Cotton Catchment Communities CRC

FINAL REPORT

Part 1 - Summary Details

Cotton CRC Project Number: 3.04.12 CRC1016

Project Title: PICSE Schools

Project Commencement Date: 1/07/2009 **Project Completion Date:** 30/06/2012

Cotton CRC Program: **Communities Program**

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PICSE FINAL REPORT FOR THE COTTON CRC

CCRDC PROJECT NUMBER: 3.04.12 CRC1016

Title: PICSE Schools

PRINCIPAL INVESTIGATOR: Assoc Prof David Russell

1. Background: National Project Progress

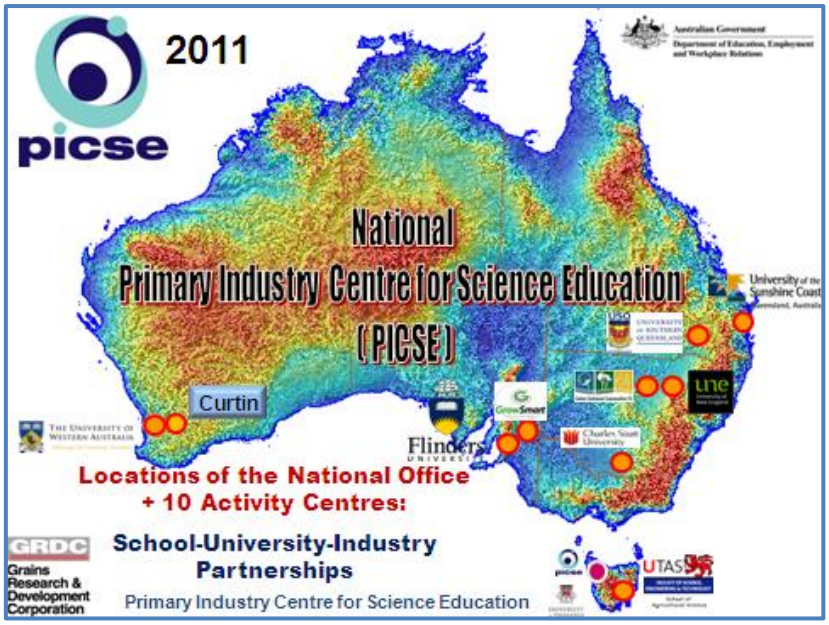

Figure 1: 2011 PICSE Activity Centres.

PICSE continues to expand.

- In 2012, discussions are well advanced with three new tertiary partners (University of Western Sydney, SARDI Food Centre and Northern Melbourne Institute of Technology) with the outcomes being the establishment of a fourth Activity Centre in NSW and the first one in Victoria. In addition, a partnership has just been signed by two significant other investors in the PICSE program, Cotton RDC and Meat and Livestock Australia (RDC)
- PICSE continued to deliver the program in 10 Activity Centres in 2011, with 5 potential new universities (CSU-second centre, University of Ballarat, University of Sydney, CDU, JCU), ready to join the current university partners with signing-up depending upon Federal Government funding from HEPPP. Applications for HEPPP funding are expected to be open in July/August.

University and non-university organisations have given a commitment to invest or are interested in growing the PICSE program through to 2014 because:

- PICSE is not only an awareness program for science but, more importantly, is an experiential strategy that changes the aspirations, study and career directions of students in a sustainable way
- PICSE delivers innovative engagement programs for student and teachers making science relevant and exciting, hence encouraging students into tertiary science and careers in industry
- PICSE is a rigorously evaluated and long term program which is sufficiently flexible to deliver customised outcomes to each investor
- PICSE has a track record of attitudinal change and increased participation in science based primary industry pathways.
- New relationships and partners are critical for the ongoing development and longer-term sustainability of PICSE.

2011/12 was a year of milestone events for PICSE. A selection of the highlights include:

- The formation of the PICSE National Advisory Board with eminent university leader and internationally recognised agriculturist, Professor Alan Robson as Chair.
- A hugely successful mid-year Canberra forum. Titled *"Positions Vacant: Young Scientists Wanted for Future Food Security"*, the event canvassed a range of views from industry, government, R&D's, teachers, universities and students. The outcomes paper is attached as **Appendix 1**. National media coverage was extensive in both print and radio syndication.
- Two very important partnerships were formalised in 2011. These included a selection of joint projects between PICSE and Agrifood Skills Australia (AFSA), and the Australian Science Teachers Association (ASTA), who will deliver against joint objectives and further enhance collaboration and industry benefit.
- The very exciting development of the web-based version of the popular Science Investigation Awards (SIA). The new program called "Science for Growth" will build on the 2400 students from across Australia who participated in the SIAs in 2011 and allow more students and teachers (city, rural and remote) to be involved.

At the commencement of the PICSE Project, an independent measurement, evaluation and reporting company (QualDATA) was outsourced to establish an evaluation process to provide an annual synthesis of data which could be used to inform progress reports for DEEWR. Each year, every participant of every PICSE activity was surveyed to collect qualitative and quantitative data. This data is collated for each Activity Centre (linked with a University) and then combined into a national report covering the effectiveness of the process and impact of the program. In 2011, a comparison has been made between the 2009, 2010 and 2011 programs, in addition to comparing the effect of the program across all partner universities. All data presented in this Progress Report is sourced from the QualDATA Impact Evaluation Report found in **Appendix 2**.

In addition the evaluation process facilitates:

1. Continuous improvement of on-going operational activities.
2. Innovation of all aspects of the PICSE program.
3. Reporting to funders, partners and stakeholders.

2. Objectives

a. Integration of Cotton CRC education activities with that delivered by the Primary Industries Centre for Science Education (PICSE).

i. Actively engage with the PISCE program through the commencement of a Science Education Officer role.

The Education Officer actively engaged the PICSE program through coordinating and implementing the nationally run PICSE programs that involves Science Education Officer forums, Class Visits to schools, Teacher Personal Development days (PD's), Industry Placement Scholarship, which involves a five-day student placement with a team of scientists in specific industries or research organizations and the Science Investigation Awards, that involves high school and primary students carrying out their own scientific investigation.

ii. Maintain partnership with the PICSE programme through Science Education Officer Role.

As part of the PICSE team the education officer assisted other activity centres with running workshops, conducting presentations at Science Investigation Awards and Teacher PD's

3. Methods

PICSE has an established operational framework that consists of:

• A Science Education Officer (SEO) – responsible for developing strong relationships with students, teachers and employers while managing all elements of the program;

• Annual Professional Development (PD) courses for science teachers – illustrating the connection between science taught in class and the science applied in local primary industries/R&D;

• Delivery of Industry Placement Scholarships (IPS) for Year 11/12 science students – including science/industry camps and industry placements to demonstrate real cotton career opportunities;

• Production of teaching resources – using Cotton Industry exemplars that integrates into school science curricula;

• A robust, monitoring, evaluation and reporting process.

4. Results

a. Integration of Cotton CRC education activities with that delivered by the Primary Industries Centre for Science Education (PICSE).

i. Actively engage with the PISCE program through the commencement of a Science Education Officer role.

The project education officer established the Cotton PICSE Activity centre by actively participating in Science Education officer (SEO) forums twice yearly, SEO phone forums bi monthly and continually engage with other PICSE SEO's and Activity Centres around Australia with planning meetings, and activity events such as Teacher PD's, reporting back sessions, presenting cotton production workshop at PICSE UNE Armidale's SIA's 2009, 2010 and 201, presenting similar workshops at the PICSE USQ Teacher PD 2009, 2010 and 2011 and by establishing a Cotton Industry based Science Investigation Awards events in Narrabri.

The project education officer's facilitation and management of the PICSE Cotton Science Investigation Awards has seen over 600 student's involvement from 5 schools across one catchment, 47 entries, over $2000 in sponsorship and the actively involvement of over 10 different organisation and 50 community members acting as judges and officials from 2009 to 2011.

The project education officer has supported the PICSE programs integration into the Cotton Industry by coordinating industry researchers from CSIRO to supply assistance, mentoring and projects for the PICSE Industry placement Scholarships. Two successful placements have been awarded in 2010 and 2012 and were highly viewed by participating members and are willing to continue involvement.

ii. Maintain partnership with the PICSE programme through Science Education Officer Role.

The project education officer has continued to deliver by:

- contributing to the PICSE Network newsletters by providing cotton related articles to be distributed across Australia to 1,400 investors and stakeholders nationwide
- speaking and presenting PICSE information packs to visiting students and teachers at various functions and events
- briefing PICSE colleagues about the Cotton Industry, the relevant science supporting the industry, current research examples
- providing text and graphics to be incorporated in each SEO's PowerPoint presentation for use at their Year 11/12 class presentations in their State. This raises the profile of the Cotton Industry and Cotton research even in no cotton growing regions.
- presenting at CONASTA (the National Science Teachers Conference), with the Cotton Industry research featuring in a number of presentation workshops conducted by the PICSE Team; material was provided by the PICSE Cotton SEO for the attending teachers who were from around the nation.
- continuing to assist and support PICSE colleagues with Cotton information and presentation assistance at national forums.
- weekly emails in which the PICSE staff report on their current activities

5. Outcomes

a. Annual Reports from the associated Universities (UNE, USQ)

PICSE UNE and PICSE USQ included Cotton activities as presented by the PICSE Cotton SEO.
The PICSE UNE and PICSE USQ Science Education Officers prepared 2011 Annual Reports which have been attached as **Appendix 3**.

b. ***Communication and Promotion***

An extensive website has been established to allow students and teachers access to PICSE resources and information on PICSE activities: www.picse.org. An example of PICSE Cotton, PICSE USQ and PICSE UNE's home webpage are attached in **Appendix 4.**

Our PICSE Network (monthly newsletter) has grown to a distribution of 1430 hard copies mailed and approx 100 sent electronically to schools, universities, industries, government and investors. An additional 500 hard copies are distributed by the SEOs as they engage with new interested parties. A couple of recent Network editions are attached in **Appendix 5**.

At the February Science Education Officers' Forum, PICSE commenced the process of developing a strategy for using Social Media for communication with PICSE students. This strategy will be finalised, with the appropriate training at the June SEO Forum.

c. **Teaching Resources**

Each year PICSE adds to its collection of teaching resources. These are produced as a collaborative output from all of the Activity Centre's. These teaching resources are selected annually to reflect topical issues in the food and fibre industries and to reflect relevant work being undertaken amongst partner organisations. They form classroom showcases that are made available to teachers both inside and outside the PICSE network. PICSE's teacher resources are distributed nationally during PICSE PDs, CONASTA, and State Science Teachers' conferences, as SEOs visit schools and by mail on request. During 2011, PICSE distributed 2,960 CDs nationally. An extensive website has been established to allow students and teachers access to PICSE resources: http://www.picse.net/Hub/resourcesTeachers.htm.

WA SEO Belinda Pope developed a teachers' resource called "PICSE's Antipasto of Science" which was launched at last year's Australian Science Teachers' Association conference CONASTA 60, held in Darwin.
In Belinda's workshop, teachers took part in a culinary adventure of primary industries and cooked their way through team challenges. Teachers became experts on each industry (including cotton), presented their industry inspired recipes and then offered their findings and antipasto treats to the rest of the group. The sections relevant to CRDC/CRDC of this resource can be found in **Appendix 6**.
The activity was set up like a Master Chef kitchen, with a pantry where teachers were able to experience the excitement of working with food, peers and towards a challenge. The aim of the activity was to highlight the many different primary industries that are involved in making food products, and the relevance and importance of future food and fibre security.

d. Annual School Visits by SEOs

The initial phase of the PICSE program is the delivery of a 20 minute PowerPoint presentation by the Science Education Officer, to university bound science students (Yr 11/12) in their chemistry or biology classes with the teacher present. The focus of this presentation is the career opportunities that primary industry and research organisations can provide young people of today. All SEOs across the Nation included a slide in their PowerPoint presentations about Cotton research (**Appendix 7**), provided by the PICSE Cotton SEO.

- *Engagement with schools during 2011 was exceptional, with 6,454 Year 11/12 science students spoken to in classes in 140 schools across the nation, and in all States.*

e. Annual Professional Development (PD) Activities for Science Teachers

During 2011, 157 Year 11/12 science teachers participated nationwide in the teachers' Professional Development entitled "The Science relating to Food and Water Security", during which the Cotton Industry was highlighted. A copy of the PICSE UNE and PICSE USQ Teacher PD Programs are attached in **Appendix 8**.

One teacher from each Activity Centre was awarded a "Travelling Scholarship" to a PD in another State; the scholarships are funded by national industry partners such as the CRDC/CRDC. The following teacher was awarded the CRDC/CRDC Travelling Scholarship for 2011.

Name	Original Activity Centre	Destination Activity Centre
Edgar Cooper	University of Western Australia	University of New England

Edgar's written report and letter of thanks are attached in **Appendix 9.**

f. Annual Science Camps and Industry Placement for Science Students

This scholarship is for Year 11/12 science students who are looking for encouragement to continue their studies of science at tertiary level. The activities engaged in during the scholarship program will relate to the sciences that support primary industries. The aim of this scholarship is to illustrate the range of rewarding career paths available for science graduates in primary industries. A copy of the PICSE UNE and PICSE USQ IPS Camp programs are attached in **Appendix 10**.

- *Eight industry/science five day residential camps were run for 168 Year 11/12 students as a prerequisite for the individualised five day Industry Placements with scientists during January 2012*.

One or two students from each Activity Centre nationally were awarded "Travelling Scholarships" to a Science Camp in another State; the scholarships are funded by national industry partners such as the CRDC/CRDC. The following student was awarded the CRDC/CRDC Travelling Scholarship for 2011.

Name	Original Activity Centre	Destination Activity Centre
Susanna Imarisio	University of the Sunshine Coast	University of New England

Cotton Travelling Scholar, Susanna, has provided a written report and letter of thanks to CRDC/CRDC which are attached as **Appendix 11**. The reports of the IPS student reports that relate to their placements with researchers and industries relating to the Cotton industry are found as **Appendix 12**.

g. Innovation

Since attributes of the student and teacher audiences, as well as the educational environment, are constantly changing, PICSE has an innovative strand embedded in its strategy. Over time, Government and RDC funding has supported successive innovations to be developed and delivered for Year 11/12, Year 7-10 and Year 5/6 student cohorts. In the latest innovation, PICSE is developing and piloting an on-line version of the very successful Science Investigation Awards called "Science for Growth Awards" which will significantly extend the reach of the PICSE program into regional and remote communities in the "Cotton Basin", see www.scienceforgrowthawards.com.au

Home Page for the 2012 Pilot "Science for Growth Awards"

6. Conclusion

The Mission of the PICSE is to *"Increase participation in science professions that support primary industries"*. The program aims to attract an increased supply of high quality young people into science based primary industries through engagement with them during school years and early university. Each year we contract QualDATA to produce an evaluation report to capture and analyse the impact on students and teachers from their participation in PICSE activities and make judgements about how well the program has met its Mission. The 2011 overall national Impact Evaluation Report has salient results:

- 85% of the teachers at the Professional Development courses were able to better advise students about career opportunities in science based primary industries.
- 66% of the secondary students reported that the Science Investigation Award activity helped their understanding of science.
- 85% of Year 11/12 science students reported that their attitude on the importance of science in primary industry had positively changed as a result of the Industry Placement Scholarship (IPS) program.
- 60% of IPS students indicated that they were now interested in science careers in primary industries.

The Executive Summary of the National Impact Report is attached as **Appendix 13**, with the Executive Summary of the individual Impact Evaluation Report for PICSE Cotton attached as **Appendix 14**.

Cotton CRC Final Report 31 May 2012

Appendices

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2	PICSE 2011 Impact Evaluation Report – Produced by QualDATA
3	PICSE UNE & PICSE USQ Activity Centre 2011 Annual Reports
4	PICSE Cotton, PICSE UNE and PICSE USQ Web Home Pages
5	Mar, Apr, May, June 2012 editions of PICSE Network newsletters
6	Antipasto of Science Workshop Flow Chart
7	PICSE Cotton PowerPoint Presentation for School Visits
8	PICSE USQ and PICSE UNE 2011 Teacher PD Programs
9	Teacher PD Travelling Scholarship report and letter of thanks
10	PICSE USQ and PICSE UNE IPS Camp Programs
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Appendix 1

Canberra 2011 Think Tank Flyer: "Skills Shortage Threatans Food and Water Security"

Skills Shortage
Threatens Food and Water Security

Students, Politicians and Industry "Think Tank": The Issues

PROF. ALAN ROBSON

Australia must immediately address its significant shortage of trained scientists to support primary industries focussed on food and water security, according to **Professor Alan Robson AM** CitWA, University of Western Australia.

Professor Robson, who is also Chairman of the Primary Industry Centre for Science Education (PICSE) National Advisory Board, was opening an industry Think Tank in Canberra. The event, organised by PICSE and AgriFood Skills Australia, brought together representatives from all sides of the issue, including government, education and research, agribusiness, food retail and students themselves.

"In order to maintain Australia's global leadership position in food and water security issues, we need a steady stream of passionate young people moving into a range of science-based careers in primary industries," said Professor Robson. "Without this, Australia's research and development will be less efficient, food and fibre production will drop and we will fail to adequately address our food and water security challenges."

Continuing that theme, Associate Professor David Russell, PICSE National Director, stated in his introduction that, "The issue of encouraging tertiary trained young people to join industries addressing food and water security for Australia is one of national concern and one that PICSE has been addressing since 2000. Australia's future rests on our ability to attract the brightest young minds to careers in agricultural science and we plan to continue that work. The Think Tank and its outcomes will help inform PICSE's direction into the future," he said.

Western Australia's Brydie Creagh says she planned on a career in forensic science prior to her PICSE industry placement, but now aims to undertake an agricultural science degree so she can work in animal research.

AGRIFOOD SKILLS AUSTRALIA

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Primary Industry Centre for Science Education

1. Building additional Partnerships to take PICSE to the next level:

- **Students** – PICSE and it's industry partners helped me demystify the opportunities in agriculture.The experience highlighted real careers and the contribution we as young people can make to food and water security.

  Dominique Cotterill Yr 12 student TAS

- **Teachers** – PICSE facilitates the building of partnerships between relevant primary industries and teachers, hence achieving attitudinal change in teachers and their students.

  Belinda Pope, PICSE,
  Science Education Officer UWA

- **Government Departments** – The role of universities is to partner with industry. The role of government is to support initiatives like PICSE, which is known to be successful in brokering such partnerships.

  Robert Griew,
  Associate Secretary, DEEWR

- **Agribusiness** – We need young people with the right attitude, good communication skills, team players and then its up to employers to give them experience, knowledge and skills to work in a business environment.

  Ian Macleod, CEO, Peracto

This summary describes the points of discussion presented by participants at the Think Tank:

Over the last 12 years PICSE has developed and trialled a successful integrated strategy to build a capacity value chain to address Australia's Future Food Security;

- Students – My experience with PICSE has provided me insights that Primary Industry science is more than a white lab coat and test tubes; it's a pathway to amazing opportunities globally. This represents common student views expressed at the Think Tank.
- Teachers – The consensus was that teachers are crucial influencers in young people's career aspirations. "PICSE showcases the relevance of primary industries, achieving attitudinal change in teachers and their students". Sue Lanham, PICSE Science Education Officer (former teacher).
- Government departments – Representatives reported the need for PICSE to create stronger partnerships and links with national organisations like the CRCs, as there is a need for increased numbers of PhDs (to support an enhanced future research workforce).
- Agribusiness – Attraction of the right young people with the right core skills is a crucial part of securing the personnel to ensure Agriculture remains a growth industry. PICSE takes a key role in selecting suitable young people, enthuses them into a primary industry career pathway via tertiary training at universities.
- Politicians – "A key issue is to get the right, positive message to young people. It is apparent that the PICSE program is doing just that." Tony Windsor MP.
- Universities – "A 2050 Challenge was defined: This is about co-developing solutions to create a new way of supplying quality food by 2050. It recognises that agriculture provides the most important careers available. PICSE promotes this to students, engaging selected students with local primary industries, research organisations and universities." Prof Holger Meinke, School of Agricultural Science, UTAS.
- Research and Development Corporations (RDCs) – "One of the core future problems in the grains industry is to secure sufficient numbers and quality of tertiary trained people. PICSE is a key part of the solution, thus it has had our long term support." Jody Higgins, GRDC.

Politicians – need to get the message to young people, city and country alike, that there are opportunities in primary industries and unmet demand.

Sid Sidebottom MP

Universities – Food science extends from the core sciences,to every part of food production, to the whole food supply chain, including an understanding of food supply chains, innovations.

Prof Margaret Britz, Dean Faculty of Science, Engineering and Technology UTAS

RDCs – We take a strategic approach to investments (attracting young people into our industry) and are seeking a more collective and collaborative approach.

Jo-Anne Ruscoe (FRDC)

Key Themes and Challenges

The Think Tank served as a platform for dialogue between leading industry, government, community, teaching and student representatives to focus on the key challenge of engaging, attracting and retaining young people in primary industries. The key themes to emerge from the day included:

- Traditional perceptions of agriculture as a labour intensive industry and poor awareness of career opportunities are the biggest disincentives for youth to pursuing careers and training in primary industries. This is reflected in statistics revealed by the Australian Council of the Deans of Agriculture, which suggest around 4,000 positions are available annually for agricultural science graduates, despite an average of just 700 graduating each year.
- Students put the onus back on industry and employers to actively promote the career opportunities available, to highlight the strong link between primary industries and science, innovation and technology, and to ensure legitimate jobs are available to graduates on completion of their studies.
- The Think Tank also identified the need to ensure science teachers and parents, as key advisors to students on careers, were themselves aware of the importance of primary industries, the education pathways available and the diversity of career opportunities.
- Students also called on industry to continue their engagement with students during their tertiary studies. This was a critical time for many students, often being susceptible to the offers, public perceptions and attractiveness of other sectors whilst bedding down their courses and degrees.
- Students who had been involved in the PICSE program were exposed to the breadth of opportunities, particularly in science, found the experience fun, engaging and adventurous, and described how it had steered or confirmed their career aspirations in the science supporting primary industries.
- The current Australian Government's strategy on the sustainability of regional Australia presents a real opportunity for primary industries. Our aim must be to support building strong sustainable regional communities with ample skilled and professional employees. This in turn can drive the establishment of new regional enterprises that support primary industries.

Call to ACTION

PICSE and AgriFood Skills will work in partnership to identify opportunities to increase the quantity and quality of students to ensure a sustainable labour supply for primary industries, now and into the future. The engagement of dual sector universities is one strategy that will become a focus.

