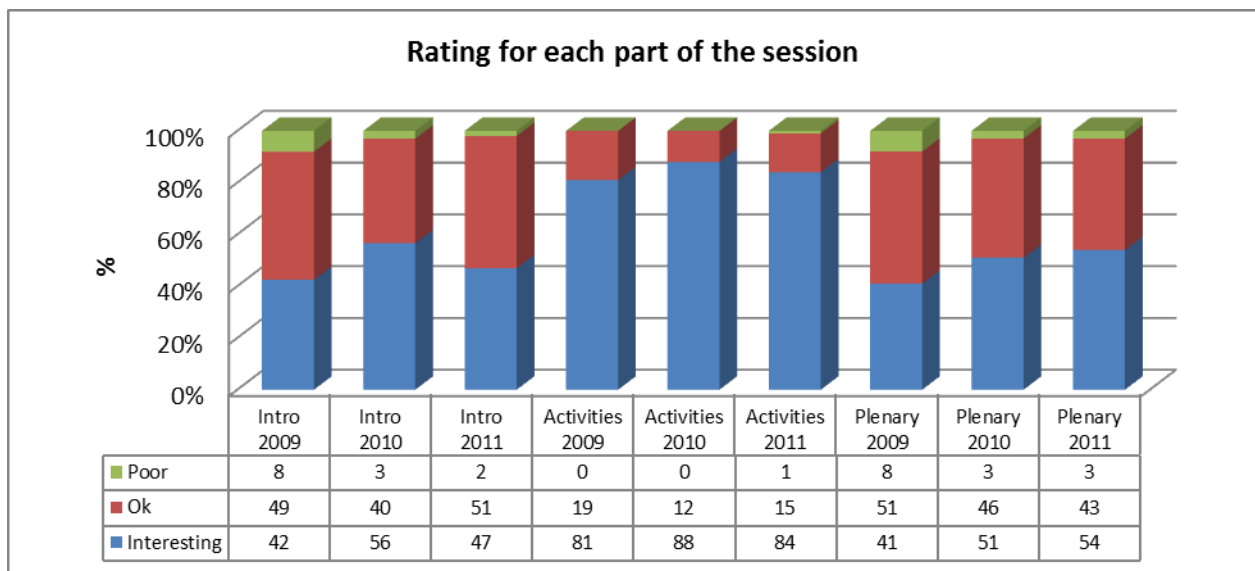
Results from the previous years are shown for comparison.

Results from student feedback (n=146 students, n=4 teachers):

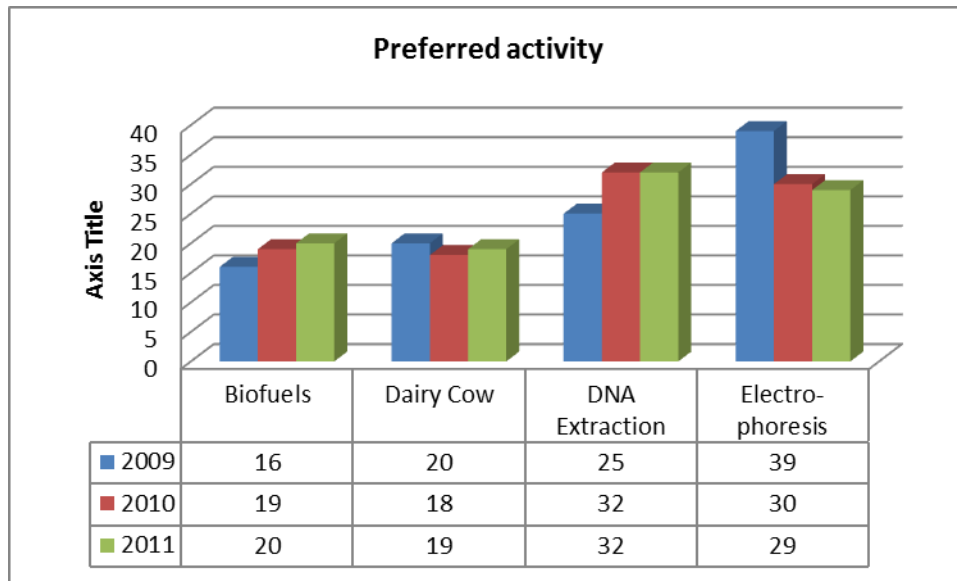


As with previous years, the majority of the students commented they knew little or nothing about the topic prior to the visit. Across all schools just 13% of students said they were not interested in science with the majority having some interest (54%) or a lot of interest (31%). With the exception of the 10 year 10 flying start students, none of those who participated in **In2biotech** were selected by their teachers as having expressed interest in science.