The Think Tank also raised some higher order issues that require urgent attention.

There emerged a sense that industry and its many related sectors are individually tackling skills based issues relevant and pertinent to their sectors. These issues need to be contextualised and linked to a bigger picture.

With an overarching mission to break down the traditional perceptions of agriculture, AgriFood Skills and PICSE are calling on governments, both Australian and state, and agribusiness, both large and small, to collaborate and contribute to addressing the following systemic issues facing the supply of skills to support Australian Primary Industries:

1. **Strengthen the regional and community base** to attract and retain skilled workers in regional areas and sectors.
2. **Increase student participation and retention** through exposure to career opportunities available in primary industries and successful engagement and participation through school education at primary, secondary and tertiary levels.
3. **Increase community literacy** in primary industries to promote awareness of the food and fibre supply chains and its significance to our economy.

'Liam Sax making noodles. The PICSE experience has made him change his career aspirations from mining engineering to conservation biology and agriculture'

About PICSE

The Primary Industry Centre for Science Education (PICSE) is an experiential education program encompassing teacher professional development, the production of class resources, learning activities, student camps and industry placements - aimed at making science and primary industry study and careers real and relevant to Australian teachers and students.

A collaboration between Australian and state governments, research and development corporations, universities, schools, national and regional industries and community organisations, PICSE has 10 dedicated Activity Centres nation-wide, each supported by a university and local industries.

"Providing real world examples of how the PICSE program funnels talented people into the agricultural science arena is the best way to raise our profile and encourage industry leaders to continue to support our endeavours," said Associate Professor Russell.

The Think Tank followed the inaugural meeting of PICSE's new National Advisory Board**.** The Board aims to raise PICSE's profile nationally, helping it continue its efforts to attract more bright young minds to careers in agricultural science and food security. In addition to Professor Robson, other members of the newly-created 10-member Board include Western Australia's Chief Scientist Professor Lyn Beazley AO FTSE; Ms Vanessa Goss, General Manager, HAL; Mr Peter Russo, CEO Australian Science Teachers Association and Mr Arthur Blewitt, CEO of AgriFood Skills Australia, the Industry Skills Council for agriculture, food processing, meat, seafood and racing.

For more information about PICSE, visit www.picse.net

About AgriFood Skills Australia

AgriFood Skills Australia is one of 11 independent, not-for-profit Industry Skills Councils established by the Australian Government.

Led by industry and funded by the Australian Government, AgriFood Skills is charged with driving the skills and workforce development agenda across 43 sectors that include agriculture, horticulture, conservation and land management, food processing, beverages, pharmaceutical, meat, seafood and racing. AgriFood Skills develops and implements workforce development strategies and industry's nationally endorsed qualifications to meet the current and emerging needs of the agrifood enterprises, employees and students throughout regional and urban Australia.

AgriFood Skills vision is the sustainable growth of Australia's agrifood industry through world class capability.

For more information about AgriFood Skills Australia, visit www.agrifoodskills.net.au

Cotton Catchment Communities CRC

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Appendix 2

PICSE 2011
Impact Evaluation Report
Produced by QualDATA

Impact Evaluation Report

2011/2012





Primary Industry Centre for Science Education

March **2012**

PO Box 7642 Toowoomba MC 4352
07 4615 2255 or 07 4630 1297

www.qualdata.net.au

Acknowledgements

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Our thanks also to Associate Professor David Russell who developed and provided the original feedback forms and assisted in modifying them to ensure that the best possible impact data could be captured and reported for this Report.

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Disclaimer

Summary

PICSE Program

The Mission of the Primary Industry Centre for Science Education or PICSE is to … *increase participation in BioScience professions.* The program aims to attract an increased supply of high quality young people into science based primary industries through engagement with them during school years and early university. The program focus is to make them aware that tertiary science courses are the entry point for *exciting and satisfying professional careers in primary industries*.

The Core Activities of the PICSE program are: Science Class Engagement including the Science Investigation Awards (SIA) ; Industry Placement Scholarships (Camps and Industry Placement (IPS)); Teacher Professional Development (PD); creating teacher resources; and communications.

Evaluation Purpose and Approach

The purpose of this evaluation report is to capture and analyse the *impact* on students and teachers from their participation in PICSE activities and make judgements about how well the program has met its objectives.

The data used for the report is sourced through the analysis of specifically designed impact questions asked of individual participants (students, teachers and 'SIA judges') across activities at each of the eight Activity Centres.

While the primary focus of this evaluation of the PICSE program is over the 2011/12 year, this report also considers trends over the last three years.

Findings

Value of the program to investors, participants and partners

Investors and partners in the program have achieved a high return on their investment and collaboration in terms of having jointly achieved an evidence-based impact on raising the profile, capacity, interest and study choice by students of study options and careers in the biosciences.

The PICSE program uses a complementary set of activities directed towards students, teachers and the broader community. These activities have demonstrated quantitatively that they have had a high level of impact in achieving the PICSE objectives. Participants have consistently reported a high level of enjoyment and personal value from participation in those activities, including improved teaching capacity, increased understanding of science and related careers, improved connection with practical applications of science in action and in making better, more informed career choices.

- PICSE activities have occurred across the feeder schools of its eight Activity Centres (based on university partners in the program that host Activity Centres, as well as an additional cotton Activity Centre) and involved over 2,000 students, 60 teachers, an and more than 200 members of the wider school community and industry personnel in the SIA program alone. The Teachers PD and IPS program markedly increase those numbers.

- Global PICSE agribusiness investor and partner, Dow AgroSciences negotiated with PICSE to fund an expansion of the SIA program to be launched in March 2012 that will be focussed on engagement of regional and capital city students who for geographic reasons and due to PICSE's limited resources are unable to participate directly in the SIA program. This Science for Growth Program has secured the involvement of peak body Australian Science Teachers Association. In 2011 Dow AgroSciences has also initiated a professional development program for one key PICSE Science Education Officer annually whilst hosting a one-week scholarship for a key IPS graduate to its international research facility in New Zealand.

- PICSE activities have resulted in attendance by PICSE graduates in undergraduate courses at over 15 Universities.

- One hundred and twenty-four of the 211 PICSE graduates tracked in 2012 attended PICSE partner universities (87 went to non-partner universities).

Impact on increased understanding of workforce needs and student career pathway opportunities by teachers

There is strong evidence that the Teacher PD Activity is positively impacting on the capacity of teacher participants in their presentation of bioscience related subjects to students, in developing their own understanding of science as it relates to potential careers and equips and motivates them to encourage and support students in pursuing bioscience careers. This is supported by the Science Investigation Award that further provides opportunity for other teachers and the wider school community to engage with the sciences.

- During 2011/12 153 teachers of subjects related to the biosciences across the eight Activity Centres participated in teacher professional development (PD) programs. The teachers rated the overall usefulness in assisting with science teaching at a high 8.6/10 and similar high ratings relating to relevance to their teaching, strengthening confidence and skills and the value of resources provided.

- Eighty-four percent or 129 of participating teachers in 2011/12 reported that involvement had provided *increased value in supporting teachers to help encourage students to continue to study science,* while also supporting teachers in *being able to better advise students about career opportunities in science based industries* (85% or 130). They also believed it was highly beneficial in providing them with an opportunity to develop relationships with industry sources who could provide assistance in their teaching (average rating 8.4 out of 10).

- The number of teachers involved in the Science Investigation Awards has increased over this period from an initial 23 to 61 in 2011/12. Eighty-eight percent of respondents reported continued interest in future annual engagement.

- In this report it has been calculated that the multiplier effect of engaging each enthusiastic teacher is translated to … *at a curriculum level the involvement of one teacher could influence 375 students over 3 years. The PICSE-wide influence each year, of the over 150 teachers who have attended the PD in the last two years, could represent influence*

on over 56,250 students Australia-wide as a result of one annual PICSE Teachers PD Activity.

Impact on the development of a deeper understanding of the value of science courses and their relevance to the contemporary workforce by students

There is a very consistent and continuing trend across the suite of activities provided to students that is impacting on student interest in the biosciences and their awareness of its relevance to the contemporary workforce.

- Over 1,000 students were engaged in the SIA across the eight Activity Centres (two-thirds female). Sixty-six percent of secondary students who participated in the SIA activity in 2011/12 indicated that their participation had helped their understanding of science. Ten percent of primary students indicated that they liked science (even) more after the activity (from the high 84% prior to the experiment). Students rated the impact of their involvement on their view of science and science studies at an average of 6.5/10 – a moderate level across a large number of students.

- Of the 164 student respondents (60% female) from the IPS program, around 85% reported that their view on the importance of science in Primary Industry had changed as a result of their involvement. They attributed the main influences for this as … *talking and interacting with people directly involved in the industry,* plus … *experiencing workplaces and better understanding real career activities being undertaken*.

Impact on attracting students into tertiary science and increasing the number of skilled professionals in science-based primary industries

The evaluation data identifies that the program has directly influenced at least 75 students (45%) during 2011/12 in their senior years to reconsider their study options towards that of the biosciences, as a result of participation in the IPS program (and strengthened the commitment of other participants who were already on this track). This number is greater when the influence of other activities such as the teacher PDs and the SIA activities are considered.

- Of the 164 student respondents to the IPS impact questions, 25% (41) indicated that they already had a strong commitment to careers in the biosciences prior to the camp – which meant that the activity attracted over 120 students who weren't committed to careers in this area. Sixty percent (98) of these (66% or 97 after placement) indicated that, as a result of their participation, they were now interested in science careers in primary industries with 82% (134) of student camp participants (71% or 105 after placement) indicating that they were currently enrolled – or intended to enrol – in a course related to science or primary industries. If this translated to university studies as the students intend, it would mean that, just through the camp activities in PICSE alone, an extra 75-80 students would start the journey into bioscience careers.

- Agricultural, biological and environmental sciences were the types of courses most students indicated as their preferred (Year 11) or actual (some Year 12) study areas. The initial follow up data with students in 2012 showed that the actual study areas generally followed this intention with 31% (67) actually enrolled in agriculture, rural and veterinary science courses; 6% (14) enrolled in environmental science courses; 30% (66) in general, marine or biological related courses; and 11% (25) in medical or health related courses.

- A focus on the 2012 student tracking data of their actions post-PICSE IPS reveals that 212 students across the eight activity centres were attending one of more than 16 universities across Australia. The Universities with the largest number of these respondents were: the University of Adelaide (33); UTAS (31); UNE (29); UWA (16); USQ (16); Flinders (15); and UQ (14).

Extent to which Activities of the Project have met their outcomes

PICSE has successfully established a presence linking schools, universities and bioscience based industries in 8 university-based Activity Centres across Australia with additional contact at cotton based Activity Centre. It has successfully run the full suite of program activities at each centre (apart from cotton which has limited scope) and provided direct evidence of an increasing engagement with students, staff and broader school industries, raising the profile, level and interest of bio-science amongst students, teachers and the broader school community and has increased the number of students pursing related studies and careers.

- The SIA program increased participation from 331 students across the 8 Activity Centres in its initial 2009/10 year to over 1,000 in the following 2 years. It has engaged an increasing number of teachers – from 23 to over 60 – and the broader school communities as judges (81-over 200). It has provided a consistent high level of enjoyment (8/10) and positively impacted on student views of science studies (6+/10).
- The IPS (camps and Industry Placement) program increased student participation from an initial 120 to 164 in 2011/12. Over 80% of these students (130+) reported that they changed their views regarding the importance of sciences related to primary industries with this being calculated to mean at least 75 extra students enrolling into bio-science university courses from the 2011/12 program alone.
- The Teacher PD program continued to grow from an initial 102 to 153 participants in 2011/12. There appears to be a high repeat participation and on-going intention to participate – providing an opportunity to build on earlier gains and update teachers with resources. The feedback indicates clearly that the program is achieving its aim of equipping them better in the classroom (rating its usefulness for teaching at 8.6/10) and to encourage students towards future science studies (71% reporting its value to them for this purpose).

Extent to which the outcomes have helped to address the needs that lead to the project

PICSE was established to meet the widely recognised growing shortage in Australia *of skilled science professionals to meet industry demand, particularly in those sectors in rural and regional areas.* The project proposal argued *that this crisis can be only averted by building Australia's human capacity in these areas of science, by linking schools, universities and industries*. The PICSE project has strategically focused its available resources around 8 Activity Centres across Australia. Within this sphere of interest, this evaluation has shown that PICSE has demonstrated a significant impact on participating schools, students and teachers in terms of raising the profile and interest in bioscience as a study option and future career.

- Eight universities and associated secondary and primary schools have been directly involved in the PICSE program, directly involving over 2,000 students, in the order of 100 staff as well as broader school community members as judges in the SIA and scientists/industry personnel through the IPS program.

- The feedback from participants is overwhelming in terms of the value of the program and impact on students and their teachers in terms of better understanding the need, role and career opportunities in the biosciences.
- Student feedback from the IPS program indicated that most participants had not previously considered careers in the bio-sciences but that many (75) indicated that this career direction was/would be their future study preference.
- Initial tracking from 219 graduates of the program indicated that 67% (147) were studying in biosciences (a further 25 in the medical and health sciences) over 15 universities across Australia.

Future PICSE directions on the basis of the data analysed.

The evaluation data clearly indicates that the PICSE suite of activities are working very effectively in terms of achieving the program goals and addressing the issue of ensuring the future workforce in the biosciences in Australia. It is clear that the IPS program is providing the cutting edge in terms of students reassigning their study and career options towards the biosciences. However, given that the indications are that three-quarters of participants had not previously considered this option seriously, then the importance of continuing complementary programs such as the SIA and Teacher PDs and classroom support is also highlighted.

The overriding message of the evaluation data is the need for PICSE to continue its momentum on all fronts and expand its sphere of operation to a broader number of schools if the national workforce issues in the biosciences are to be addressed.

- The participation data suggests that with female student participants outnumbering PICSE by one-third, there is a need to more proactively target male students.
- The impact data shows that the Teacher PD is a very effective tool in strengthening science teaching in schools and positively impacting on teachers' interest and ability to encourage their students to study science, understand the role of science in agriculture and follow careers in biosciences and agriculture. In addition leverage is supplied through the use of Teachers PD Travelling Scholarships. There is a defined multiplier benefit that can be attributed to the Teachers PD, which demonstrates how each teacher could be expected to influence at least 375 students in this direction.
- Student tracking data should include a feedback question on how much they attribute their choice to their involvement with PICSE.
- It is clearly essential for PICSE to develop stronger relationships with the 7-8 beneficiary Universities of the PICSE program that are not yet partners to maximise benefits from those universities.
- It is noted that the January 2012 Report to the Business/Higher Education Round Table, 'Rebuilding the Agricultural Workforce', Allen Consulting Group, recommends a significant rethink of the agriculture education model and recommends the fourth of the five priorities to be to 'expand the PICSE program'.

Contents

Purpose

The Mission of the Primary Industry Centre for Science Education or PICSE is to … *increase participation in BioScience professions.*

It does this through a series of six key goals that are based around three key drivers which are outlined below.

This evaluation report for 2011/12 captures and analyses the *impact* on students and teachers from their participation in PICSE activities. For participation in bioscience professions to *increase* as a result of PICSE activities, there needs to be a change in awareness, understanding and interest in bioscience professions among the cohort of students from targeted schools – with more students than otherwise – deciding to study for, and pursue careers in, these professions.

This report draws from impact data collected from participants in the Core Activities of the PICSE program – Science Class Engagement, Industry Placement Scholarships or the IPS program, Teacher Professional Development (PD) and creating teachers resources and communications. The data is assessed to determine the extent of this impact and it's expected and actual conversion to an increased number of students studying bioscience related tertiary courses post-secondary school and working towards rewarding careers in bioscience professions.

Key issues addressed are:

- The perceived value of the program (as determined by the evaluation) by investors, participants and partners
- Did teachers increase their understanding of workforce needs and student career pathway opportunities?
- Did students develop a deeper understanding of the value of science courses and their relevance to the contemporary workforce?
- On the basis of the MER, how did the Project attract students into tertiary science and increase the number of skilled professionals in science-based primary industries?
- Outline how the Activities of the Project have met the outcomes, including the performance indicators specified
- On the basis of the MER, how the outcomes have helped to address the needs that lead to the project, as identified and illustrated by the PICSE submission to the Department of Education, Employment and Workplace Relations (DEEWR)
- Identify future PICSE directions on the basis of the data analysed.

This Report draws together key data from the PICSE program areas and specifically addresses the KPIs set out in the DEEWR contract. These include but are not limited to:

- Summary of results and impact of each PICSE Core Activity – nationally.
- Highlights of each activity by each of the eight regional Activity Centres (ACs);
- Trends and comparisons of results from previous years (2009-2011), demonstrating the growth of engagement (or otherwise) and outcomes during the life of the project.

Background

PICSE seeks to achieve its mission of increasing participation in the BioScience professions through a series of key Goals:

1. Deliver innovative engagement programs for students and teachers that makes science relevant and exciting
2. Increase the range of experiences to allow students to make informed choices for tertiary science focused study and industry retention
3. Grow the partnership base by being responsive to investors drivers and business priorities
4. Effectively communicate the relevance and benefit of the PICSE program
5. Enhance program performance and innovation through evaluation
6. Deliver to Government priorities.

These Goals aim to attract an increased supply of high quality young people into science based primary industries through engagement with them during school years and early university. The program focus is to make them aware that tertiary science courses are the entry point for exciting and satisfying professional careers in primary industries.

The PICSE program's strategy is based on addressing these three key drivers:

- Raising **awareness,** amongst students and those who influence them, about career opportunities in these industries
- Creating an **interest / intention** in young people to seek specific science focussed career options in the primary industries
- Increasing **participation** in Yr 11 and 12 school science courses, so that participation increases in tertiary science related courses, which ultimately leads to increased numbers of young people entering suitable primary industry related careers.

To undertake this process, PICSE provides an established program and strategy that includes four core functions. These functions are all conducted in each of the PICSE Activity Centres (ACs), which are based at partner universities:

1. **Science Class Engagement** – including annual Yr 11/12 Science Class Visits by PICSE Science Education Officers (SEOs) and conducting a series of Science Investigation Awards in primary and high schools in the region of the ACs.

2. **Industry placement scholarships (IPS)** – after receiving a general invitation from PICSE SEOs, science students complete a written application to seek to participate in the IPS. Shortlisted students are invited to participate in a face-to-face interview in which 20-25 student participants of a high calibre, commitment and alignment to the PICSE mission are selected to continue in the program.

   The selected students complete the whole IPS program consisting of a five-day Science/Industry Camp in December, a five-day placement where each student becomes an integral part of a scientific or extension team in a variety of industries with hand-picked employers and a high profile Reporting Back Session with an audience of parents, teachers, university staff and industry mentors. At the completion of the IPS program, students are presented with a certificate of completion and a $300 scholarship cheque. Each Activity Centre selects an additional two students for a Travelling Scholarship to a PICSE Camp in another state. This acknowledges the value of these exceptional students, providing them with another opportunity to broaden their horizons.

Annually a national PICSE-Dow AgroSciences (DAS) Graduate Award is made to an outstanding Year 12 student participant of the PICSE national program. This is an all-expenses paid one week placement at the DAS Waireka Global Discovery Research Station in New Zealand.

3. **Teacher Professional Development** – science teachers are a crucial group of ambassadors for the PICSE program in schools. PICSE seeks input and advice from teachers and delivers resources and Professional Development (PD) courses that are valued by teachers. Each year, the theme of the 2-day PDs is common, though customised by each Activity Centre by relating it to the local primary industries and engaging with industry employers. By changing the theme each year, the PD remains topical and relevant, with many teachers registering for the PD year after year. The PD also provides an opportunity to launch that year's teaching resource.

   In addition the use of a Teacher's Travelling Scholarships, covering accommodation, travel and registration for a PICSE PD in another State, can be regarded as a "loyalty" scheme, for past teachers participants in the PICSE program. Each Activity Centre offers two Travelling Scholarships. The key purpose of the PD is to increase awareness and interest in primary industries and the relevance of the science taught to these local industries. In addition, teachers are exposed to the career opportunities for students available in these industries.

4. **Teaching Resources and Communications** – This function is the "Extension" side of the program, i.e. the process through which PICSE delivers the resources into the classroom, with the help of the SEOs and teachers. With the assistance of scientists and selected teachers, SEOs develop classroom materials that relate to local industries and support the curriculum. The PICSE national office collates these resources and outsources them to a software firm to produce an interactive CD. The PICSE national team also produces printed resource booklets for use in the Science Investigation Awards program.

   The key purpose of this function is to have a multidimensional communications portal including face-to-face (SEO and teachers) and web interface (www.picse.org) for each Activity Centre and the National Office, PICSE Facebook for student interaction, a monthly one page "Network" Newsletter, six monthly SEO Planning Forums, an annual Forum in Canberra to showcase the success of the student engagement and a national media strategy.

Collectively, these activities build strong and sustainable relationships with employers, science practitioners, educators and students (both primary and secondary with continued engagement at tertiary level).

Methodology

Impact data were collected from feedback sheets from participants in the key activity areas of the Science Investigation Awards (SIAs), Teachers PDs and the IPS (Camp and Industry Placement) program.

Feedback sheets were designed to differentiate Process Questions (for example: How much did you enjoy the activity?) from Impact Questions (for example: What influence did this have on your thinking about future study options?). In this report, we have focused only on the impact questions. The key areas of interest were:

1. Whether both teachers and students increased their awareness, understanding and interest in the biosciences, and
2. How this influenced choices made (or intended) by participating students.

The table below summarises the data sources and the analysis undertaken. Each Activity Centre received a summary of the impact data relevant to their Activity Centre for each of the SIAs, Teachers PD and IPS. The national office of PICSE received all those data plus a summary SIA Impact Report, a teachers PD Impact Report and an IPS Impact Report. The national reports served as a cross-analysis across the Activity Centres in each activity area.

Data Source	Analysis
Collate feedback from SIA awards on templates provided by PICSE. These include: • Students • Teachers • Judges	1. SIA impact data synthesised into tables, charts and graphs and segmented to represent each PICSE Activity Centre and Nationally. 2. Detailed commentary and analysis of SIA data relating to each Activity Centre and Nationally.
Collate feedback from Teacher PDs on templates provided by PICSE	1. Teacher PD impact data synthesised into tables, charts and graphs and segmented to represent each PICSE Activity Centre and Nationally. 2. Detailed commentary and analysis of Teacher PD data relating to each Activity Centre and Nationally.
Collate feedback from IPS program (Camps and Industry Placement) on templates provided by PICSE, including three Yr 9/10 camps.	1. Industry Placement Scholarship impact data – covering the Camp, the 5-day placements and the Reporting Back Sesssions – synthesised into tables, charts and graphs and segmented to represent each PICSE Activity Centre and Nationally. 2. Detailed commentary and analysis of the impact data relating to each Activity Centre and Nationally.
Tracking data on students post-secondary from each Activity Centre	1. Analysed by university, activity centre and study course area.

The data and reports were collated into this overall impact report and an Executive Summary destined to summarise the key findings to investors and key stakeholders. A particular stakeholder is the primary funder, DEEWR.

Overall Findings

The Mission of the Primary Industry Centre for Science Education or PICSE is to … *increase participation in BioScience professions.*

For participation in bioscience professions to *increase* as a result of PICSE activities, there needs to be a change in awareness, understanding and interest in bioscience professions among the cohort of students from targeted schools – with more students than otherwise – deciding to study for, and pursue careers in, these professions.

Participation and Reactions

SIA

From the initial 331 students participating in the first SIA in 2009/10, there have been over 1,000 students participating in each of the subsequent years (1,082; and 1,003 – reduced by the PICSE program to ensure the level of the experience was maintained) and more Activity Centres (now 8) became involved and at the same time as more students became involved in most centres. The number of teachers increased as well over this period from an initial 23 to 61 in 2011/12. The broader involvement in the program has also been underlined by the 202 people who have undertaken the judging role in the program.

This level of participation reflects a high level of interest in the program and the value that the school community sees in the activity for students. This is reflected in an increasing level of response from students about wanting to be involved in subsequent years from the initial 80% to the current 88%. This demonstrates consistent longer term continued and increased interest – and gives confidence about the future potential.

Comments were consistent with this reported on-going interest with a high level of 'enjoyment' and 'fun' being associated with the event by students. Feedback from teachers across Activity Centres strongly supported the view that the SIA program was effective in engaging students in science in a way that had been previously lacking. Judges too noted and commented on this impact and the value of the learning approach.

The value of this activity lies in this opportunity to engage the broader school community – and provide a supporting environment to students who may be considering bioscience careers. The focus of the SIA program is fundamentally about generating Awareness and Interest in students, teachers and community members. That 88% of respondents reported continued interest in future annual engagement, demonstrates a level of Intention for greater Participation in the program longer term.

The over 1,000 students involved in the SIA needs to be put into context with the 164 who participated in the IPS program. This demonstrates that a range of activities are needed to engage the wider group of students, teachers and the broader school community in the importance and opportunities of bioscience related careers and that while some fulfil Awareness functions others such as the IPS move strongly towards Participation.

The gender balance has remained consistent across the 2010 and 2011 data with approximately one-third more female students participating. This reflects the increasing

interest and participation in science studies in female students and decreasing engagement of male students.

It is noteworthy that global PICSE agribusiness investor and partner, Dow AgroSciences, was sufficiently impressed with the SIA program that in 2011 it negotiated with PICSE to fund an expansion of the program. This has become known as the PICSE-Dow AgroSciences Science for Growth Program. It is to be launched in March 2012 and will be focussed on engagement of regional and capital city students who for geographic reasons and due to PICSE's limited resources are unable to participate directly in the SIA program. This Science for Growth Program has secured the involvement of peak body Australian Science Teachers Association.

IPS (Camps and Industry Placement)

As noted above, the IPS program involved 164 student participants across the eight Activity Centres in 2011/12 – up from the initial 120 who were involved in the 2009/10 program. There was a consistent message that students now had a better and broader understanding and knowledge of the science related study and career opportunities available to them.

A large majority of students who attended the IPS Camp (84.1% or 138) and the IPS RBS (87.8% or 129) indicated that their view on the importance of science in Primary Industry had changed as a result of their involvement. They attributed the main influences for this as … *talking and interacting with people directly involved in the industry,* plus … *experiencing workplaces and better understanding real career activities being undertaken*.

Students commented that *this in particular had given them a better understanding of what is involved with, as well as what opportunities are available in terms of careers in Primary Industry and biosciences.* Many students also mentioned *the hands-on nature of the program and camp, as well as the value of the talks, tours and presentations.*

This widespread response demonstrates that the program is providing the experiential learning opportunities that the program proposed to provide. It makes the link between the classroom and practice – as well as Participation in the ultimate career destination(s). This activity provides an opportunity for students to explore – either to test the study option that is already in their mind – or to see if this potentially is a better career choice than the option(s) they had previously been considering.

For many students this is the first time they have experienced a 'real career setting' on which to judge their thinking or career expectations. Further it supported more informed tertiary course destinations – on the basis that they had met / understood / experienced real tertiary institution engagement including understanding at a personal level the career implications of their tertiary course choices. 70% (114) of students therefore reassessed their options for future careers and study to the extent that 39% (64) demonstrated interest in PhD studies in 2012.

Sixty percent of students participating in the IPS program were female students. This reflects a similar level of participation to the SIA activity, noting that the UTAS Activity Centre has a majority of males.

Teachers PD

Consistent with the need to provide a supporting and informed environment in schools, the Teachers PD Activity seeks to broaden the reach of the PICSE program by encouraging, skilling and resourcing those teachers who are engaged in teaching science related subjects at school. The logic is that teachers can influence student choices by providing interesting and well informed teaching programs for students that pique their interest whilst meeting curriculum needs.

In this case the proposition is that teachers will use exemplars from bioscience and primary industries when provided with interesting and relevant exemplars from those industries. In being able to make links from classroom teaching to the real world, teachers can also refer to the specific career opportunities they are now more aware of, by relating their teaching in their area of expertise to those real settings.

The original 102 teachers in 2009/10 climbed to 154/153 in the two subsequent years as three more Activity Centres became operational. It is expected that at any location, there will be a set number of teachers who would see this as relevant to their teaching area.

Eighty-four percent or 129 of these participants indicated that they intended to attend in the following year – which was a significant indication of relevance and value. On average, teacher participants rated this as one of the highest value of PICSE activities.

Seventy-five percent or 115 indicated that the 2011/12 PD had provided them with a greater depth of knowledge in their subject area with 92% or 140 indicating that the resources and activities provided were of direct relevance to their next year's curriculum.

It is noteworthy that, given teachers teach different classes and subject areas in a high school and senior school, their influence is multiplied. A potential impact scenario for secondary science teachers attending the PICSE Teacher PD was developed in 2012:

> *Based on a full teaching load of 5 classes and an average of 25 students/class per year, an average teacher could be expected to influence approximately 125 students / year. Further each teacher can be reasonably expected to embed that experience in their teaching curriculum for 3 years before being influenced by curriculum changes to revise their teaching materials.*
>
> *Therefore at a curriculum level the involvement of one teacher could influence 375 students over 3 years. The PICSE-wide influence each year, of the over 150 teachers who have attended the last two years, could represent influence on over 56,250 students Australia-wide as a result of one annual PICSE Teachers PD Activity.*
>
> *This however excludes the impact that the program might have on teachers at a personal level. This personal influence is potentially an additional influence to their thinking about the importance and value of primary industries and the potential bioscience career opportunities for students.*

Impact on thinking and choices

SIA

Critical with this activity was whether it just filled in time for participants with an interesting activity – or whether it actually had a lasting effect on attitudes and actions.

Sixty-six percent of secondary students who participated in the SIA activity in 2011/12 indicated that their participation had helped their understanding of science. Ten percent of primary students indicated that they liked science (even) more after the activity (from the high 84% prior to the experiment). Students rated the impact of their involvement on their view of science and science studies at an average of 6.5/10 – a moderate level across a large number of students.

As indicated above, Teachers involved in SIA rated the activity as having a relatively high impact on students' interest in science – and was particularly good at engaging students who previously showed little interest. Judges also reflected this view – but had less direct contact with students and so were less able to offer their view on this.

As a result it can be considered that the SIA program supports increased Interest as well as Awareness of the biosciences.

The SIA program is also potentially cumulative. Students could participate in the program over a number of years – reinforcing their interest in defined science focused study and career opportunities – and teachers and the broader school community can have their own interest and confidence in science refreshed from year to year.

The high level of interest in participating in future years referred to earlier suggests this may well be the case.

IPS (Camps and Industry Placement)

It could be assumed that many students who participated in the Camps/IPS program also had participated in the SIA program. For them, it is an opportunity to 'get up close' to the implications of a bioscience study choice and subsequent career. The ability of the program to further impact on thinking and choices of this group of interested/already sensitised students is central to the PICSE model.

This impact was strongly reflected in student responses to impact questions. Eighty-four percent (138) of camp participants (88% or 129 after the placement) changed their view regarding the importance of science in primary industry.

In practice, only 25% (41) indicated that they already had a strong commitment to careers in the biosciences prior to the camp – which meant that the activity attracted over 120 students who weren't committed to careers in this area. Sixty percent (98) of these (66% or 97 after placement) indicated that, as a result of their participation, they were now interested in science careers in primary industries. If this translated to university studies, it would mean that, just through the camp activities in PICSE, an extra 75-80 students would start the journey into bioscience careers.

A high 82% (134) of student camp participants (71% or 105 after placement) indicated that they were currently enrolled – or intended to enrol – in a course related to science or primary industries. This would translate to approximately the number indicated above – around at least 75 extra student science enrolments.

Given the low numbers currently across Australia, the number is quite significant. The Australian Council of Deans of Agricultural Science has prepared considerable data on the status of tertiary students vs. professional graduate staff needs.

Agricultural, biological and environmental sciences were the types of courses most students indicated as their preferred (Year 11) or actual (some Year 12) study areas. The initial follow up data with students in 2012 showed that the actual study areas generally followed this intention – as shown in the table below.

Study Area	Number students	% of Total
Agricultural/Rural/Veterinary Science	67	**31**
Environmental Science	14	**6**
General /Aquaculture/Marine/Biological science	66	**30**
Medical/health	25	11
Engineering	17	8
Non-science (law, other)	30	14
Total	**219**	**100%**

This type of data is demonstrating the flow-on benefits from the PICSE program to university placements. There is substantial evidence that even in this relatively limited program across 8 Activity Centres, around 80 students each year (last two years) have reacted to the opportunities provided by PICSE to shift their study choices in the direction of biosciences.

Looking at it another way, without PICSE, there could be 70-80 students fewer choosing to study the biosciences in each of the last two years – or over 150 less potential professionals in the system since 2010.

The follow up data also showed that a number of universities across Australia specifically benefited from these student cohorts. This includes several universities who are not PICSE partners so by default they derive considerable benefit from the PICSE program without making a contribution directly or indirectly.

These include Adelaide University, University of Queensland, Melbourne University, etc who are nominated by students as preferred sites for their courses. The PICSE graduate data outlined below that tracks the eventual tertiary institutions which these students attend post PICSE demonstrates far-reaching consequences.

Teachers PD

The Teacher PD activity seeks to influence teachers who in turn can influence young people to study science in school and at university in preparation for embarking on careers in primary industries/biosciences. It seeks to provide useful resources while supporting the motivation and thinking about the valuable contribution of teaching science. The impact needs to be in how participation in the program increases teacher interest and ability to subsequently support and encourage students in pursing bioscience activities.

There is strong evidence in data supporting this impact. Eighty-four percent or 129 of participating teachers in 2011/12 reported that involvement had provided *increased value in supporting teachers to help encourage students to continue to study science* while also supporting teachers in *being able to better advise students about career opportunities in science based industries* (85% or 130).

The material and experiences were rated highly as helping their teaching (average rating **8.6 out of 10**) and that it had gained new and relevant information that would help them teach

and motivate their students. Eighty-five percent or 130 believed that they were now better able to advise students in science careers, with a similar number indicated that they felt better able to encourage students to continue on with science careers. They also believed it was highly beneficial in providing them with an opportunity to develop relationships with sources who could provide assistance (average rating 8.4 out of 10). This reflects the student responses as to the value of the IPS program – being able to link their school experiences to the real world.

Seventy-three percent or 111 of teacher participants reported impacts on their thinking – about science and its teaching – with 63% reporting that it had motivated them in their teaching.

It is clear that the teacher PDs are providing the impact intended – and ,as noted above, this activity has the clear logical potential to influence a much wider group of students than attend the IPS program – or SIAs.

Summing up

The evidence is clearly showing the range of PICSE activities are fulfilling the niche that they are targeted towards:

- The SIA is positively engaging the broader school community in science activities and raising the profile and interest in the biosciences.
- The Teacher PDs are clearly providing valuable support to those who teach bioscience related subjects and are providing them with useful materials, contacts, industry knowledge, networks and motivation to encourage students in scientific studies and careers.
- The IPS program is having a very big influence on participating students in terms of their view of agriculture and other bioscience related careers – and directly influencing their choices.
- It would seem as if the program in its current form is influencing in the order of at least 70 students per year to choose tertiary studies in the biosciences that otherwise may well not make that choice .

Given the current and projected shortages of students and professionals in these areas, there is a strong argument for this approach to continue and to be expanded.

The following sections of the Overall Impact Report provide the details that support the overview comments reported above. They are further supported by detailed SIA, Teachers PD and IPS Overall Impact Reports. These are in turn supported by a suite of Activity Centre specific reports.

Science Investigation Awards (SIA) Activity

The SIA Activity is focussed on meeting two of PICSE's **Goals**:

- Deliver innovative engagement programs for students and teachers that makes science relevant and exciting
- Increase the range of experiences to allow students to make informed choices for tertiary science focused study and industry retention

The **Objective** of the SIA Activity is to add value to the science class engagement by reinforcing science curriculum key learning's, generate new interest in science, foster teamwork, improve concentration, make science fun, create new experiences relating to science, impact on student career choice and build confidence in students. The **Process** of the SIA is to make science real to students (and teachers) by exposing them to 'science in action' by personal investigations of specific scientific endeavours through considering real life examples. In this way the SIAs complete science class visits by SEOs.

Each PICSE Activity Centre delivers SIA programs for primary and secondary schools according to the SIA parameters specifically agreed between the university partner and PICSE

Summary of Evaluation Findings from 2011/2012

Students

While there has been a slight 7% decline in number of **student participants** overall, the level of enjoyment and the impact of the program, on the view by secondary students, of science and science studies (which reflects their level of interest in taking science subjects in Years 11 and 12 and as a career option) remained constant. The new evaluation question for 2011 regarding the extent to which the program helped their understanding of science (which supports their level of interest) revealed a strong figure of 66%.

However the interest of students in participating in next year's program increased by 4% which demonstrates slightly increased interest in the key impact indicator of Participation. It is noteworthy that this important indicator has risen across the PICSE program in the three recent years from 80% through 84% to the current level of 88%. Generally students reported satisfaction factors such as … *(the program) being well organised, interaction with other students and the judges*, *wonderful, an interesting event, great, fun and enjoyable* with some keen to *revisit the program*.

The decline in participation has to be considered in context – in 2009 the numbers were 331, whereas the numbers in 2010 rose dramatically to 1,082. For that reason the slight decrease in participant numbers may simply be that a sustainable level has been reached. However the potential for it to rise in future is clearly apparent, with an increased interest in participation being foreshadowed for the 2012 school year.

Another important impact indicator question sought an understanding of the changed levels of 'liking of science before and after involvement in the SIA program'. The level of change was +10% demonstrating a positive impact of the SIA program on the enjoyment by students of science as a discipline.

Students commented:

- *Finding out the truth about something we are interested in by our own experiment* ***(UTAS Secondary)***
- *Coming to UWA, seeing other students here and learning about the university* ***(UWA Secondary)***
- *It helped me realise that there is more to science and that if we want to we can easily deepen our knowledge.* ***(UTAS Secondary)***
- *It showed me just how much science affects your life as it includes so much of everyday life.* ***(UWA Secondary)***
- *It's more than just sitting in a classroom. It's more interactive and involving.* ***(GrowSmart Secondary)***

Judges

In terms of impact on those who can be influential in the community, the level of support of **SIA judges** remained largely constant at a high level of belief that the PICSE program overall … *is having a high impact on students.* Judges commented on issues including … *students engaged well with projects, students were passionate about their projects, students had done some great research,* as well as reporting … *the need for greater interaction with /feedback to students* .The level of feedback from judges to students appears an area of consideration for PICSE management.

There has been consistent, strongly held belief by judges over the last three years that the SIA program is promoting positive engagement and creating a strong learning experience for students. Similarly there has been a consistently strong continued interest in future involvement by judges in the SIA program based on the perceived value of the judges' role and the contribution they are making to the program and to the future of the students and their potential role in the industry.

Judges comments:

- *Many of the students learnt a lot from the process and were very enthusiastic about the experiments*
- *Many put a lot of effort in and were very excited and motivated in the end, by their results*

Teachers

Teacher participation overall rose between the 2010 and 2011 programs based on a significant increase from USQ – while most activity centres generally saw a small decline in participation. This appears to be a matter for attention by PICSE management to determine why this has occurred and the extent to which it is important to the integrity of the program. Teachers generally continued to rate the PICSE program as having a relatively high impact on students' interest in science as a study area. There was a consistent belief by teachers across activity centres that the SIA program positively engaged students who were previously uninterested in science.

This observation is an important determinant of the success of the PICSE program, given that PICSE's objective is to engage with students who are yet to confirm their interest in science and the agri-food and fibre industries. This is an important factor in considering the counterfactual – if the PICSE SIA Program did not exist, then the conversion of these students to 'interested in science' is unlikely to have occurred.

Teachers have also maintained their interest in continued involvement in the SIA program. This demonstrates the value and faith that this discerning audience sees and has in the SIA program. A number reported interest in continued involvement over time and a number reported 'steady improvement in the program' over time.

There was general consistency in the views of both the judges and teacher feedback across activity centres.

The issue of gender balance – in favour of female students – remained consistent across the 2010 and 2011 years. However it is noted that there were generally greater numbers of males than females across a number of Activity Centres in the primary school years, which was overall was reversed in secondary school years. The extent of concern about gender balance is an issue for PICSE management.

At an organisational level the PICSE Activity Centre management systems require some fine tuning on the basis that the Charles Sturt University Activity Centre failed to provide the necessary data for a review of their Activity Centre due to unclear deadlines and the Cotton Industry Activity Centre provided partial rather than full data as a result of a wildcat teachers strike in NSW that caught organisers unawares.

Teachers comments:

- *High impact. Students see the value of their work and this is acknowledged in scientist interest*
- *Students saw scientists and the possibilities they perhaps didn't know about*
- *Spot on. Interaction with the scientists is the key*
- *Very interesting day. Looking forward to next year*

Trends

Student Participation

Student Numbers (both primary and secondary)			
Activity Centre	**2009/2010**	**2010/2011***	**2011/2012**
Cotton CRC		26	**5**
Flinders	24**	25	**69**
GrowSmart		94	**133**
UNE	26	53	**84**
USC		73	**115**
USQ	6	47	**40**
UTAS	189	482	**436**
UWA	86	282	**121**
Overall	331	1082	**1003**

*Note: The sharp increase in participation is due to SIA pilot program in 2009 being fully implemented during 2010.
**Note: Flinders and GrowSmart were grouped together in 2009/2010 data.

Teacher Participation

Teacher Numbers			
Activity Centre	**2009/2010**	**2010/2011**	**2011/2012**
Cotton CRC		6	**1**
Flinders	4*	2	**2**
GrowSmart		7	**5**
UNE	5	8	**9**
USC		4	**7**
USQ	1	4	**1**
UTAS	9	19	**23**
UWA	4	5	**13**
Overall	23	55	**61**

*Note: Flinders and GrowSmart were grouped together in 2009/2010 data.

Judges Participation

Judges Numbers			
Activity Centre	**2009/2010**	**2010/2011**	**2011/2012**
Cotton CRC		8	**11**
Flinders	5*	4	**10**
GrowSmart		12	**26**
UNE	6	20	**21**
USC		22	**39**
USQ	2	10	**6**
UTAS	52	73	**65**
UWA	16	18	**24**
Overall	81	167	**202**

*Note: Flinders and GrowSmart were grouped together in 2009/2010 data.

OVERALL SIA **student** participant scorecard 2009/2010* - 2011/2012

No of students participating** (primary and secondary)

7% from 2010/2011

Total participants		
2009/2010	2010/2011	2011/2012
331	1082	1002

Enjoyment of the program (primary and secondary)

Quite enjoyable – No change from 2010/2011

Overall average rating		
2009/2010	2010/2011	2011/2012
7.6 (range 6.6 - 9.3)	7.9 (range 7.3 – 9.0)	7.9 (range 6.8 – 8.8)

Did the experiment help school work (primary only)

No comparison available

(Different question style across 3 years - 2009 feedback was comments, 2010 checkboxes, 2011 primary students only asked if experiment helped with school work)

Overall % who felt experiment helped with school work
2011/2012
64%

Impact on view of science and science studies (secondary only)

Moderate impact – no change from 2011/2010

Overall average rating		
2009/2010	2010/2011	2011/2012
6.2	6.5	6.4

- UWA student average ratings fell marginally from **6.2** in 2009 to **5.9** in 2010 but rose sharply to **7.4** in 2011
- USQ student average ratings are falling over the last 3 years from **8** in 2009 to **7.3** in 2010 to **5.8** in 2011

* Cotton CRC and USC not included in 2009/2010 data
** Note that the sharp increase in participation is due to move from pilot program in 2009 to full program in 2010

SIA helped understanding of science (Secondary only)

No comparison available

(New question from 2011/2012)

Overall % who said yes
2011/2012
66%

Interest in participating next year (primary and secondary)

Marginal change in high interest from 2010/2011

Overall % change		
2009/2010	2010/2011	2011/2012
80%	84%	88%

- 100% of USQ secondary students interested in future participation (up from 83% 2010/2011)
- 100% of GrowSmart primary students interested in future participation (up from 68% 2010/2011)

Like of science before and after experiment (primary school question only)

No comparison available

(Note 2010/2011 data asked one question only – Enjoy Science more because of SIA – rather than 2 parts)

Overall % change in before and after experiment
2011/2012
+10%

- 10% more primary school students liked science post the experiment (84% before; 94% after).

Student Impacts – 2011/12

Enjoyment of the SIA

Overall students continued to enjoy the SIA program (average rating of 7.9 out of 10). Continuing the trend from 2010/2011, primary school students on average rated their enjoyment of the program at a greater level than secondary school students (the former average rating 8.5 and latter 7.7).

Student sentiments did not generally change from last year with all student levels continuing to enjoy the practical activities, experiments and learning new things.