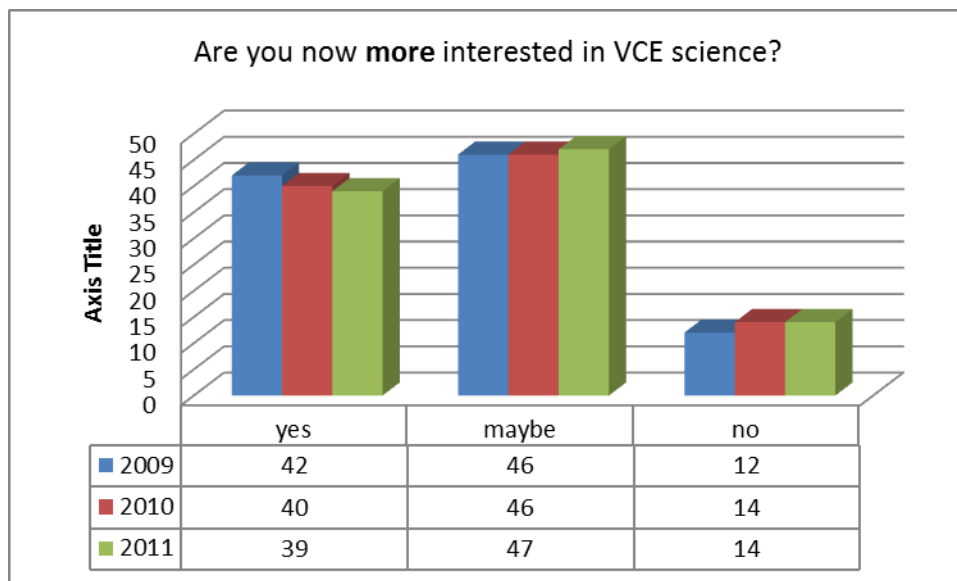
Students' attitudes to all aspects of the program (Introduction, Activities and Plenary) were positive. As predicted, almost all (88%) of the students found the activity workstations the most enjoyable aspect of the session. Not all students were able to hear the conclusion as time was restricted and the activities took up all the allotted time.



DNA extraction was the most popular activity with 34% of the vote. Gel electrophoresis was the next most popular with 29% followed closely by Biofuels (19%) and Cows (18%).



The sessions had a positive impact upon the students with 39% of them saying they were now **more** interested in pursuing sciences beyond Yr10 and 47% saying they '*may be*' more interested. Only 14% of participants said they were not more interested in taking Science at VCE after the **In2biotech** activity.



Teachers were appreciative of being offered the In2biotech program and gave positive feedback on its quality and effectiveness. All teachers (100%) rated the program '*excellent*' in terms of student learning and engagement. Half (50%) of the teachers said they knew '*a little*' about biotechnology before the session with the other half knowing '*a lot*'; but even so 75% said they were more likely to teach biotechnology as a result of participating in In2biotech.

The **planned outcomes** were listed at the start of this document and the extent to which they were achieved is noted in the table below:

Predicted Outcomes for Schools	Evidence of achievement
Teachers with a greater knowledge of biotechnology applications for climate change mitigation and ideas for teaching biotechnology in the classroom.	Teachers had the opportunity to learn about the topic and 75% stated they were more likely to teach biotechnology in their classroom after the workshop. They also gained an understanding of resources available and how to use them.
Students with a greater awareness of climate change and applications of biotechnology in agriculture.	41% of students said they knew nothing about biotechnology prior to the sessions. Many students made positive comments about having a better understanding of biotechnology and the potential benefits it could bring in mitigating climate change.
Scientifically motivated and enthused students.	Students were enthusiastic and engaged in the activities and many described the workshop as 'fun', 'awesome' and 'interesting'. 39% of students said they were now more interested in pursuing sciences beyond Year 10 and 47% saying they ' <i>may be</i> ' more interested. 100% of teachers rated In2biotech as ' <i>Excellent</i> ' in terms of student learning and engagement.
Teachers able to interact with young scientists and update their skills (especially valuable where non-specialists are teaching science).	All teachers participated in the activity stations and gained an insight into the topic and the kinds of learning activities that students find most engaging.

Conclusion

Based upon feedback from all stakeholders the program of visits this year was deemed a success with all planned outcomes being achieved.

This is the third year that Get into Genes and In2science have collaborated on a roadshow, and the planning and preparation ran smoothly with effective communication between Barbara Dinsdale (In2science) and Jo Oreo (Get into Genes).

The numbers of students participating in the sessions at each varied from 20 to 50. Some of the schools only had a small student population and this had an impact upon the numbers involved.

The Peer Mentors did an outstanding job of presenting material and engaging with the students and teachers in the schools. The quality of these undergraduate students in both their knowledge and their communication skills was imperative and for this event appropriate students were selected. All were a credit to their university.

All schools participating in **In2biotech** were government schools.

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Acknowledgements

Thanks to staff at Chaffey Secondary College, Red Cliffs Secondary College, and Irymple Secondary College for hosting the In2biotech workshops and providing some materials and consumables.

Consumables and equipment for the Gel Electrophoresis and DNA Extraction activities were provided by Get into Genes. Thanks to Jo Oreo for putting this together and training the mentors.

Thanks also to Barbara Dinsdale for her work behind the scenes and to John McDonald, the program manager for his support.

Huge thanks goes to the three university students who gave up their time to run the activities and without whom the roadshow would not take place.

The car was kindly provided by the La Trobe University fleet.