Primary school students noted that they enjoyed doing the experiments, watching them unfold, seeing the outcomes and working with friends. **Secondary students** also enjoyed designing their own experiment/project, actually undertaking the projects, presenting their results and working in a team.

The testing because it was a lot of fun and it was a chance to try different things for the experiment ***(GrowSmart Primary)***

Working together, planning, experimenting and having a heap of fun ***(USC Primary)***

Finding out the truth about something we are interested in by our own experiment ***(UTAS Secondary)***

Coming to UWA, seeing other students here and learning about the university ***(UWA Secondary)***

Having to summarise the investigation in order for it to fit on the board ***(USC Secondary – enjoyed least)***

The majority of **primary school students** (84%) indicated that they enjoyed science prior to the SIA program with this figure rising by 10% after the experiment had been conducted. Almost two thirds (64%) indicated that the experiment helped schoolwork.

There was little change in **primary** or **secondary** school comments about what they least enjoyed; including actually doing and writing up the work and the length of time it took to complete some projects. This year there was little mention of short timeframes or long waits in the judging process as there was previously.

I have never really enjoyed science, so this didn't help much. ***(UNE Secondary)***

It helped me realise that there is more to science and that if we want to we can easily deepen our knowledge. ***(UTAS Secondary)***

It showed me just how much science affects your life as it includes so much of everyday life. ***(UWA Secondary)***

It's more than just sitting in a classroom. It's more interactive and involving. ***(GrowSmart Secondary)***

I already had an interest in science prior to participation in the SIA program. ***(Cotton CRC Secondary)***

Impact on view of science and science studies – secondary only

Students rating of the impact of the SIA program on their view of science and science studies remained at a moderate level – the same as last year (overall average rating 6.4 out of 10 – last year 6.3).

This year UWA rated the highest level of impact (average rating 7.4 – last year **USQ** students rated the highest level of impact average rating 7.3) and as last year the **Cotton CRC** had the lowest (average rating down from 5.3 to 4.2).

Student comments remained similar to last year in that they were already interested in science. Some noted that SIA made science more fun and accessible as well as expanding their perceptions that science isn't just in the classroom.

Two thirds of students (66%) indicated that SIA helped their understanding of science. Students commented that they had more understanding of how things worked and the broader applications of science.

Other issues

The gender balance has remained consistent across the 2010 and 2011 data with approximately one-third more female students participating.

Teacher Impacts

Overall teacher participation rose between 2010/2011 and 2011/2012 however the majority of these were in USQ where 19 more teachers were involved than last year. Most of the other activity centres generally saw a small decline in participation apart from GrowSmart where 2 more teachers were involved than last year and UWA and Flinders which retained the same numbers.

Teachers generally continued to rate the PICSE program as having a relatively high impact on students' interest in science as a study area. There was a consistent belief across activity centres that the SIA program positively engaged students who were previously uninterested in science. Teachers have also maintained their interest in continued involvement in the awards program.

High impact. Students see the value of their work and this is acknowledged in scientist interest ***(UNE Teacher)***

The awards have provided us with an excellent opportunity to engage students in science ***(UTAS Teacher)***

Extremely well organised and feedback from "real" scientists is really valued by our students. A fantastic program ***(UWA Teacher)***

It gave them confidence in their ability and showed them that while they were inexperienced they could produce a project they could be proud of. They are looking forward to next year ***(Flinders Teacher)***

Consistent with the view of the judges, teacher feedback varied little across activity centres, although some changes were noted including:

GrowSmart

- Teacher participation **decreased** by 22% after rising by 125% the previous year (from 4 to 9 to 7)
- In 2010 there was a fall in the teachers' average rating of the value of the judging process and presentations in maximising the benefits of the program (**average rating down** from 8.9 to 7.8)

USQ

- Teacher participation **increased** by 475% (from 4 to 23)
- Belief that the experience impacted on students' interest in science as a study area rose slightly between 2010 and 2011 (**average rating up** from 8.3 to 9.0).

USC

- After increasing by 300% last year (from 1 to 4) teacher participation **returned to 1** in 2011/2012

UTAS

- After increasing by 111% last year (from 9 to 19), teacher participation **this year fell** by 32% (to 13)
- Teachers felt that the support of the science investigation officer and their resources to the success of the program was less useful this year (**average rating down** from 7.4 to 5.6)

UWA

- Teacher participation **remained the same** after increasing by 25% the previous year (from 4 to 5 staying at 5).
- The falling trend in the teachers rating of usefulness of the SEO Officers between 2009 and 2010 continued in 2011 (**average rating down** from 9.5 to 8.4 to 6.0).

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Judge Impacts

Judge participation continued to generally increase or remain similar, continuing the trend over the last two years. Only two activity centres (USQ and UTAS) saw a decrease in the number of participants. Participants generally maintained their perception that the PICSE program is having a high impact on students, apart from the Cotton CRC judges whose average rating dropped from 8.4 to 6.3. They commented that it was hard to tell when no students were present to discuss the question face to face (due to the teachers strike).

There also appeared to be a small decline in judges' belief in the value of the judging process maximising the benefit for students. Ratings were marginally down across most centres; the biggest rating fall being in Flinders. The belief that the SIA promoted positive engagement and a learning experience for students has been consistently strong over the last three years as was the judges' continued interest in future involvement.

This sort of experience is sure to impact the students and make them more interested in science ***(UWA Judge)***

This is an important and vital part of the application of science ***(UTAS Judge)***

The judging process is crucial. This will become even more so as the numbers rise ***(USQ Judge)***

The program encourages and motivates the young students to focus on science. I think it was a great success ***(UNE Judge)***

I think it's a great program for students, great for them to have the opportunity for feedback, to present their ideas and to see other student work ***(Cotton CRC Judge)***

Overall this feedback did not vary to a great degree across activity centres, however, a few changes were noted.

Flinders

- Judge participation **increased** by 150% from 2010/2011 (up from 4 to 10).
- Their belief in the value of the judging process in maximising the benefit for students **decreased** (**average rating down** from 10 to 7.4).

GrowSmart[1]

- Judge participation **increased** by 117% from 2010/2011 (up from 12 to 26).
- Their belief in the impact of SIA on students' interest in science fell slightly (**average rating down** from 8.2 to 7.4).

USQ

[1] *Please note that in 2009 Flinders/GrowSmart were grouped together whereas in 2010, they were treated separately*

- Judge participation **decreased** by 40% after a significant increase of 400% from 2009 to 2010 (up from 2 to 10 then down to 6).
- The average rating judges gave the value of the judging process in maximising the benefit for students slightly fell (**average rating down** from of 8.3 to 7.8).

UTAS

- Judge participation **decreased** by 12% in 2011/2012 after a strong increase of 40% the previous year (up from 52 to 73 then falling to 64).
- There was a slight fall in the judges' rating of value of the judging process in maximising the benefit for students (**average rating down** from 8.3 to 7.6).

Cotton CRC

- Judge participation **increased** by 38% (up from 8 to 11)
- There was a marked **decrease** in the judges' belief of the impact of SIA on student interest in science (**average rating down** from 8.4 to 6.3)

USC

- Judge participation generally **remained the same** (from 20 to 21)
- There was a **decrease** in the judges rating of value of the judging process in maximising the benefit for students (**average rating down** from 9.4 to 7.9)

The Industry Placement Scholarship Program

The Industry Placement Scholarship Program or IPS includes the student camp where over a week a group of students are collectively exposed to a range of industry careers in action by meeting handpicked employers in their workplaces, a five-day individual (or sometimes a small group) placement where each student becomes an integral part of the work team of those hand-picked employers, then finally a high profile Reporting Back Session where they explain the significance of their exposure to those workplaces / industries to their peers.

The IPS Activity is focussed on meeting two of PICSE's **Goals**:

- Deliver innovative engagement programs for students and teachers that makes science relevant and exciting
- Increase the range of experiences to allow students to make informed choices for tertiary science focused study and industry retention

The **Objective** of the IPS focuses on increasing the awareness and interest/intention of students (as well as teachers at a distance) about the importance and value of the science being used in primary industries, relating this to student career opportunities in those industries. It specifically focuses on increasing the future participation of students in the industry by getting them to personally experience a real-life handpicked workplace. The **Process** of the IPS is to make this real through students experiencing the excitement and enthusiasm of others in their workplaces and then having a 5-day experience of working themselves in a real work setting that might be applicable to them in future.

Each PICSE Activity Centre delivers one IPS program annually. This may include students from other locations through the Travelling Scholarship Program.

The IPS program is the **pre-eminent element** of the PICSE program in that it delivers the experiential component of the program that focuses on the core area of value of the PICSE program – increasing the participation of bright young students in bio-science careers. The value added effects come from the group dynamics and the flow-on of the enthusiasm generated to teachers and other students.

Summary of Evaluation Findings 2011/2012

Impact on thinking and interest

One of the most critical impacts of the Camp/IPS program is to open students' eyes to the possibilities for bio-science and primary industry careers. The best indicator for this was the questions relating to whether participation in the program changed students' views regarding the importance of science in primary industry and whether it had a positive impact on their level of interest in pursuing a career in science and primary industries. Given that the program could have been expected to attract those with some interest anyway, capturing a significant change in views could be expected to have been difficult. In practice, however, there was a strong recorded impact in these key areas:

- 84% of camp respondents (138) reported that they had changed their view regarding the importance of science in primary industry. This was mirrored in the feedback from the IPS reporting back session where 88% (129) indicated the same change. A

student from Flinders reported … *It has ignited my passion further and has opened my mind to more career possibilities*

- While 25% (41) of camp participants indicated that they already (prior to participation) had a strong commitment to careers in science/primary industries, a very high 60% (98) indicated that, as a direct result of their participation, *they were now interested in a science career in primary industries*. 13% (21)indicated no change in the already lack of interest and 1 person indicated that they were now less interested (also an important element). This trend was strengthened following the completed IPS program which included the camp – with 66% (97) now indicating increased interest in such study and careers, 20% (30) indicating that their already positive interest had not changed (it is notable that some gained even more interest over the whole program), and 12% (17) continued 'no interest'. A student from the Charles Sturt University Activity Centre reported … *It has broadened my ideas for course choices and opportunities available.*

- This level of impact is very significant in terms of potentially influencing increased enrolments into science and primary industry related studies. One key attribute to this change was … *talking and interacting with people directly involved in the industry*

- The level of impact in student thinking was very similar to that observed in previous years reinforcing the extent and size of the impact that such a program has on participants.

Given (me) insight into the broad range of quality opportunities available
(Student at USC Activity Centre)

Translation to enrolments/intended enrolments

Participants were also asked to indicate their enrolment intentions (or actual enrolment if Year 12 students had already applied) in a course related to science or primary industries. The trend reflected the levels of interest indicated by students in pursuing these studies – either because they had already planned for this – or because of the influence that the experience had on them.

- 82% of students (134) indicated that they were currently enrolled – or intended to enrol – in a course related to science or primary industries. Only 12% (20) indicated that they had not/did not – with 6% (10) indicating that this was not relevant – perhaps because they did not intend to directly study post Year 12.

- Although following the same high trend, the IPS response – 71% (105) – was a little lower than the initial post-camp response. Perhaps the extra time brought back some form of reality check or issues of practicality or parental / peer / teacher influence occurred. However, even working on the conservative 71% of actual/intended compared to the initial 20% (31) of interest (pre-camp), indicates a very high potential translation to actual increased enrolments. It is noteworthy that this reduction occurred in most Activity Centres so this is potentially an area for attention and fine tuning by PICSE management.

- The work of the PICSE program, based on these figures, directly translates to a potential extra 75 or more students enrolling into science/primary industry courses.

- The highest ranked courses that students indicated that they were interested in enrolling in (or had enrolled in) were Agricultural related course followed by biological and environmental sciences. It was interesting to see a high preference for Medicine amongst preferred courses (17 or 11% of camp participants choosing this as their first

preference). A student at UWA reported that it … *Has made me more opened minded about agricultural sciences and there are so many good options.*

- 70% (114) of students indicated that participation in the camp had resulted in them reassessing their options for future careers and study.

- University preference can normally be expected to reflect the type of course, numbers of student responses and their localized university catchment area. This is reflected in the results – with a high indication of interest across universities offering these courses. Some mentioned increased interest in studying at the particular university (Activity Centre) involved with their industry placement program demonstrating loyalty to that site.

- 39% (64) of camp respondents indicated that they were interested in future PhD studies with 59% (96) undecided (note, most participants were still in Year 11 and such a decision would seem premature for many). It is not clear how much influence the camp had on this level of interest.

This level of impact in intended or actual studies and career also reflected that found in earlier years, again reinforcing the impact that changed attitudes can and does have on decision-making.

An overall observation is the extent to which students made very defined course assessments as a result of attending the IPS program. For example a number of students attending the Flinders, UTAS, UWA and USC program were highly impacted by the aquaculture and marine science focus. This translated to the second highest rating of interest at the Flinders Activity Centre on careers / course preferences in the Aquaculture / Marine Science disciplines. A number of other quite specific university destinations were also selected.

Given me a clear understanding of what courses I want to complete and will be suited to me ***(Student at UNE Activity Centre)***

Level of influence

The IPS Program has grown – as demonstrated by the responses analysed in this report. There were 164 (147 IPS feedback) participant responses in 2011/12 compared to 152 (136 IPS feedback) in 2010/2011 and 120 (90 IPS feedback) in 2009/10 – an overall increase on both figures of approximately 50% over 2009/10 figures.

- These students ranged from 13-27 in number across each of 8 locations. Many of these were in Year 11 when they participated. This provides a critical mass of individuals in a range of locations who also have the potential to influence other students in their choices. A student at the USQ Activity Centre reported their key influence being … *Getting hands on experience and talking with industry professionals.*

- 64% (105) of camp respondents were female (60% or 89 from the IPS reporting back session). This is in-line with broader educational trends – but also highlights the need for better targeting of male students to participate in the program, noting that the UTAS Activity Centre has a majority of males.

I have become very focused and it has helped me find a goal to aim for ***(Student at the UWA Activity Centre)***

Organisations such as the Costa Group's AgriExchange were nominated specifically as sites that influenced student career decisions.

Number and Spread of Students Attending the IPS Camp and IPS RBS

There was a progressive increase in student respondent numbers over three years for the both the IPS Camp and the IPS RBS. The increase between 2010/2011 and 2011/2012 though, was only slight, with IPS Camp numbers increasing by 12 and IPS RBS numbers increasing by 13. (***Note:*** *It is important to take into account the number of respondents for each Activity Centre in relation to the Overall PICSE Teacher PD Scorecard 2010/2011 – 2011/2012. For example, small changes where there are low numbers in an Activity Centre can equate to a large percentage change for that centre. CSU is a new activity centre for 2011/201. In 2009/2010 Flinders and GrowSmart data was combined as one Activity Centre.*)

IPS Camp - Respondent Numbers			
Activity Centre	**2009/2010**	**2010/2011**	**2011/2012**
CSU *	-	-	13
Flinders	31	18	20
GrowSmart	**	18	20
UNE	18	21	23
USC	7	21	22
USQ	14	17	18
UTAS	25	29	21
UWA	25	28	27
Overall	**120**	**152**	**164**

IPS RBS - Respondent Numbers			
Activity Centre	**2009/2010**	**2010/2011**	**2011/2012**
CSU *	-	-	12
Flinders	29	14	17
GrowSmart	**	16	20
UNE	21	19	19
USC	5	22	20
USQ	5	16	15
UTAS	20	25	20
UWA	10	24	24
Overall	**90**	**136**	**147**

Changes in Impact

This section shows how the average responses to specific impact questions have varied from the previous year (2010/2011). There were many questions that were difficult to make direct comparisons between, as their wording and response options differed between the two years.

- There was **no significant overall** change from the previous year in IPS Camp students' view regarding their attitude towards studying science at university as a result of the camp. (2010/2011: 72%, 2011/2012: 74%, Change: +2%). Across individual Activity Centres, **UWA** (2010/2011: 79%, 2011/2012: 96%, Change: +17%) and **Flinders** (2010/2011: 83%, 2011/2012: 95%, Change: +12%) had noticeable increases in changes to students' attitudes, while grow **GrowSmart** (2010/2011: 78%, 2011/2012: 60%, Change: -18%) had a noticeable decrease.

- Comments from IPS Camp students regarding their attitude towards studying science at university as a result of the camp, **remained consistent** from the previous year. The main theme of comments from students from both years, was they now had a better and broader understanding and knowledge of the science related study and career opportunities available to them.

- It was difficult to compare the question regarding the impact of the IPS Camp on students' interest in seeking a career in science that supports Primary Industry, as in the 2010/2011 feedback survey it was as 'yes/no' style questions and in 2011/2012 it was worded slightly different and there were four options on levels of change to choose from. Across both years though, (2010/2011: 84%, 2011/2012: 60%) the majority of students indicated the camp positively changed their attitude towards seeking a career involving Primary Industry. It was similarly difficult to compare IPS RBS students' responses between the years, as again, response options were different. The majority of students from both years though (2010/2011: 66%, 2011/2012: 85%), selected responses that indicated the IP program had changed their attitude and made them more interested in seeking a career that supports Primary Industry.

- Comments from IPS RBS students on the most beneficial aspect of the IP Program to their thinking about future studies and careers, **remained consistent**. Students from both 2010/2011 and 2011/2012 mentioned the benefit of the hands-on nature of the work experience as well as the value of talking with their mentors and people actually working in the industry. Comments from IPS Camp students could not be compared as the questions was not included in 2010/2011 data.

- IPS Camp students' interest in post graduate (PhD level) study was difficult to compare from the previous year, as 'undecided' was added as a response option in 2011/2012. In 2010/2011, a large majority of students (84%) indicated they were interested in post graduate study proceeding the camp, while in 2011/2012, bearing in mind the addition of the 'undecided' option (selected by 59% of students), there were significantly fewer (39%) students indicating an interest in studying at a PhD level.

Impacts on Students from Participation in the IPS Camp and IP Program in 2011/12

This section summarises the responses of students from across the Activity Centres that participated in the Industry Placement Scholarship Camp (IPS Camp) and Industry Placement Program Reporting Back Session (IPS RBS). These questions specifically focused on impacts on students' views and attitudes towards studying and pursuing a career in science.

It has broadened my ideas for course choices and opportunities available ***(CSU)***

It has ignited my passion further and has opened my mind to more career possibilities ***(Flinders)***

Before I wanted to study science at uni, now I REALLY want to study science ***(GrowSmart)***

Given me a clear understanding of what courses I want to complete and will be suited to me ***(UNE)***

Given insight into the broad range of quality opportunities available ***(USC)***

I knew I wanted to study science but it has given me a better understanding ***(USQ)***

I have a lot more interest now in agriculture instead of general science ***(UTAS)***

Has made me more opened minded about agricultural sciences and there are so many good options ***(UWA)***

Change in Views and Attitudes

Overall, the large majority (73.8%) of students who attended the IPS Camp, indicated that it had changed their attitude towards studying science at university. They commented that as a result of the camp, they now had a better and broader understanding and knowledge of the science related study and career opportunities available to them. Many students had been positively encouraged to study agricultural science in particular, while some mentioned an increased interest in studying at the particular university (Activity Centre) involved with their industry placement program.

A large majority of students who attended the IPS Camp (84.1%) and the IPS RBS (87.8%), indicated their view on the importance of science in Primary Industry had changed as a result of their involvement. The majority of students from both the IPS Camp (59.8%) and the IPS RBS (66%), also felt their involvement had made them more interested in a science career in Primary Industries. With another 25% of students from the Camp and 20.8% of RBS students indicating they were already committed to a career in Primary Industry, it reveals that overall, the large majority of students are now interested in a science career that supports Primary Industry.

Being able to talk with professionals in different fields ***(CSU)***

The hands on placement ***(Flinders)***

Actually doing the work required in that particular field ***(GrowSmart)***

Trying something you may not usually consider ***(UNE)***

The work placement, working with real scientists ***(USC)***

The camp and seeing the broad range of careers available ***(USQ)***

Seeing the broad range of industries in Agricultural Science ***(UTAS)***

The whole experience, it was so interesting and inspiring ***(UWA)***

Beneficial Parts of the IPS Camp and IP Program to Future Thinking

The most beneficial part of the IPS Camp and the IP Program highlighted by students in regards to their thinking about future science studies and careers in Primary Industry, was

talking and interacting with people directly involved in the industry. Students commented that this in particular had given them a better understanding of what is involved with, as well as what opportunities are available in terms of careers in Primary Industry. Many students also mentioned the hands-on nature of the program and camp, as well as the value of the talks, tours and presentations.

Future Study Plans

The majority of IPS camp attendees (81.7%) and IPS RBS attendees (71.4%) indicated they were currently enrolled in or intended to enrol in a course related to science or primary industries. When asked to rank which university course they were considering or currently enrolled in, Agricultural science received the most rankings of one from both students attending the IPS Camp (27 Rank 1s, 28 Rank 2s, and 18 Rank 3s) and the IPS RBS (35 Rank 1s, 19 Rank 2s, and 14 Ranks 3s).

While the majority IPS camp attendees (58.5%) were undecided whether they would study at a PhD level, 39% indicated they were interested. The majority of students who attended the camp (69.5%), also indicated their participation had resulted in them reassessing their options. The main way in which students noted they were reassessing their options, was exploring different university courses, particularly those relating to science and agriculture. Many students commented that they were now interested in a new and different study and career path.

Actually seeing and gaining a better understanding of what careers involve ***(CSU)***

Most benefit to me was when the speakers spoke highly on what they did ***(Flinders)***

Science applied in real life ***(GrowSmart)***

Seeing the facilities at UNE and talking with lecturers from the university ***(UNE)***

The visit to the industries helped to gain understanding ***(USC)***

Getting hands on experience and talking with industry professionals ***(USQ)***

Gaining a general understanding of what Primary Industry does ***(UTAS)***

I learnt so much more on industries I was not familiar with, giving me a better insight to what I might like to do ***(UWA)***

Teacher Professional Development (PD) Activity

The Teacher PD Activity is focussed on meeting two of PICSE's **Goals**:

- Deliver innovative engagement programs for students and teachers that makes science relevant and exciting
- Increase the range of experiences to allow students to make informed choices for tertiary science focused study and industry retention

The **Objective** of the Teacher PD focuses on increasing the awareness and understanding of teachers about the importance and value of the science being used in primary industries, relating this to student career opportunities in those industries. The **Process** of the Teacher PD is to make this real to teachers by exposing them to exemplars of 'science in action' that they can use themselves during classroom teaching of sciences.

Each PICSE Activity Centre at a minimum delivers a two-day professional development for teachers. The 2011/12 theme was "The Science of Food and Fibre Security" with each Activity Centre focusing on the science involved in securing our future in food and fibre.

Summary of Evaluation Findings from 2011/2012

Overall Findings

There was a very positive response from teachers who attended the PD activities about the value of the activity to themselves and their students. This was in the same order of positive response from previous years reflecting continued relevance of the Teachers PD activities in meeting the needs of teachers.

On average, teacher participants rated this as one of the highest value of PICSE activities. This is due partly because this was the one in which they have been most engaged – and because the results reflect on how their gains will impact on a very wide range of students and on their own teaching activities. In that regard the Teacher PD is seen to be a very strong support process for them in terms of helping their teaching directly (such as providing resources and contacts) and directly changing their understanding of primary industries and possible career pathways for their students.

The 153 participating teachers were drawn from a range of science related subject areas across high school years and from schools in the eight Activity Centre locations across Australia in which the Teachers PD is conducted (not undertaken in Cotton Activity Centre). It is noteworthy that, given teachers teach different classes and subject areas in a high school and senior school, their influence is multiplied (see potential impact scenario below).

The PD activity has continued to impact on teachers' own capacity in relation to science teaching with an overall usefulness in assisting with science teaching rating at a high 8.6/10 and similar high ratings relating to relevance, strengthening confidence and skills and the value of resources provided.

Importantly there is an increasing impact of the PDs on the ability of teachers to encourage students to pursue science and agriculture studies at high school and university and consider specific careers in these disciplines.

The impact data shows that the Teacher PD is a very effective tool in strengthening science teaching in schools and positively impacting on teachers' interest and ability to encourage their students to study science, understand the role of science in agriculture and follow careers in science and agriculture. In addition leverage is supplied through the use of Teachers PD Travelling Scholarships. A comment from one recipient in 2011/12 is:

> *I am writing to thank PICSE for the travelling scholarship I received in December 2011 to the GrowSmart program in Loxton, South Australia. It was a wonderful experience and I feel like I have gained some valuable ideas that I can implement in my classroom. I also wanted to thank the PICSE organisation and David Russell for this opportunity and the great work you are doing. The PICSE Teacher PD is generally considered the best science teacher PD offered in the country and having been to three of these now, I can agree with this sentiment. Andrew Mason, Hellyer College (Tasmania)*

Specific and Relevant Impact Data … at a glance

Participation

- One hundred and fifty-three teachers from the eight Activity Centres participated in this round of the professional development activities provided by PICSE. This maintains the high level of participation achieved in the previous year. Of these, just over half were female teachers.
- Participating teachers were involved across the full range of high school year levels with a weighting towards the senior classes. Biology was the main science related teaching area taught by participants followed by Chemistry, Physics and Environmental Science.

Reported Perceived Value of overall PICSE Activities to Participating Teachers

- Participating teachers have continued to rate the overall value of the sum of the range of PICSE activities on average across Activity Centres very highly at 9.2/10 – the same level as for the past two rounds. The Teacher PD Activity was rated the highest average of the suite of PICSE activities at 9.4/10. Although there is some minor variation between Activity Areas and over time – the variation does not indicate any area of particular concern.
- One teacher from CSU reported …*Variety of resources - fantastic. At last somewhere to get very relevant resources. Renewed acquaintances. Everyone very approachable. A nice change.*

Usefulness

- The participating teachers rated the usefulness of the PD activity in helping teach science highly at 8.6/10 – consistent with previous ratings. This ranged from 8.2 (GrowSmart SA) to 9.2 (UNE).
- A teacher from USC commented … *I have learnt a great deal which I can pass on to the students,* while a teacher from UNE noted … *A rare opportunity to hear the latest research in the agricultural industry.*

Relevance to Next Year's Curriculum

- The question in this year's evaluation specifically asked about relevance *for next year's* curriculum. In previous years, the *next year* focus was not included – rather the question was more general. This could have impacted on the following comparative results.
- Seventy-five percent of participants (115) indicated that the PD had provided *a greater depth of knowledge in the subject* for the next year. This was less than the 82% the year before – and could be because of the immediate focus or because of the cumulative benefit of the attendance of many 'return respondents' who have attended one or more previous PDs. It is noted that Flinders and USCs showed a large jump in reported relevance from the previous year.
- There was a 9% jump in the percentage of participants (83 to 92% or 140) who reported that the resources and activities provided were *of direct relevance to next year's*

curriculum. This suggests an increase in the quality and perhaps quantity of resources being provided through the program.

Impact on Teacher skills in Science Teaching

- Overall, 44% of teachers (67) said that the PD provided them with *increased confidence in teaching science* subjects, 67% (102) indicated that it impacted on their *motivation in teaching science* and 73% (111) indicated that it impacted on their *thinking in teaching science subjects*. This was very similar to the previous year and indicated that the PD continued to offer new insights and energy.
- A teacher from UTAS commented … *Enables me to quote real world examples to the students,* while a respondent from UNE noted *… Some excellent material for use in the classroom.*

Value in Promoting the Importance of Science to Students

- Seventy one percent (71% or 108) of teachers considered that the material provided could be used in *reinforcing the importance of science for Primary Industries*. This is seen as an important outcome for the PD activity and is directly relevant to PICSE Goal 1.
- There were further small increases (from 80% to 84% or 129) from the previous year in the impact of the PD on *the teachers' abilities to encourage students to continue to study science.*
- This trend was also evident in the 85%(130) of teachers who indicated that participation would help them to be better able to *advise students about career opportunities* in science based industries – relevant to PICSE Goal 2.
- There was a large number of participants (80% or 123) who indicated that the PD would help them to better be able to encourage students on to university study in sciences related to Primary Industries (in the previous year, the question related to science study in general and only 53% had indicated then that the PD had helped them encourage students to study science generally).
- One teacher from CSU commented … *Have greater awareness of need for science student graduates and their opportunities in agriculture,* while another from Flinders reported … *Seeing the exciting possibilities for students.*

Interest on attendance in future PDs

- Eighty-four percent (84% or 129) of teachers indicated that they planned to attend the PD in the following year – reflecting the value that they gained from participation in this and previous years.

A potential impact scenario for secondary science teachers attending the Teacher PD:
Based on a full teaching load of 5 classes and an average of 25 students/class per year, an average teacher could be expected to influence approximately 125 students / year. Further each teacher can be reasonably expected to embed that experience in their teaching curriculum for 3 years before being influenced by curriculum changes to revise their teaching materials. *I have learnt a great deal which I can pass on to the students* ***(Teacher, USC)***

Therefore at a curriculum level the involvement of one teacher could influence 375 students over 3 years. The PICSE-wide influence each year, of the over 150 teachers who have attended the last two years, could represent influence on over 56,250 students Australia-wide as a result of one annual PICSE Teachers PD Activity. *Have greater awareness of need for science student graduates and their opportunities in agriculture* ***(Teacher, CSU)***

This however excludes the impact that the program might have on teachers at a personal level …*Reinforced some current understandings, added a great depth to my thinking and challenged my current thoughts re food and water* ***(Teacher, UNE).***

This personal influence is potentially an additional influence to their thinking about the importance and value of primary industries and the potential career opportunities for students.

Changes and Trends

This section provides a snapshot of changes in participation and responses to impact questions in the feedback from the range of teachers who have participated in this activity since 2009. (*It is important to take into account the number of respondents for each Activity Centre in relation to the Overall PICSE Teacher PD Scorecard (next page) 2010/2011 – 2011/2012. For example, small changes where there are low numbers in an Activity Centre can equate to a large percentage change for that centre. CSU is a new Activity Centre. Over time the manner of reporting Flinders and GrowSmart data has changed.)*

Number and Spread of Teacher Involvement in PDs

Respondent Numbers			
Activity Centre	**2009/2010**	**2010/2011**	**2011/2012**
CSU *			**12**
Flinders	27	13	**8**
GrowSmart		14	**15**
UNE	15	18	**19**
USC		15	**15**
USQ	9	24	**19**
UTAS	35	49	**39**
UWA	16	21	**26**
Overall	102	154	**153**

Changes in impact

The following Scorecard shows how the average responses to specific impact questions have varied from the previous year. Variation beyond an overall 5% in ratings or percentages has been highlighted as an indicator of change beyond natural variation.

Overall PICSE Teacher PD Scorecard 2010/2011 - **2011/2012** 1

Note: 2009/2010 data does not include USC and combined Flinders/GrowSmart data. 2010/2011 data does not include CSU. Scorecard only includes comparison of questions which were asked in both 2010/2011 and 2011/2012.

No. of teachers participating → Marginal change from 2010/2011

Total participants		
2009/2010	2010/2011	**2011/2012**
102	154	**153**

Perceived value of activities → Very valuable - no overall change from 2010/2011

Overall average rating		
2009/2010	2010/2011	**2011/2012**
9.2	9.2	**9.2**

- **Flinders** teachers' perceived value of *Teaching Resources* rose 1.1 average rating points from 8.6 to 9.7
- **UWA** teachers' perceived value of *SIAs* fell 1.3 average rating points from 9.9 to 8.6

Usefulness of PD in helping teach science → Very useful - marginal overall change from 2010/2011

Overall average rating		
2009/2010	2010/2011	**2011/2012**
8.6	8.7	**8.6**

Relevance of PD to next year's curriculum* → Marginal overall change from 2010/2011

**Note: Comparison of the question 'Provided material which could be used in reinforcing the importance of science for Primary Industries' could not be made, due to the different wording in 2010/2011 ('Provided material which could be used in assessment')*

- There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **Flinders** (+26% from 62% to 88%) and **USC** (+20% from 60% to 80%) indicating the PD was relevant in *providing a greater depth of background knowledge in the subject for next year****
- There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **USC** (+27% from 60% to 87%) and **USQ** (+21% from 79% to 100%) indicating the PD was relevant in *providing activities/ resources which can be used in the classroom/laboratory/field*
- There was a decrease in 2011/2012 from 2010/2011 in the percentage of teachers from **UWA** (-21% from 90% to 69%) and **GrowSmart** (-19% from 79% to 60%) indicating the PD was relevant in *providing a greater depth of background knowledge in the subject for next year****

Provided a greater depth of background knowledge in the subject for next year**		
2010/2011	2011/2012	**Change**
82%	75%	**-7%**

***Note: 2010/2011 question did not include 'for next year'.*

Provided activities/resources which can be used in the classroom/laboratory/field		
2010/2011	2011/2012	**Change**
83%	92%	**+9%**

Cont. Overall PICSE Teacher PD Scorecard 2010/2011 - **2011/2012** 2

Note: 2009/2010 data does not include USC and combined Flinders/GrowSmart data. 2010/2011 data does not include CSU. Scorecard only includes comparison of questions which were asked in both 2010/2011 and 2011/2012.

Impact on **confidence** in teaching science subjects

No overall change from 2010/2011

There was a significant increase in 2011/2012 from 2010/2011 in the percentage of teachers from **Flinders** (+42% from 8% to 50%) indicating the PD had impacted their *confidence in teaching science subjects*

Confidence		
2010/2011	2011/2012	**Change**
44%	44%	**0%**

Impact on **motivation** in teaching science subjects

Marginal overall change 2010/2011

There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **USC** (+20% from 60% to 80%) and **Flinders** (19% from 31% to 50%) indicating the PD had impacted their *motivation in teaching science subjects*

There was a decrease in 2011/2012 from 2010/2011 in the percentage of teachers from **GrowSmart** (-32% from 79% to 47%) and **UNE** (-26% from 89% to 63%) indicating the PD had impacted their *motivation in teaching science subjects*

Motivation		
2010/2011	2011/2012	**Change**
64%	67%	**+3%**

Impact on **thinking** in teaching science subjects

Marginal overall change from 2010/2011

There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **USQ** (+23% from 46% to 68%) indicating the PD had impacted their *thinking in teaching science subjects*

There was a decrease in 2011/2012 from 2010/2011 in the percentage of teachers from **Flinders** (-35% from 85% to 50%) and **GrowSmart** (-26% from 86% to 60%) indicating the PD had impacted their *thinking in teaching science subjects*

Thinking		
2010/2011	2011/2012	**Change**
75%	73%	**-2%**

Cont. Overall PICSE Teacher PD Scorecard 2010/2011 - **2011/2012** 3

Note: 2009/2010 data does not include USC and combined Flinders/GrowSmart data. 2010/2011 data does not include CSU. Scorecard only includes comparison of questions which were asked in both 2010/2011 and 2011/2012.

Impact of participation on teachers' ability to **help encourage students to continue to study science**

Marginal overall change from 2010/2011

There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **Flinders** (+15% from 85% to 100%) and **USC** (13% from 73% to 87%) indicating their participation had impacted on on their ability to *help encourage students to continue to study science*

Percentage of Teachers		
2010/2011	2011/2012	**Change**
80%	84%	**+4%**

Impact of participation on teachers' being **better able to advise students about career opportunities in science based industries** ***

***Note: Question was worded slightly differently in 2010/2011 as 'Will be better able to advise students about study and/or career opportunities in science'.*

Marginal overall change from 2010/2011

There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **USC** (+20% from 60% to 80%) and **Flinders** (+15% from 80% to 100%) indicating their participation had made them *better able to advise students about career opportunities in science based industries*

There was a decrease in 2011/2012 from 2010/2011 in the percentage of teachers from **GrowSmart** (-26% from 93% to 67%) indicating their participation had made them *better able to advise students about career opportunities in science based industries*

Percentage of Teachers		
2010/2011	2011/2012	**Change**
82%	85%	**+3%**

Impact of participation on teachers' being **better able to encourage students to continue on to university study in sciences relating to Primary industries****

****Note: Question was worded slightly differently in 2010/2011 and did not include 'relating to Primary industries'.*

Overall increase from 2010/2011

There was an increase in 2011/2012 from 2010/2011 in the percentage of teachers from **USC** (+27% from 53% to 80%) indicating their participation made them better able to encourage students to continue on to university study in sciences relating to Primary industries

Percentage of Teachers		
2010/2011	2011/2012	**Change**
68%	80%	**+12%**

Impacts from Participation in the Teachers PD 2011/12

This section summarises the responses of teachers participating across the Activity Centre PD activities to the impact questions in their exit feedback survey. These questions specifically focused on impacts on teacher capacity to provide improved science lessons, as well as their ability to better inspire and encourage students to pursue science and agricultural studies and careers.

Usefulness and value of PD

Overall, teachers found the Teachers PD activities to be very valuable (average *rating range* of **8.6 to 9.4 or average of 9.4 out of 10**) when compared with Class Presentation, SIAs, Teaching Resources and IPS. They considered it very useful in terms of helping their teaching (average rating **8.6 out of 10**). They also believed it was highly beneficial in providing them with an opportunity to develop relationships with sources who could provide assistance (average rating **8.4 out of 10**). Teachers commented that the PD had been a valuable and rewarding experience, where they had gained new and relevant information that would help them teach and motivate their students. Some mentioned the benefit of seeing the real world applications of the science, while others now felt more confident, motivated and reinvigorated. The opportunity to network was seen as particularly valuable, with some teachers appreciating being able to meet new people and talk with peers and other industry professionals.

Reinvigorates enthusiasm to try new resources. Thank you ***(CSU)***

Making contacts who willingly give of their time ***(FIinders)***

This PD has enabled me to make the link between theory and practice in agriculture ***(GrowSmart)***

A rare opportunity to hear the latest research in the agricultural industry ***(UNE)***

I have learnt a great deal which I can pass on to the students ***(USC)***

Highly relevant to link with tertiary and industry ***(USQ)***

Gives me insight into how students can be persuaded to do Ag Science ***(UTAS)***

Well done, excellent PD and a lot of effort in organisation and planning. Good networking ***(UWA)***

Now aware of your program. Great source of contact, resources, camps and science placement ***(CSU)***

Thank you for providing the opportunity of coming to stimulating talks and activities ***(Flinders)***

Very hands on small group. Very helpful ***(GrowSmart)***

Some excellent material for use in the classroom ***(UNE)***

I think the "cooking" activity will be great in primary school ***(USC)***

Enables me to quote real world examples to the students ***(UTAS)***

I am in an outreach PICSE role and I can see this will all be relevant and teachers are very excited ***(UWA)***

Relevance to next year's curriculum

Teachers saw the PD as being highly relevant to next year's curriculum, with **75%** indicating that it had provided them with a *greater depth of background knowledge in the subject* for next year. The vast majority (**92%**) also felt that it had provided them with *activities and resources which could be used in their classroom, laboratory or field*. A further **71%** felt that it had provided them with material which could be used in *reinforcing the importance of science for Primary*

Industries. Comments from teachers highlighted the benefit of the PD in providing new ideas, resources and activities which could be used in their curriculum. Some teachers reiterated the value of real world examples, while others again mentioned the value of networking. One teacher from **Flinders** suggested it could be useful to have resources available on the website.

Impact on awareness and understanding of primary industries

Across all activity centres, the majority (**75%**) of teachers indicated the PD had *changed their understanding of primary industries*. The vast majority (**89%**) also felt they had *improved their understanding of possible primary industry career pathways*, while **exactly half** indicated their *awareness of primary industries had increased* as a result of viewing the CD.

Have greater awareness of need for science student graduates and their opportunities in agriculture ***(CSU)***

Seeing the exciting possibilities for students ***(Flinders)***

I have learnt a lot more about Primary Industries. (I know very little) ***(GrowSmart)***

Reinforced some current understandings, added a great depth to my thinking and challenged my current thoughts re food and water ***(UNE)***

I want to encourage people in general to be more knowledgeable in these practices ***(USC)***

More confidence to provide contexts and career education ***(USQ)***

A clear need to promote primary industry to science students ***(UTAS)***

Impact on confidence, thinking, motivation, and ability to influence students

Overall, teachers felt their thinking (**73%**) and motivation (**67%**) were those most impacted by the PD in regard to teaching science subjects. Comments from teachers highlighted the impact the PD had on their thinking, with specific mentions of new knowledge and ideas gained, increased understanding of career pathways, and a greater awareness of opportunities. One teacher from **Flinders** observed that *when you have background knowledge, your motivation to encourage students to study these areas increases also,* while another from **USC** remarked that *knowing more always makes one more confident.*

The majority of teachers felt the PD had impacted their ability to influence students, with: **85%** feeling they would now be better able to advise students about career opportunities in science based industries; **80%** better able to encourage students to continue to study science; and **80%** now better able to encourage students to continue on to university study in sciences relating to primary industries.

Participants

Fifty percent of participants indicated they were female, 43% that they were male with 7% not indicating their gender.

Participating teachers were involved across the full range of high school year levels with a weighting towards the senior classes of Yrs 11/12. Biology was the main science related teaching area taught by participants followed by Chemistry, Physics and Environmental Science.

Reflecting the overall positive feedback given by teachers, the majority (**84%**) indicated they would attend the PD next year.

Post Secondary Choices

Tracking

Activity Centres have sought to directly track the direction and destinations of students who participated in the Camp/SIA activities post-secondary school. This has mainly been undertaken by sending an SMS to their mobile phones asking them about their current study or work outcomes. In this section, student tracking data for PICSE has been compiled using 2011 and 2012 data from the following centres: CSU, Flinders, Growsmart, USQ, USC, UNE, UTAS and UWA.

Approximately 200 students were tracked in 2011 and 220 in 2012. The data is unlikely to be complete – as some students would have changed their mobile phone numbers, and some would not have responded to the request. It does, however, provide a window into the choices made by students who participated in the program.

University selection

A focus on the 2012 data reveals that 212 students across the eight activity centres were attending one of more than 16 universities across Australia. The Universities with the largest number of these respondents were: the University of Adelaide (33); UTAS (31); UNE (29); UWA (16); USQ (16); Flinders (15); and UQ (14).

Course selection

The data has been presented from the degrees undertaken during each of the consecutive years, ie 2011 and 2012 from the PICSE candidates over previous years. For example, 2012 courses currently undertaken could include participants from multiple years (2011 Yr 12's, 2010 Yr 12's and 2009 Yr 12's).

University Courses have been grouped into 11 categories: Agricultural Science; Environmental Science; Biological Sciences; General Science Degree; Medicine; Engineering; Law; Rural Science; Aquaculture/Marine Science; Veterinary Science; and 'Other'. The 'Medicine' category has been classified as any degree relating to the healthcare industry. The following are examples from the data which fit into the 'Medical' category: Nursing; Pharmacy; Medicine Surgery/Science; Dentistry; Physiotherapy; Medicine; Heath (Biomedicine); Health Science and Laboratory Medicine and Biomedical Science.

Again, looking at the 2012 data, and grouping the data further, study choices can be shown as:

Study Area	Number students	% of Total
Agricultural/Rural/Veterinary Science	67	**31**
Environmental Science	14	**6**
General /Aquaculture/Marine/Biological science	66	**30**
Medical/health	25	11
Engineering	17	8
Non-science (law, other)	30	14
Total	**219**	**100%**

Universities attended

2011 - Activity Centre vs. University Attended									
University	**CSU**	**Grow-Smart**	**UNE**	**USC**	**USQ**	**UTAS**	**UWA**	**Total**	**Partner**
Adelaide		41						**41**	**X**
UTAS						24		**24**	**√**
UNE	1		21				1	**23**	**√**
UWA							22	**22**	**√**
USQ			2		11			**13**	**√**
Flinders		12						**12**	**√**
UQ				4	8			**12**	**X**
Uni SA		9						**9**	**X**
Curtin							7	**7**	**X**
CSU			4			2		**6**	**√**
Griffith				2	2			**4**	**X**
Latrobe						2		**2**	**X**
Melbourne	1					1		**2**	**X**
Murdoch							2	**2**	**X**
USC				2				**2**	**√**
Other*	2	5	4	1	1	1	1	**15**	**X**
Totals	**4**	**67**	**31**	**9**	**23**	**30**	**33**	**197**	

Note: There was no 2011 data for Flinders.

It is noteworthy that the 2011 and 2012 data (see next page) shows that:

- In 2011 there were 94 of the 197 PICSE graduates that went on to attend non-PICSE partner universities
- In 2012 there were 87 of the 211 PICSE graduates that that went on to attend non-PICSE partner universities.

2012 - Activity Centre vs. University Attended										
University	**CSU**	**Flinders**	**Grow-Smart**	**UNE**	**USC**	**USQ**	**UTAS**	**UWA**	**Total**	**Partner**
UNE	1			29	1		1	1	**33**	**√**
UWA								31	**31**	**√**
Adelaide			29						**29**	**X**
USQ				2	1	13			**16**	**√**
UTAS							16		**16**	**√**
Flinders		5	10						**15**	**√**
UQ					6	8			**14**	**X**
Uni SA			9						**9**	**X**
Curtin								8	**8**	**X**
USC					7				**7**	**√**
CSU				5			1		**6**	**√**
Murdoch								3	**3**	**X**
Griffith					1	1			**2**	**X**
Melbourne					1		1		**2**	**X**
QUT					1	1			**2**	**X**
UNSW				1				1	**2**	**X**
Other*		1	5	5	1			4	**16**	**X**
Totals	**1**	**6**	**53**	**42**	**19**	**23**	**19**	**48**	**211**	

**Universities that were only selected once were grouped in 'Other'.*

Courses undertaken

2011 - Activity Centre vs. Course Enrolled								
University	**CSU**	**GrowSmart**	**UNE**	**USC**	**USQ**	**UTAS**	**UWA**	**Total**
General Science Degree	2	27	1	2	10	11	5	**58**
Agricultural Science	1	12	6		1	14	3	**37**
Medicine		7	3	4	4	3	6	**27**
Veterinary Science	1	5	5	2	1	1	1	**16**
Engineering		3	5				5	**13**
Biological Sciences		5		1	1	1	3	**11**
Environmental Science		3	2	1		1	4	**11**
Other		3			4	2	2	**11**
Rural Science			8				1	**9**
Aquaculture/Marine Science		2				2	3	**7**
Law			1		1			**2**
Totals	**4**	**67**	**31**	**10**	**22**	**35**	**33**	**202**

Note: There was no 2011 data for Flinders.

2012 - Activity Centre vs. Course Enrolled									
University	**CSU**	**Flinders**	**GrowSmart**	**UNE**	**USC**	**USQ**	**UTAS**	**UWA**	**Total**
General Science Degree			19	2	6	5	6	8	**46**
Agricultural Science			12	6	2	1	13	4	**38**
Other		5	3	2	2	7	1	8	**28**
Medicine		1	6	3	4	4	1	6	**25**
Engineering			5	5	1		1	5	**17**
Veterinary Science	1		2	8	1		2	1	**15**
Biological Sciences			2		1	6	1	4	**14**
Environmental Science			2	2	2		1	7	**14**
Rural Science				13				1	**14**
Aquaculture/Marine Science			2					4	**6**
Law				1	1				**2**
Totals	**1**	**6**	**53**	**42**	**20**	**23**	**26**	**48**	**219**

Cotton Catchment Communities CRC

picse

Appendix 3

PICSE UNE & PICSE USQ Activity Centre 2011 Annual Reports

2011-12 UNE PICSE Annual Report

The following report outlines a summary of activities for the 2011-12 phase of the UNE PICSE program.

In its fourth year, the UNE PICSE program has continued to grow and develop further as evidenced by the figures in Appendix A below.

Class Visits

In May, Susanna Greig (UNE PICSE Science Education Officer) travelled to 21 schools in the New England North West region and spoke to over 600 students to outline the opportunities for careers for scientists in agriculture and the science supporting the work linked to the local and national sponsors of the UNE PICSE program. Susanna also outlined the UNE PICSE Industry Placement Scholarship and students were invited to apply. In 2011, we received 36 applications which is the greatest number received in the 4 year history of the UNE PICSE program! Further details of the UNE PICSE class visits are in Appendix B below.

UNE PICSE student James Stuart with Nicholas Willey (DAS) completing Industry Placement

Biannual Steering Committee meetings

On May 27 and Nov 17, UNE PICSE ran its biannual Steering Committee Meetings.

These meetings allow the UNE PICSE team to collect feedback and ideas for further planning for the program from members of the committee who are key leaders in academia, industry and education. Please see Appendix C lists the members of the UNE PICSE steering Committee.

Biannual Science Education Officer Forums

Between May 30 and June 3, 2011 and Feb 12-17, 2012, Susanna Greig and Carissa Green (UNE PICSE SEO and SEO assistant respectively), travelled to the newly established PICSE Activity Centre based at Charles Stuart University, Wagga Wagga, then to the national PICSE hub at UTas, Burnie campus to attend the biannual SEO PICSE forums. These forums are essential in the planning, evaluation and quality assurance of the national PICSE program.

Canberra Think Tank

Kate Lumber presenting

On July 21-22, the national PICSE program held its annual national Canberra forum which was titled "Positions Vacant: Young Scientists wanted for Australia's Future Food Security" and was a joint venture between PICSE and AgriFood Skills. Students from across Australia who had completed the PICSE Industry Placement Scholarship joined us at this forum to give a short presentation during the "Think Tank" program and engaged in discussions with politicians and industry leaders related to identifying how best to attract the next generation of skilled scientists into this sector. Kate Lumber, currently in Year 12 at McCarthy Catholic College, represented UNE PICSE. Suz Greig accompanied Kate at this forum. Our UNE PICSE Line Manager, Prof. Brian Sindel also attended.

Students with David Russell at Canberra

CONASTA 60 (National Science Teachers Conference)

The national science teacher's conference was held in Darwin, July 10-13, 2011. The national PICSE program had an obvious presence at this conference offering 4 sessions highlighting the science in the primary industries, science investigations and PICSE resources. Carissa Green, represented UNE PICSE and joined staff from PICSE Activity Centres at UTAS, UWA, USC and USQ.

IPS Reunion

UNE PICSE ran a reunion event on July 15, 2011 for those students who had completed the 2010-11 Industry Placement Scholarship. Students who had just applied for the 2011-12 scholarship were also invited to gain a taste of PICSE activities. At this event, 27 tertiary bound students travelled to UNE to gain further insights into the science based careers and opportunities within agricultural science following tertiary

Will Thorncraft and Janelle Wilkes at UNE PICSE IPS reunion event

studies. Students were also advised about the opportunities and courses at UNE. This activity allows us to maintain contact with both future and past students from the UNE PICSE program.

Science Investigation Awards

On Sept 11, 2011, the third UNE PICSE Science Investigation Awards were held at Lazenby Hall, UNE. Since its introduction, this event has grown more than fourfold in student numbers and more than tenfold in sponsorship. One hundred and six students from 12 schools in the New England North West region presented their science investigation projects to 25 scientists judging he projects. The sponsorship funds of $4,100 were given entirely to the schools and students with award winning projects.

Teacher Professional Development event

UNE PICSE organizes and runs a 2 day and evening dinner Teacher Professional Development event (TPD), which is endorsed by the NSW Institute for Teachers. On Dec 1 & 2 2011, 20 teachers travelled to UNE to attend the UNE PICSE TPD event including Edgar Cooper from Perth, WA. Yvette Ballard from Guyra Central School, NSW attended the UNE PICSE TPD event as well as the USQ PICSE TPD. Both Edgar and Yvette completed all expenses PICSE travelling scholarships to discover the science securing the future of the agrifood industry interstate.

Industry Placement Scholarship

Twenty students from schools in the New England North West region were offered a UNE PICSE Industry Placement Scholarship following an application and face to face interview.

These students attended a 'Science to Industry' Student Camp between 12-16 Dec, 2011, where they were given guided tours of award winning agricultural science enterprises and interacted with internationally recognized scientists to discover the broad range of science based career opportunities within primary industries.

Joining the group, were three students (Christina Bowling, Susanna Imarisio, Patrick Groenewold) from WA, QLD & Tasmania each on PICSE travelling scholarships. Furthermore, Georgia Rogan from the UNE PICSE group, attended the USC PICSE Student Camp prior to her UNE PICSE student camp experience. These travelling scholarships provide students with an excellent opportunity to investigate the science based careers beyond their local region.

Update on Milestones from MOU

Activity	Output/Outcome	Due Date	Key Performance Indicator (KPI)	Status
The appointment of Ms Susanna Grieg as the full	A Science Education Officer with science degree and/or educational experience as well	01/04/2011	Preliminary engagement of the SEO with local	Completed

time Science Education Officer (SEO) andan assistant.	as an assistant appointed with consultation of National Director (PICSE)		industries, schools and university personnel	
Establishment of Management and Steering Committees	Identification of industry, educational and university personnel for the Steering Committee for both SEOs	30/04/2011 & 30/11/11	Representatives from industry, educational and university partners attend the 2 Steering Committees	Completed
Biannual delivery of a national forum for the Science Education Officers and presentation of the common program, guidelines, outcomes and quality assurance.	Quality Assurance of program and staff, expansion of skills and knowledge of staff involved in program, innovation and development regularly achieved	30/06/2011 & 28/02/2012	Full attendance at national forums by the Science Education Officer(s)	Completed May 30-June 3, 2011 and Feb 12-17, 2012.
Annual school visits by Science Education Officer	Class interaction enhances student understanding of local science careers linked with university study options	30/09/2011	The number of schools who invite the SEOs to make class presentations about local career opportunities in science based primary industries	Completed May 2012
Annual Science Investigation Awards for High School Students	SEOs establish a mentoring program with partner schools in rural areas that includes engagement with students who may not have aspirations to enter university and gain their participation.	30/09/2011	Involvement of otherwise 'unengaged' students in the science investigation process and successful Science Investigation Award event conducted and evaluated.	Completed Sept 12, 2011
Annual two day Professional Development sessions for	Teachers increase their understanding of workforce needs and student career pathway opportunities	30/11/2011	Positive teacher responses to Professional Development	Completed Dec 1 & 2 2011

science teachers			through evaluation surveys	
Annual five day student camp, five day industry placement and reporting back session	Students develop deeper understanding of the value of science courses and their relevance to the contemporary workforce	28/02/2012	Student evaluation of camp/industry placement activity, through evaluation surveys	Completed Camp: Dec 12-16, 2011; and Industry Placements: Jan 5-20, 2012; SRBS: Feb 6, 2012
Six and twelve monthly evaluation and reporting with planning for the next phase	Reports provided by each Activity Centre which are combined into a National Report for investors	31/05/2011 & 28/01/2012	All Activity Centres produce two reports pa, based on a common template	Completed May 30, 2011 and as evidenced by this report.

Appendix A: Expansion of the program

Project outcomes	2007-08	2010-11	2011-12
Schools involved in the program	10	20	21
# students to whom PICSE presentations were made	225	557	609
PICSE Industry Placement Scholarship (IPS) offered	11	20	20
Teachers attending Teacher Professional Development (TPD)	20	20	20
TPD resource development	0	1	1
Industry Placement Scholarship reunion at UNE	0	1	1
yr 9/10 students attending Science Investigation Awards	0	60	106

Appendix B: Summary of school visits

				No. Classes		No. of Students				
Name of School/College	Location	Date of Visit	Teacher/s Name	Year 11	Year 12	Yr 10 & other	Year 11	Year 12	No. of IPS Applicants	No. of Successful IPS Students
Calrossy Anglican School	Tamworth	3/05/2011	Toni Ryan	1	1		18	9	5	4
Carinya Christian School	Tamworth	12/05/2011	James Karnaghan	1	1		20	15	3	1
Duval High School	Armidale	9/05/2011	Ian Crompton	1	1		25	15	3	2
Farrer Memorial Agricultural High School	Tamworth	3/05/2011	John McAdam	1	1		25	10	1	0
Glen Innes High School	Glen Innes	16/05/2011	Leanne Newsome	1	1		25	13	0	0
Gunnedah High School	Gunnedah	10/05/2011	Stuart McVittie	1	1		12	11	2	0
Guyra Central School	Guyra	13/05/2011	Yvette Ballard	1	1		12	6	2	0
Inverell High School	Inverell	16/05/2011	Anne Migheli	1	1		29	19	2	1
Macintire High School	Inverell	18/05/2011	Deb Snaith	1	1		32	18	2	2
MCCarthy Catholic College	Tamworth	3/05/2011	Karen Dickinson	1	1		26	6	3	1
NEGS	Armidale	23/05/2011	Magenta Southgate	1	1		26	17	0	0
O'Connor Catholic College	Armidale	2/05/2011	Regina Menz	1	1		29	9	7	6
Oxley High School	Tamworth	12/05/2011	Rod Blaker	1	1		27	19	1	0
Peel Tech High School	Tamworth	12/05/2011	Ben Coombes	1	1		12	15	1	1
St Marys College	Gunnedah	10/05/2011	Prue Kesby	1	1		19	15	1	0
TAS	Armidale	9/05/2011	Geoff Derwin	1	1		30	12	1	1
Walcha Central School	Walcha	4/05/2011	Jeoff Barrett	1	1		16	10	2	1
William Cowper Anglican School	Tamworth	3/05/2011	Todd McDonald	1	1		5	2	0	0
Totals							388	221	36	20
							609			

Appendix C: Members of UNE PICSE Steering committee

UNE PICSE Steering Committee	
Name	**Position & Organization**
David Russell	PICSE National Program Director
Brian Sindel	UNE PICSE Line Manager
Jennie Shaw	Pro VC & Dean, Faculty of Arts & Sciences, UNE
Eve Woodberry	Pro Vice-Chancellor (Students and Social Inclusion), UNE
Chris Guppy	Soil Scientist, UNE
Robin Jessop	Previous PICSE Line Manager, UNE
John Kleeman	Director of Strategy & Engagement, Policy, Planning & External Relations, UNE
Mick Duncan	Agronomist, Northern Agriculture President, Grasslands Society of NSW Inc
Clare Edwards	District Agronomist, NSW Dept Primary Industries
Belinda Pine	Consultant - Quality Teaching - Later Years NSW Dept. of Education and Communities, New England Region
Phil Jones	School Education Director New England (Central) NSW Department of Education & Communities
Stephanie Cameron	Owner, Manager, East West EnviroAg,
Kay Lembo	PICSE National Quality Assurance Manager
Susanna Greig	UNE PICSE Science Education Officer
Carissa Green	Assistant to the UNE PICSE Science Education Officer

ANNUAL REPORT

2011 - 2012

PRIMARY INDUSTRY CENTRE FOR SCIENCE EDUCATION

UNVERSITY OF SOUTHERN QUEENSLAND

USQ UNIVERSITY OF SOUTHERN QUEENSLAND

fulfilling lives

The Activity Centre for the Primary Industries Centre for Science Education (PICSE) program was set up at The University of Southern Queensland (USQ), Toowoomba in 2007. Since this time the program at USQ has continued to expand with the inclusion of new initiatives and new partners to the program.

The following report outlines some of the activities at the Centre to date.

REPORT ON THE STEERING COMMITTEE MEETING HELD 8 NOVEMBER 2011

The second Steering Committee meeting for 2011 was held on 8 November in the USQ Faculty of Sciences Boardroom. Professor Grant Daggard, Deputy Dean of the Faculty of Sciences chaired the meeting in the absence of Dean of Sciences, Professor Janet Verbyla. The PICSE National Director, Dr David Russell provided a national update for the Committee and Science Education Officer Mary McGilvray updated the committee on events at PICSE USQ since the last meeting and forthcoming in the following months.

TEACHERS PROFESSIONAL DEVELOPMENT DAY

A two day Teachers Professional Development program was held on Monday 5 and Tuesday 6 December 2011. Nineteen high school science teachers from around the state spent two days at the University of Southern Queensland (USQ) looking at the latest research in food security.

The teachers travelled from Emerald, Millmerran, Warwick, Chinchilla, Oakey and Toowoomba, along with one teacher who made the journey from Guyra, NSW to participate in the program.

During the two days teachers heard from leading researchers in the areas of food production and security and environmental protection. Industry partners included the Hermitage Research Station, the Cotton Catchment Community CRC, Stahmann Farms and USQ.

Teachers had the opportunity to network both with each other and with the scientists, and gained ideas of the possible job pathways for students, as well as seeing the relevance of science taught in the classroom to the cutting edge science in industry. Activities including the antimicrobial effects of spices, data logging to obtain an endpoint for a titration of wine were related to classroom activities.

INDUSTRY PLACEMENT SCHOLARSHIP PROGRAM

The Industry Placement Scholarship (IPS) program consists of a Science/Industry Camp, Industry Placement and a Reporting Back Session.

Seventeen (17) students were chosen to undertake the IPS program for 2011/2012. Students from Centenary Heights State High School, Clifton State High School, Fairholme College, Harristown State High School, Kingaroy State High School, Pittsworth State High School, St Joseph's College, Toowoomba Christian College, Toowoomba State High School (Mt Lofty Campus), as well a student travelling interstate from Flinders University in South Australia, attended the USQ camp.

The 2011 camp which was held from 28 November to 2 December included visits to industry partners Leslie Research Station, Monsanto Australia, Pacific Seeds, Symphony Hill Vineyards, The Queensland College of Wine Tourism, Vanderfield, and Robert Wicks Pest Animal Research Centre. The Department of Biological and Physical Sciences and The National Centre for Engineering in Agriculture, based at USQ also provided support to the program as well as a local toastmasters club.

Students were exposed to a range of laboratory exercises, industry visits, public speaking and career information sessions.

Students were placed at Monsanto Australia, Pacific Seeds, the Department of Biological and Physical Sciences USQ, the National Centre for Engineering in Agriculture USQ and a range of Department of Employment, Economic Development and Innovation – DEEDI facilities including the Leslie Research Centre, Tor Street, Bribie Island Research Station and the Robert Wicks Pest Animal Research Centre at Inglewood.

One student was successful in obtaining a three month scholarship exchange to Japan and subsequently was not available to complete an industry placement.

REPORTING BACK SESSION - 9 FEBRUARY 2012

The PICSE USQ reporting back session was held on 9 February 2012 at USQ where 14 of the 17 students gave a five minute presentation about their experience on the camp and industry placement. Mrs Bobbie Brazil, Chancellor of USQ opened the ceremony and Dr David Russell (National PICSE Director) summarised the important points raised by the students in their addresses. Students were presented with certificates at the end of the ceremony and a light supper was provided during the evening.

It was with sadness that the evening also paid tribute to Imogen Myatt, one of USQ's PICSE students who tragically lost her life in a car accident after just completing her industry placement at the Bribie Island Research Centre.

CONCLUSION

This annual report highlights activities of the PICSE USQ program since July 2011.

The USQ Activity Centre is currently a 0.5 centre and for 2011-2012 was staffed with a 0.3 Science Education Officer Mary McGilvray with Kay Lembo (0.6 PICSE National and 0.4 USQ) undertaking the 0.2 in the form of school visits / presentations. The resourcing of the USQ Activity Centre proved particularly challenging in 2011-2012 with conflicting demands of Mary's and Kay's workloads.

UPDATE ON MILESTONES from the MOU

Milestones to be achieved by the end of Phase 2: 9 February 2012	
Milestone	**Progress**
1. Successful completion of a teachers' PD (2011)	**Completed:** Teachers' PD was held on 5 and 6 December 2011. The PD was successful with 19 teachers participating in hands on laboratory and computer activities, field trips and seminars conducted by scientists working in primary industry.
2. Successful completion of the Industry Placement Scholarship program, including a residential camp (2011)	**Completed:** 17 students were selected for the IPS program. The IPS camp was held 28 November – 2 December 2011. Placements were completed between 9-20 January 2012. The Reporting Back Session was held on 9 February 2012 and all scholarship monies were distributed.
3. Production of a satisfactory Annual Report by end of January	**Completed:** and submitted.
4. Full attendance by the SEOs at the two Annual Planning Forums	**Completed:** Hobart UTAS 13 – 18 February 2011 and Wagga Wagga CSU 30 May – 2 June 2011. Both forums attended by Mary McGilvray and Kay Lembo.
5. Production of satisfactory Mid-year Report by the end of June.	**Completed** : and submitted

Appendix A: Expansion of Program

Event	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Schools involved in the program	11		15	34	17
Number of Year 11/12 students to whom PICSE IPS presentations were made	390	600	388	434	499
PICSE Industry Placement Scholarship (IPS) offered	14		12	16	17
Teachers attending Teacher Professional Development (TPD) Day	7	6	9	25	19
TPD resources developed			1	1	
Number of students attending Industry Placement Scholarship reunion at USQ					6
Number of students attending the Science Investigation Awards			8	52	72

Appendix B: Partners providing in-kind support to PICSE – (eg. Industries, Educators etc involved in Teacher PD's, IPS Camps & Placements)

Dr	Karen	Spence	Lecturer (Science Education) & Program Coordinator (Professional Experience)	Faculty of Education, USQ
Mr	Peter	Elsworth	Senior Scientist - Robert Wicks Research Station, Inglewood	Department of Employment, Economic Development and Innovation - DEEDI
Mr	Andrew	Granzotto	Robert Wicks Research Station, Inglewood	Department of Employment, Economic Development and Innovation - DEEDI
Mr	Michael	Brennan	Robert Wicks Research Station, Inglewood	Department of Employment, Economic Development and Innovation - DEEDI
Mr	Ian	Daniel	Operations Manager	Vanderfield
Dr	Kristen	Knight	Entomologist	Monsanto Australia Limited
Ms	Kym	Deaves	Research Laboratory Supervisor	Monsanto Australia Limited
Dr	Anke	Martin	Post Doctoral Research Fellow	Office of Research, Centre for Systems Biology, USQ
Ms	Roslyn	Reen	Nematodes	Department of Employment, Economic Development and Innovation - DEEDI
Mr	Mike	Hayes	Wine Maker and Manager	Symphony Hills Winery
Mr	Graham	Christensen	Member of Toastmasters	Rotary, Toowoomba
Mr	Bill	Morgan	Education and Training Manager	Queensland College of Wine and Tourism
Mr	Peter	Orr	Winemaker	Queensland College of Wine and Tourism
Ms	Jenny	Neels	Production Manager	Olive Products Australia
Ms	Vicki	Bourchier	Production Manager	Olive Products Australia
Ms	Trudy	Staines	Education Officer	Cotton Catchments Communities CRC
Mr	Ross	Burling	General Manager Processing	Stahmann Farms
Dr	Emma	Mace	Adjunct Associate Professor	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Mr	Greg	Platz	Researcher	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Mr	Andrew	Borrell	Researcher	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Dr	Barbara	George-Jaeggli	Researcher	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Dr	Wendy	Lawson	Research	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Mr	Simon	Hamlet	Researcher	Hermitage Research Station,

				Department of Employment, Economic Development and Innovation - DEEDI
Mr	David	Jordan	Researcher	Hermitage Research Station, Department of Employment, Economic Development and Innovation - DEEDI
Dr	Bernadette	McCabe	Senior Lecturer (Microbiology)	Faculty of Sciences, USQ
Dr	Mark	Lynch	Lecturer (Biochemistry/Chemistry)	Faculty of Sciences, USQ
Ms	Ursula	Kennedy	Lecturer (Wine Science)	Faculty of Sciences, USQ
Professor	Grant	Daggard	Professor (Cellular & Molecular Biology) and Deputy Dean	Faculty of Sciences, USQ
Professor	Lindsay	Brown	Professor (Biomedical Sciences)	Faculty of Sciences, USQ
Mr	Anand	Mistry	PhD Student – Department of Biological and Physical Sciences	Faculty of Sciences, USQ
Mr	Hemant	Poudyal	PhD Student – Department of Biological and Physical Sciences	Faculty of Sciences, USQ

PICSE USQ STEERING COMMITTEE MEMBERS 2011

Name	Organisation/Position
Associate Professor David Russell	National Director, PICSE
Professor Janet Verbyla	USQ Dean of Sciences and PICSE Line Manager
Mrs Kay Lembo	Science Education Officer and Eastern Area Coordinator PICSE National
Mrs Mary McGilvray	Science Education Officer (SEO), USQ PICSE
Mr Murray Wright	Industry Learning Coordinator, USQ
Dr Kerry Withers	Academic Liaison Officer, USQ
Mrs Hellen Weber	Head of Science, Concordia Lutheran College
Ms Kym Deaves	Research Laboratory Supervisor, Monsanto
Ms Erin Tonscheck	Department of Education and Training
Mr Andrew Easton	Crop Research Lead - Brassicas, Pacific Seeds Pty Ltd
Dr Roger Stone	Director, Australian Centre for Sustainable Catchments
Mr Ian Daniel	Operations Manager, Vanderfield
Mr John Bird	Director, Agribusiness Skills and Extension Strategy, Department of Employment, Economic Development and Innovation
Mr Greg Dickman	Regional Director, Darling Downs South West, Department of Education and Training
Mr Jim Brennan	Head of Science, Centenary Heights State High School
Mr Peter Elsworth	Senior Scientist, Robert Wicks Pest Animal Research Centre, Department of Employment, Economic Development and Innovation

Appendix C: School Visits for 2011

		No. of Classes			No. of Students			
Name of School/College	**Location**	**Yr 10 & other**	**Year 11**	**Year 12**	**Yr 10 & other**	**Year 11**	**Year 12**	**No. of IPS Applicants**
The Glennie School	Toowoomba		1	4		9	81	
Centenary Heights State High School	Toowoomba	1	3	1	23	56	13	1
Fairholme College	Toowoomba		1			9		1
Toowoomba State High School	Toowoomba		2	2		57	51	5
St Mary's College	Toowoomba		1	1		10	8	
Assumption College	Warwick		1			12	6	
Toowoomba Christian College	Toowoomba		1			13	9	4
Harristown State High School	Toowoomba		2			48		1
St Joseph's College	Toowoomba	1			2	3	3	2
Chinchilla State High School	Chinchilla	1	1	1	36	24	7	
Clifton State High School	Clifton		1	1		18	12	2
Pittsworth State High School	Pittsworth		1			13		1
Downlands College	Toowoomba		2			37		
Totals		3	17	10	61	309	190	17

Total Students **560**

Cotton Catchment Communities CRC

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Appendix 4

PICSE Cotton, PICSE UNE and PICSE USQ Web Home Pages

PICSE - Cotton - Provided by IT Resources University of Tasmania

http://www.picse.net/COTTON/index.htm

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Cotton Catchment Communities CRC

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Announcements

September 2011

Welcome to the PICSE Cotton webpage. Feedback is most appreciated and can be directed to Jessica.Bennett@utas.edu.au

The latest PICSE Network for is now available! **Download and View**

The latest PICSE teaching resource is now available!

CLICK HERE TO BE REDIRECTED TO OUR ONLINE RESOURCE

News

PICSE on Facebook

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What's On

June

M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Primary Industry Centre for Science Education

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Announcements

PICSE UNE 2012/13 Dates Released

To the right, under 'What's On' you will find a list of events and dates on the UNE PICSE calendar for 2012/2013.

If you would like any additional information please contact **Susanna or Carissa**.

The latest PICSE Network is now available! **Download and View Now**


NETWORK picse

ABARES Graduates "On the Ground" in the Riverland

From the Director

PICSE Ambassadors

News

April 2012

PICSE UNE on the road

UNE PICSE Science Education Officers have just completed meetings with head science teachers in schools in the New England North West region linked into the program. In early Term 2, we look forward to completing a run of school classroom visits to talk to students about the Science Investigation Awards and the Industry Placement Scholarship Program. We are thrilled to learn that the schools already linked to the UNE PICSE program are interested to continue to offer the UNE PICSE opportunities to their students and teachers. Furthermore, UNE PICSE has been successful in a recent Ian Potter application, which will allow us to work with more regional and remote schools in the region. The 2012-13 phase of the UNE PICSE program is looking to be an exciting and busy period!

PICSE on Facebook

Like

204 people like **PICSE**.


Lisa Timothy Violetta Sasha

What's On

UNE PICSE activity	*Date*
School presentations	May
IPS applications due	first week of June
National PICSE SEO forum	June 17-22
National PICSE Canberra forum	June 25-26
IPS interviews	June/July
IPS Reunion	July 2
Registrations due for SIA	July 27
Students advised of UNE PICSE IPS offering	Aug
Science Investigation Awards	Sept 11

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Announcements

October 2011

Congratulations to all students who participated in the 2011 Science Investigation Awards held on Friday 12 August, 2011 at the University of Southern Queensland. Over 90 students from Prep to Year 12 displayed and explained their investigations to a range of scientist, academics and community representatives, as well as participating in range of interactive science activities.

Prof Grant Daggard presented the winner from each category prizes up to $300 for their entry. Two prize winners from Centenary Height State High School were Alexander Redmond, who won the Woolworths Best Food Focused Investigation and Nick Thompson who won First in the Years 8-10 Age Category.

Thanks again to all students, teachers, schools, judges, presenters and volunteers who made this event a great success.

News

October 2011

Registration for the 2011 PICSE Teacher Professional Development workshop for Science Teachers is now open.

This year, the theme is "The Science of Food and Fibre Security" and will held at the University of Southern Queensland, Toowoomba Campus on Monday 5th and Tuesday 6th December.

Course cost of $150 includes all meals (including Monday workshop dinner), transport, program materials as well as a free PICSE laboratory coat.

What's On

June

M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Coming Up in 2012:

Dates to be announced soon.

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Appendix 5

PICSE Network Newsletters (Mar/Apr/May/June 2012)

PRIMARY INDUSTRY CENTRE FOR SCIENCE EDUCATION

NETWORK

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In 2011, PICSE awarded a total of 168 Industry Placement Scholarships to students across Australia. The scholarships comprise of a 5 day camp (usually at the host university) followed by a 5 day industry placement. These experiences have long lasting impacts on students. Over the coming months we will be sharing these stories. Here is a selection.

From Queensland .....

James and Dr Kent Fanning

Student Report from PICSE USC

James, a Year 12 Xavier Catholic College Hervey Bay student wrote *"My passion for science has grown from the experience gained during the camp and placement by positively broadening my understanding, and so giving me a new perspective of the Primary Industries and associated sciences in Queensland. My industry mentor said, "Have a passion for the area of expertise you decide to specialise/study in, as people with passion for their roles make the best scientists." I will continue to strive to be the best scientist I can be through following where my passion lies, which is for the moment in Queensland's Primary Industries."*

James worked with Scientists at the Health and Food Sciences Precinct preparing micro algae samples for HPLC to analyse antioxidant compounds in the hope of finding high levels of compounds such as carotenoids.

This experience has provided James with an entrée into the diversity of career opportunities within the Queensland Department of Primary Industries and a focus to follow his passion: science.

From Western Australia .....

Student Report from PICSE UWA

The world is full of varied opportunities and a bounty of career options. Sophie, from Newman College, Perth, knows this well. Prior to being awarded a PICSE UWA Industry Placement Scholarship, Sophie was *"unsure of what exactly I wanted to study at university and what career I wished to pursue in the future."*

At the camp, she was amazed by the breadth and depth of agricultural sciences. Sophie never realized how many opportunities were present in the primary industries within Western Australia or what being involved with agricultural sciences meant. Sophie tells us, *"I found that whilst on camp I became very interested in the lab work and research into various characteristics and factors affecting animal production in primary industries."*

Sophie's growing interest in animal science was further fuelled when, for her industry placement, she joined a team of researchers extracting RNA from the eyes of Western Rainbow fish, caught a pair of mother and child guppies for experimentation, analysed how population density affects an animal's use of energy in reproduction, and worked with wine bandages made with bacteria. How good is that!

As a result of Sophie's experiences with PICSE, she now aims to study at the University of Western Australia with a particular focus on animal research and agriculture.

Sophie during her Industry Placement

From South Australia .....

Student Report from PICSE GrowSmart (Riverland)

Zachary, from Pedare Christian College, Adelaide, wrote *"When the PICSE GrowSmart industry camp first began, I'll admit to being a bit intimidated; packed into a bus with a heap of people whom I didn't know and would have to live with for the next week. It soon became clear that any uncertainty was unfounded. Settling in to our accommodation, having dinner, moving into the rooms, all helped us to bond and get to know each. The 'get-to-know-you' games forced on us the first night by the camp leaders, Trevor and Sylvia, turned out to be a massive hit. We visited wineries, greenhouses, SA Water House and many other great industry workplaces.*

I will always think back to the camp as having been my first real step toward attaining the career in science that I really want. I will avidly recommend the camp to the Year 11/12 science students of 2012 so that they can gain similar rewards from the camp including a new perspective on their own scientific potential working in South Australian primary industries.

My industry placement was in the SARDI labs at the Plant Genomics Centre working with several different researchers. It was an inspirational experience, one which I will remember and treasure long into my tertiary studies in science and into my career path.

The PICSE GrowSmart camp and placement have sharpened my focus. I will definitely pursue my scientific studies from this point forward. It feels great to know the number and types of opportunities there are for a science graduate in primary industries."

Zac in the Yalumba Wines Chemistry laboratory

..... From the Director

PICSE Powerhouse

The PICSE Family

Twenty-two PICSE staff flew into Tasmania for a week of planning, staff development and team building last month. In this first Science Education Officers Forum for 2012, participants:

- were briefed on scientific developments by two of our investors, the Murray Darling Basin Authority and Dow AgroSciences,
- further developed the new Science for Growth Awards program,
- used the evaluation results from 2011 to fine-tune this year's PICSE activities,
- planned the development of teaching resources that align with the National Curriculum, as well as using exemplars relating to our industry investors.

This SEO Planning Forum was an exhilarating powerhouse which reinforced the strong relationships within the PICSE family and set the scene for an exciting year ahead. The next SEO Planning Forum will be held in June and all PICSE Investors are invited to brief our SEOs about exciting aspects that we can promote in our class visits.

Associate Professor David Russell

PICSE is funded by the Federal Government's Diversity and Structural Adjustment Fund (DEEWR), University of Tasmania, University of Western Australia, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University, Curtin University and the Grains RDC, Cotton RDC, Fisheries RDC, Horticulture Australia Ltd, Cotton CRC, Murray Darling Basin Authority, Dow AgroSciences and Woolworths Ltd.

PRIMARY INDUSTRY CENTRE FOR SCIENCE EDUCATION

NETWORK

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PICSE-Dow AgroSciences *Science for Growth Awards* Launched

The Science Investigation Awards have been a tremendously successful means of engaging students and teachers with industry scientists and university researchers in all our Activity Centres, so PICSE and Dow AgroSciences have combined efforts to extend this impact to ALL classrooms in Australia.

Designed with rural and remote schools in mind, but open to all students, the PICSE-Dow AgroSciences Science for Growth Awards (SGAs) provide an online environment for support and judging of student science projects. Through the newly launched website, students and teachers can register and then upload their work for judging by industry scientists.

The Science for Growth Awards website provides support for students and teachers

In 2012, the SGAs are in a trial phase, and are inviting submissions from students in Years 9 and 10 from Queensland and New South Wales schools.

Throughout their projects, students can check in with other students, teachers and the Science for Growth Coordinator (a science teacher) via an online forum to ask and answer questions and share ideas or workshop problems.

The final date for student project submission is Sunday 17 June 2012 at 5:00PM. The projects will then be judged against transparent criteria focusing on scientific communication skills. Shortlisted projects will be allocated a Skype interview with a Scientist Judge who will discuss their findings.

Great cash prizes have been provided to recognise and celebrate budding scientists. Students are then encouraged to enter their projects in their state Science Teachers' Association awards programs, which have a different judging focus and provide entry to the BHP Billiton Awards in Australia.

For more information or to register, go to www.scienceforgrowthawards.com.au or contact the Science for Growth Coordinator Anna Paice on SGA.Admin@utas.edu.au

From the Director

The PICSE Report Card

The mission of PICSE is to *"Increase participation in science professions that support primary industries"*. The program aims to attract an increased supply of high quality young people into science based primary industries through engagement with them during school years and early university.

Each year we contract QualDATA to produce an evaluation report to capture and analyse the impact on students and teachers from their participation in PICSE activities and make judgements about how well the program has met its mission.

The 2011 national Impact Evaluation Report has just been completed and we would like to share some of the salient results:

- 85% of the teachers at the Professional Development courses were able to better advise students about career opportunities in science based primary industries.
- 66% of the secondary students reported that the Science Investigation Award activity helped their understanding of science.
- 85% of Year 11/12 science students reported that their attitude on the importance of science in primary industry had positively changed as a result of the Industry Placement Scholarship (IPS) program.
- 60% of IPS students indicated that they were now interested in science careers in primary industries.
- In 2012, IPS students intended to or were enrolled in:
  - agriculture, rural and veterinary science courses (31%);
  - environmental science courses (6%);
  - general science, marine or biological related courses (30%).

Joshua in the canola fields during his Industry Placement

We note that in the January 2012 Allen Consulting Group Report to the Business-Higher Education Round Table, 'Rebuilding the Agricultural Workforce', recommends a significant rethink of the agriculture education model and recommends that one of the five priorities be to 'expand the PICSE program'. The recent Impact Evaluation Report demonstrates the value of doing just that!

Associate Professor David Russell

From Cotton Country .....

Cottoning-on to Cotton: A Student's Story

Alana in the cotton fields during her Industry Placement

Meet Alana, a 17 year old from Calrossy Anglican School in Tamworth. In Year 10, Alana decided she wanted to be an agronomist. Her parents had no idea what Alana was talking about, so they asked her to do some work experience to find out what an agronomist's career involves. Alana spent two weeks with Landmark in Gunnedah and loved it!

Shortly after that, her school was asked to send some students to the National Cotton Conference on the Gold Coast. Alana was selected and met cotton growers Andy and Georgie Carrigan from Milchengowie at Boggabri. They sparked her interest in cotton and invited her for holiday work during the picking season.

In 2011, Alana was excited to be selected for the PICSE Industry Placement Scholarship through UNE, where her placement was facilitated by PICSE Cotton Science Education Officer, Trudy Staines, at the Australian Cotton Research Institute (ACRI) in Narrabri. Alana's placement this year was with the CSIRO Plant Industry crop physiology and management team, lead by Senior Principal Research Scientist Michael Bange. Alana worked in the laboratory and field covering a number of research activities.

Most of the work involved collecting data, using various measurements across many different trials, and making use of complex equipment such as an infra-red thermometer to measure temperature and a *"pressure bomb"* to calculate a plant's water stress. Alana worked with Dr Nicola Cottee using screening methods to detect heat tolerance in cotton cultivars. She also assisted the entomology team by placing tiny pest caterpillars into diet trays, using a small paintbrush. *"It was a test of patience, speed and skill as they started to crawl everywhere!"* said Alana.

Alana said *"The cotton industry demands high quality and high yields, while dealing with the arising problems of variable climate, insect and weed resistance. My PICSE experience has shown how new varieties of cotton will have to be produced to help control insects, as well as allowing cotton to grow in hotter and drier climates."*

"Cotton is an industry I could see myself involved with in the future, as it has been a most enjoyable and memorable experience. It has given me an insight into the cotton industry, which is looking for more scientists and researchers. I have made many more contacts in this industry, which has been beneficial in helping me towards a career in this industry."

..... From New South Wales

Industry Placement Scholarship Supports Students Decision-making

The PICSE UNE Industry Placement Scholarship (IPS) program has been running for five years and has been well supported by industries in the New England region.

In 2012, Year 11 student Morgan worked with Julie Roberts investigating research careers in poultry. Morgan was able to use cutting edge equipment that Poultry CRC scientists use and see the wide range of research that is going on within the poultry industry.

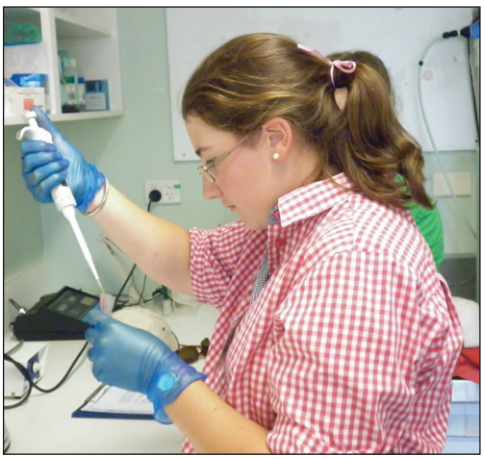
Morgan said *"My placement has shown me that even small sections of the primary industries require immense research, and that embarking on a career in this area is highly rewarding, as the whole community needs primary industries".*

Another student, James, completed his Industry Placement working with Dow AgroSciences. James worked at the Breeza research station with Dow researchers Nicholas Whilley and Natalie Elias completing a vaporisation trial. He was able to take part in both the field and lab components of research. *"I found this experience both interesting and engaging as the results of many of their trials can be used by producers to improve their farming practices,"* said James.

Other Industry Placements were hosted by the Animal Genetics and Breeding Unit (AGBU) at UNE. During the placement, students worked with cattle, sheep and pig genetics. Each of the students gained knowledge in statistics and also were shown how to measure external traits of animals.

One of the students placed at AGBU, Briony, said *"The week has helped me to confidently say that I will pursue a career in the area of Rural Science, with the hope of one day becoming a knowledgeable scientist who is willing to support and nurture young people with a passion for science and agriculture."*

Industry hosts often ask where PICSE students have gone after completing the scholarship. The PICSE program is rigorously tracking the movements of our students, since we have invested time and resources in their educational pathway. We have followed the group of 22 students who completed the 2010 UNE PICSE Industry Placement Scholarship. In 2012, 18 were completing studies at university and 12 of these chose to study at the University of New England.



Briony during her placement at AGBU

PICSE is funded by the Federal Government's Diversity and Structural Adjustment Fund (DEEWR), University of Tasmania, University of Western Australia, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University, Curtin University and the Grains RDC, Cotton RDC, Fisheries RDC, Horticulture Australia Ltd, Cotton CRC, Murray Darling Basin Authority, Dow AgroSciences and Woolworths Ltd.

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Four Years of Industry Placement Scholarship Students Meet at UWA

At the PICSE UWA Industry Placement reunion, students learnt about current research and volunteer opportunities from Honours and PhD students, spoke with university graduates, current students and industry representatives on the ins and outs of university life and opportunities available when studying Natural and Agricultural Sciences at UWA.

Fiona Young of Consult Ag started studying Commerce, then quickly changed to Agriculture: *"It was the best decision I ever made. I got into uni life and there were so many jobs and opportunities. The flexibility is great as there is so much to choose in the field of Agriculture".*

Fiona talked about the things that enrich university life such as joining clubs, getting involved in orientation activities and applying for scholarships. *"Honours is a great opportunity and transition from University to work. You set goals and work independently. It is what you make of it"*, said Fiona.

Lachlan, a 2011/12 IPS student, commented that *"It was great to hear that doing your Honours gives more than just a qualification and personal satisfaction. The results can also be used by the wider community to change lives and spearhead innovations".*

PICSE Alumni checking out cutting edge research in the UWA greenhouses

At the reunion, students gathered at popular coffee shops and on the famous Oak Lawn at UWA, giving them a feel for the culture of University life while catching up with more PICSE Alumni between lectures.

Meeting the Science Student Office was very useful for all students for extra guidance on exactly what course plan they should take to get the most out of their degree and career aspirations.

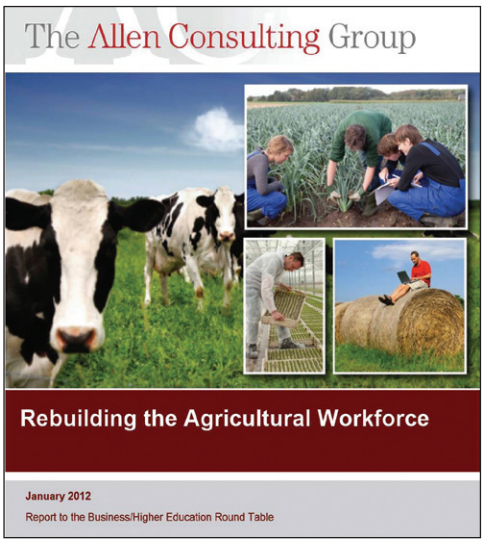
"The day was amazing. It was fantastic to catch up with my PICSE friends again on a day that was just like a mini version of the camp", said Sarah from last year's IPS.

Join the PICSE facebook page to find out more and how to get involved.

From the Director

Canberra Round Table: Establishing an Agricultural Workforce Strategy

From time to time PICSE fields telephone calls from organisations seeking detailed accounts of the success of PICSE activities and the impact the program has had on students and teachers. Our answers rely heavily on the annual independent QualDATA impact data and our students' qualitative reports that demonstrate sustained attitudinal change.



"Rebuilding the Agricultural Workforce" report available via www.bhert.com

The outcomes of these unsolicited contacts range from an invitation to present at a Government inquiry, media items, new PICSE Activity Centres to national reports that address workforce shortages. Two of such reports are Woolworths' *"Future of Food: Food Security and Sustainability Initiative"* (Landcare Report, July 2010) and the Business/Higher Education Round Table commissioned *"Rebuilding the Agricultural Workforce"* (Allen Report, January 2012).

Both reports identified PICSE as a significant program that *"encourages senior school children to consider agriculture as an excellent career option"* (**Future of Food;** Woolworths) as well as being *"an established program seeking to achieve the precise outcome which is the subject of this study"* (**Rebuilding the Agricultural Workforce;** Allen Report).

PICSE has been collaborating with key stakeholders in the University, Skills and Agribusiness sectors in planning a joint Canberra Round Table on 19 June, to establish a process to implement the priority items as identified in the Allen Report, *viz:*

1. Reconceptualise agricultural education as one diverse sector.
2. A marketing campaign to change the image of agriculture.
3. A national program of agriculture cadetships.
4. Expand the PICSE program.
5. Resolve data issues to allow for a valid evaluation of the effectiveness of this program.

The Canberra Round Table will deliver an Outcomes Paper to the Government, which will provide a draft strategy, timeline and budget for the delivery of the five Priorities listed.

Associate Professor David Russell

From Tasmania .....

Young Scientists Experience Life in the Field

Robyn with a Wessex Saddleback piglet

It is always a pleasure to engage with students that are keen to learn and open themselves to the wonders of science. Twenty Tasmanian students were selected to participate in the annual Year 10 science camp on April 18-20.

Students were stimulated by exercises on microbiology, photosynthesis and measuring the estimated paper fibre capacity in strands of eucalypt plantation trees. They also gathered insight from Cradle Coast Natural Resource Management, agricultural consultants and agronomists from Serve-Ag, and on the final day experienced life on a pig farm!

In their free time students enjoyed outdoor activities provided by Camp Clayton. The gathering of like-minded students created a great starting point for the 'social' side of the camp to blossom. Students reported that they, *"Enjoyed seeing the many different aspects of science and how it applies to life"*. Students wanted the camp to last longer as *"Three days was not enough time"*. They were surprised by the diversity of career paths in science and agriculture and had a great time overall.

Highlights included the Wessex Saddleback pigs and the visit to the Gunns Fibre Technology lab at Ridgley. The hands on experiments throughout the camp helped retain the interest of students.

The camp successfully provided the students an enjoyable time with the main focus being on science and agriculture in a positive learning environment.

... From the Strategic Development Manager

Strategic Plan gets Board "TICK"

The third PICSE National Advisory Board (NAB) meeting was held in Canberra on the 30 March 2012. Key items on the agenda included the draft PICSE Strategic Plan, the 2011 Evaluation and Impact Report and details of the exciting new program, *the Science for Growth Awards.*

In the 14-year evolution of PICSE, the program has undergone significant growth. The expansion of the program, originally outlined in the 2006 Business Case, has seen PICSE partner with universities and agribusiness in all but one Australian state. During this time, the core program elements have been fastidiously maintained and delivered.

The 2012–2017 PICSE Strategic Plan builds on the core program and incorporates significant new program innovation, new industry partners, stronger working alliances with the VET sector, science teachers and identifies a strategic facilitation role (bringing students and industry together) in post school education and the skills development environment. The plan will be released in June 2012.

Evaluation and impact reporting is a hallmark of the PICSE program. This year, PICSE has produced a two page fact sheet that highlights a selection of key impacts. This is now available on the PICSE website at: www.picse.net/HUB/outcomes.htm

The PICSE National Advisory Board in Canberra

The NAB was presented with a live preview of the latest new program: *Science for Growth Awards*. This exciting new program is the web-based equivalent of the popular PICSE Science Investigation Awards. In 2012, the SGA will be introduced as a pilot in Queensland and New South Wales. Pending the evaluation of the pilot later this year, PICSE aims to make this a national program in 2013. For all the details, visit the SGA website: www.scienceforgrowth.com.au

Vic Dobos

PICSE is supported by the Federal Government and funded by University of Tasmania, University of Western Australia, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University, Curtin University and the Grains RDC, Cotton RDC, Fisheries RDC, Horticulture Australia Ltd, Murray Darling Basin Authority, Dow AgroSciences, Meat and Livestock Australia and Woolworths Ltd.

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ABARES Graduates "On the Ground" in the Riverland

In May, a group of young Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) economics graduates were hosted by PICSE staff on a field trip in the Riverland of South Australia, looking at innovative examples of primary industry.

Starting with a visit to AgriExchange to see and hear about the large scale growing and packing of citrus, the graduates then learnt about Suffolk sheep at Chesson Park. At *"Bulla Burra"*, a large grain growing enterprise, they heard about the principles of collaborative farming and went for a ride on the GPS-controlled, auto-steer seeders and sprayer units, a fantastic experience!

Key environmental science parameters for rehabilitating wetlands on the River Murray were explored at Banrock Station's Wine and Wetland Centre. Then at Century Orchards, amongst 140 000 almond trees, the graduates experienced how science and technology are being used in large scale almond growing. The trip concluded with a visit to Biological Services, learning how predator insects are being used to control pest insects in a range of horticultural crops, thereby greatly reducing the need to use chemical sprays.

Almond harvest ready for shipment at Century Orchard

On the following day the ABARES Regional Outlook Conference was held in Berri. Vic Dobos (from the PICSE Senior Management Team) and Trevor Noble (PICSE GrowSmart Science Education Officer) attended, along with three PICSE students and a teacher from a PICSE school in Adelaide. Forecasts for various commodities were presented, including discussions about the future of farming. Some common themes emerged, for example the need for growers to be passionate and innovative in order to cope with continuously changing global markets.

From the Director

PICSE Ambassadors

Recently I had the privilege of awarding certificates and badges to our inaugural PICSE Ambassadors Brydie and Lachlan at the University of Western Australia (UWA) Steering Committee Meeting. We invite our top PICSE students to be our Ambassadors because they are excellent role models, have excellent communication skills, demonstrate a passion about studying at university, have a clear career pathway into a science based industry within the Primary Industry sector and are keen to get involved in PICSE outreach, activities, media opportunities as well as assisting in the PICSE Alumni program.

At the Steering Committee Meeting, Brydie and Lachlan described what they saw as the key aspect of being a PICSE Ambassador: *"To me, being a PICSE Ambassador means having the ability to inspire other students and for me to promote PICSE as a life changing program,"* said Brydie.

"To me, being a PICSE Ambassador means having a positive influence on young people's study and career pathways into the world of primary sciences," said Lachlan.

Lachlan and Brydie will be participating in the PICSE Youth Round Table in Canberra on 18th and 19th June facilitated by Dr Lydia Turner, a past PICSE student from the *"Class of 1998"*. Lydia will be seeking input from past PICSE students, AgriFood Skills Ambassadors and RIRDC New Horizons Scholars, hence engaging young people in the solution that addresses the skills shortage in primary industries. These outcomes will be fed into the Canberra Round Table that will take the *"Rebuilding the Agricultural Workforce"* into the implementation phase.

Lachlan and Brydie accepting their PICSE Ambassador certificates and badges at UWA

Assoc Prof David Russell

From Western Australia .....

Branching into Curtin

There is a new addition to the PICSE Family: Curtin University in Perth has launched a new Activity Centre in 2012. Curtin University has a long history of science education and communication in schools and communities, and is excited about the PICSE Activity Centre joining its outreach activities.

The Curtin PICSE Activity Centre is located within the Department of Environment and Agriculture. *"Our Department has many committed educators and active researchers concerned with understanding and resolving the important environmental, biological, and food and beverage issues facing us today,"* said Gina Pearse, PICSE Science Education Officer at Curtin. *"The PICSE program is vital in helping us to ensure we have young passionate graduates to address these challenges for our future."*

Gina has been working solidly to get the Activity Centre up and running and has a busy year ahead with many events scheduled. *"Here at Curtin PICSE we have identified nine schools that we would be thrilled to engage in our program for 2012, including five metro schools, and four WA Colleges of Agriculture,"* said Gina.

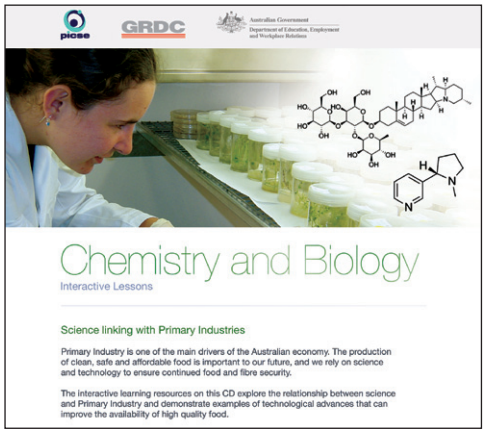
Members attending the inaugural PICSE Curtin Steering Committee Meeting held May 2012

As part of establishing these networks, Gina recently presented to 20 Agriculture teachers and trainers at the AgLinkEd Professional Development Conference in Narrogin. *"This conference was an ideal forum to excite teachers about PICSE and highlight the unique opportunities for them and their students to explore the science relating to primary industries,"* said Gina.

Visit the PICSE website for more Curtin activities: http://www.picse.net/CURTIN/

..... From the Senior Management Team

Responding to Australian Curriculum Drafts



Current PICSE Teaching Resource available online

Over the past 14 years, PICSE has been actively supporting and encouraging the teaching of agriculture and primary industry contexts in science classes across Australia.

During this time PICSE has been delivering professional development workshops for science teachers to provide relevant exemplars from primary industry and research projects that can be used in chemistry, biology, physics and environmental classes.

In addition to this PICSE has actively encouraged incorporating agricultural, food and fibre context in schools through the development of science resources (www.picse.net/HUB/resources), as well as providing input into the Australian Curriculum drafts.

Currently ACARA (Australian Curriculum, Assessment and Reporting Authority) are conducting a consultation process until 3rd June, on the draft curriculum areas that can embed agricultural and primary industry contexts for our nation's schools.

PICSE will distil any feedback from our partners into this ACARA process. Kay Lembo will keep interested partners informed about this consultation process for the draft ***Shape of the Australian Curriculum: Technologies*** (Years F-12) and the draft **Senior Science subjects: Biology, Chemistry, Earth and Environmental Science and Physics** (Years 11 and 12).

Kay Lembo
National Manager - Delivery and Quality Assurance

From Queensland .....

PICSE's Effect Flows to School and Beyond

Few work experience placements enable students to integrate and utilise the work they were involved in into their school assessment. The PICSE USC Industry Placement Scholarship has enabled Queensland students to revisit their Industry Placement in order to continue experiments started during their placement and utilise this to complete Extended Experimental Investigations (EEI) for assessment.

Megan is a Year 12 student from Mountain Creek State High School. She impressed the PICSE Steering Committee members at their recent meeting with her continued engagement with the Maroochy Research Station (Qld Agriculture, Fisheries and Forestry) as a result of her PICSE Industry Placement with them earlier this year.

Megan truly enjoyed her PICSE experience and was keen to expand upon this. Year 12 assessment in Queensland schools incorporates a major EEI project. Megan was invited to return to the Maroochy Research Station to continue her work with scientists and plant diseases to utilise her research results for the EEI assessment.

Helen Gillis, Head of Science at Megan's school, commented on the fantastic opportunities that have arisen for Megan as a result of the PICSE program, including the possibility of her findings being published in a peer-reviewed journal if a second trial confirms Megan's results.

Congratulations Megan!

Megan completing her research at Maroochy Research Station

PICSE is supported by the Federal Government and funded by University of Tasmania, University of Western Australia, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University, Curtin University, University of Western Sydney and the Grains RDC, Cotton RDC, Fisheries RDC, Horticulture Australia Ltd, Murray Darling Basin Authority, Dow AgroSciences, Meat and Livestock Australia, Woolworths Ltd and Department of Agriculture Fisheries and Forestry.

Cotton Catchment Communities CRC

picse

Appendix 6

Antipasto of Science Workshop Flow Chart

Antipasto of Science

INTRODUCTION

- PICSE (2 min)
- What is Agriculture (2 min)
- What are Primary Industries (2 min)
- Move to groups/industries (2 min)
- Brief/Overview of activity (2 min)

PRE COOKING

- Get familiar with recipe (5 min)
- Collect ingredients (5 min)
- Carry out recipe (15 min)

POST COOKING

- Presentation of food /industry 2 min each while eating (10 min)
- Answer questions for understanding (2 min)
- Ideas and group discussion (3 min)

GRDC

Feature Recipe-Teachers
Hummus Dip with Carrot, Celery and Capsicum Sticks

Primary School Fruit Muesli Bars with White Choc and Yogurt Topping

High School Gourmet Pizzas

Fisheries RDC

Feature Recipe-Teachers
Salmon Roulade on Savoury Piklets

Primary School Burgers with Tuna Patties

High School Creamy Seafood Fettuccini

Cotton CRC

Feature Recipe-Teachers
Marinated Feta and Olives

Primary School Chunky Fish and Chips

High School Special Fried Rice

Dairy

Feature Recipe-Teachers
Brie and Cranberry Grissini

Primary School Sweat Treat Ice Cream Sundae

High School Cheese, Tomato and Bacon Scrolls

Woolworths Fresh Food

Feature Recipe-Teachers
Basil Pesto Dip with Crispy Tortilla Chips

Primary School Roast Veggie and Feta Tarts (Pot of Jewels)

High School Crunchy Caesar Salad

QUESTIONS?

What Primary Industries were involved in producing your recipe? ……

What would be the result of your recipe/common food products if one Primary Industry was to no longer exist due to environmental factors? …..

Basil Pesto Dip with Herb Pepper Crisps

Duration:

10 minutes

SCIENCE
TAKING YOU PLACES

Ingredients:

125g basil leaves

75 g Rocket and Spinach leaves salad mix (optional)

4 x gloves of Garlic

¾ cup parmesan cheese

¼ cup pine nuts (or cashew nuts)

1 cup Cotton Seed Oil (or Olive Oil), (½ for dip and ½ for bread)

1/3 cup Dried Mixed Herbs

1 x teaspoon Paprika

Method:

Brush oil onto lavish bread and sprinkle with mixed herbs and paprika. Cut bread into 20 squares. Then cut each square in half to make triangles. Place into a preheated oven at 180*C for 5 minutes or until crisp. Remove and allow to cool. Place basil, salad leaves (optional), garlic, parmesan cheese (cubed), pine nuts and oil into a processor. Process for 20-30 seconds or until a smooth/chunky paste is achieved.

Serve and Enjoy!

Brie and Cranberry Bites

Duration:

10 minutes

Ingredients:

125g Brie Cheese

1 cup Cranberry or Raspberry Jam

½ Bread Stick

¼ cup of Cotton Seed Oil

Salt and Pepper to taste

Herbs to garnish

Method:

Cut the bread stick into slices about 1cm thick. Mix oil, salt and pepper and brush onto the bread slices. Place into preheated oven at 200*C for 8 minutes or until golden brown and allow to cool. Cut Brie into slices around the wheel about 0.8cm wide and place onto toasted bread slices. Place 1 heaped teaspoon portion of jam on top of Brie and garnish with herbs on the side.

Serve and Enjoy!

Hommus Dip with Veggie Sticks

Duration:

10 minutes

Ingredients:

425g can of chickpeas

2-3 tablespoons of Lemon Juice

2-3 tablespoons of Cotton Seed Oil (or Olive Oil)

2 cloves of crushed Garlic

¼ cup of Tahini Paste

Salt and Pepper to taste

Sprinkle of Paprika

1 x carrot

3 x celery sticks

1 x capsicum

1 x cucumber

Method:

Place chickpeas, lemon juice, oil, garlic, salt and pepper into a processor. Process for 20-30 seconds or until smooth. Add ¼ cup of Tahini Paste to the mixture, if desired. Lightly sprinkle paprika over the top of the dip if desired. Cut all vegetables into strips to serve with the dip.

Serve and Enjoy!

Marinated Feta and Kalamata Olives in Chilli, Garlic, Rosemary and Cotton Seed Oil

Duration:

10 minutes

Ingredients:

1 cup Cotton Seed Oil (or Olive Oil)

300g Feta

300g Kalamata Olives

2 x gloves of Garlic

3 x springs of Rosemary

1 x Red Chilli

½ Bread Stick

Method:

Cut feta into 1 x 1 cm cubes, chop chilli into small pieces, and roughly chop rosemary sprigs then add to the oil. Gently mix the oil mixture to distribute. Let the oil mixture sit while you cut the feta. Add feta and olives to the oil. Roughly tear bread into dipping portions for the remaining oil.

Serve and Enjoy!

Smoked Salmon, Cream Cheese and Dill Mini Toasts

Duration:

10 minutes

Ingredients:

125g Smoked Salmon slices

2 x tablespoons of finely chopped Dill

2 x teaspoons of Lemon Juice

1 x cup of Creamed Cheese

½ Bread Stick

¼ cup of Cotton Seed Oil

Salt and Pepper to taste

Method:

Cut the bread stick into slices about 1cm thick. Mix oil, salt and pepper and brush onto the bread slices. Place into preheated oven at 200*C for 8 minutes or until golden brown and allow to cool. In a small bowl mix chopped dill, lemon juice and salt and pepper until combined. Cut smoked salmon into strips. Unevenly spread cream cheese mixture onto toasts and assemble salmon strips on top. Garnish with dill sprigs.

Serve and Enjoy!

Cotton Catchment Communities CRC

Cotton Catchment Communities CRC aims to provide high quality research, education and adoption activities benefiting the Australian cotton industry, regional communities and the nation.

Did you know that....

The **cotton plant** is a leafy, green shrub in the Hibiscus family. About 30 species of insects attack the cotton plant, causing **major damage** to the crop.

Fibre from **one 227kg cotton bale** can produce 215 pairs of jeans, 250 single bed sheets, 750 shirts, 1200 t-shirts, 2100 pairs of boxer shorts, 3000 nappies, 4300 pairs of socks or 680 000 cotton balls.

Cotton's strength and absorbency levels make it an ideal fabric for **medical and personal hygiene products** such as bandages and swabs.

350 million people are engaged in cotton production worldwide.

Australia is one of the main cotton producers in the world and cotton is one of Australia's most profitable rural industries.

By identifying and researching connections between improved productivity, natural resource management and addressing climate change, the Australian cotton industry is recognised as a **world leader in producing high quality cotton.**

Most Australian cotton farms are owned and operated by **family farmers**. These farmers grow other crops and often graze sheep and cattle as well.

Appendix 7

PICSE Cotton PowerPoint Presentation for School Visits

picse

GRDC Grains Research & Development Corporation

HAL Know-how for Horticulture™

The University of Western Australia Achieving International Excellence

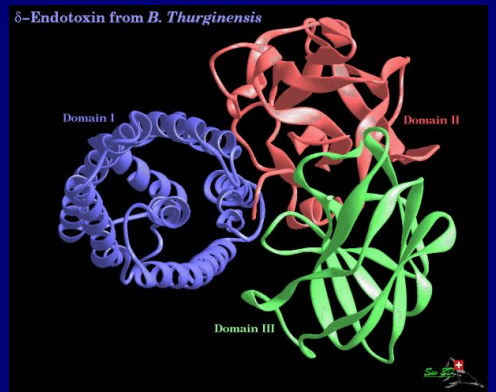
Clothing the World starts with Great Ideas

Cotton Production

Department of Agriculture and Food

Clothing the World starts with Great Ideas

Cotton Research



The Research Topics in Cotton:

Reduce water usage?

How best to Control Pests?

picse

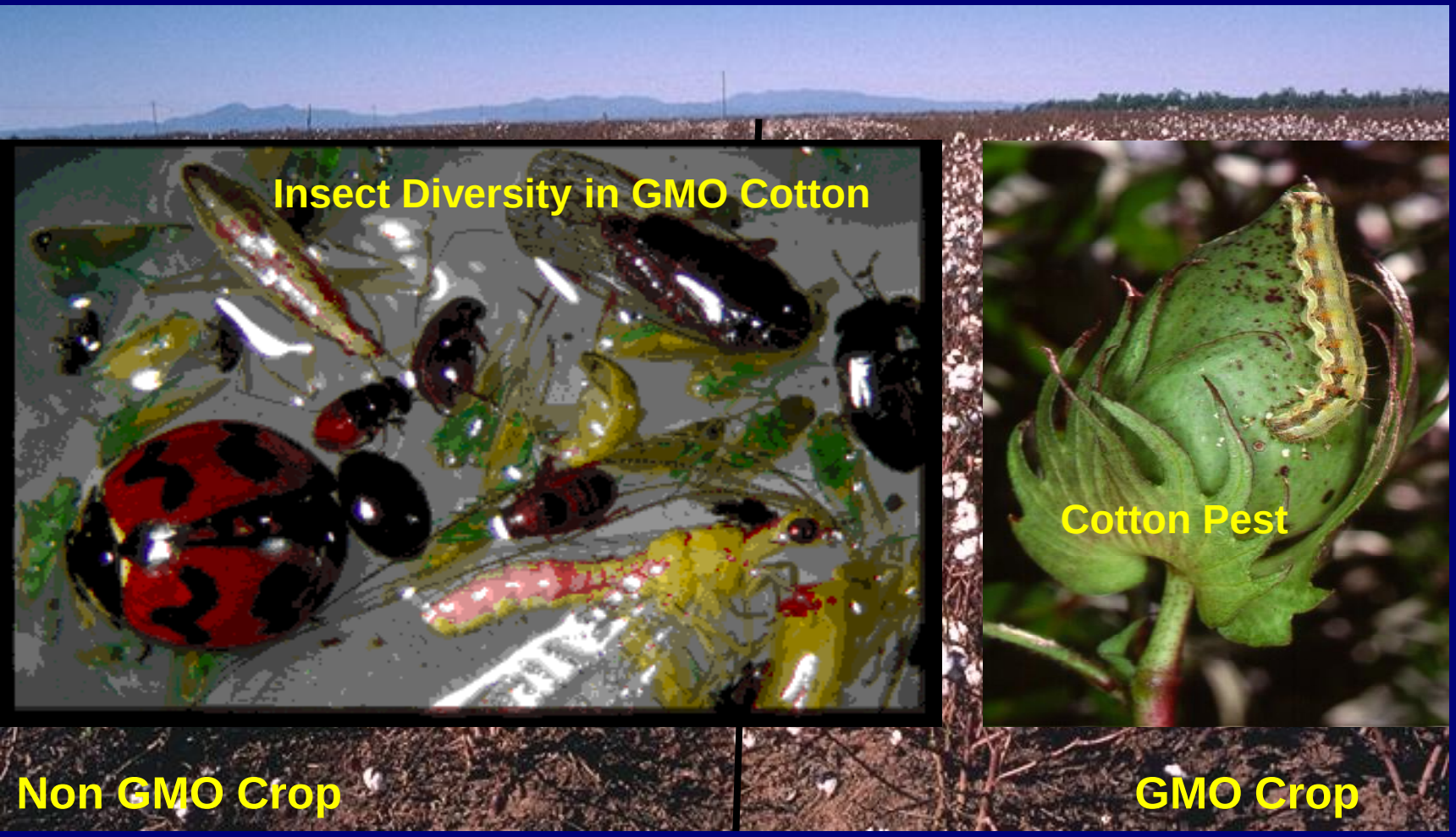
GRDC Grains Research & Development Corporation

HAL Know-how for Horticulture™

The University of Western Australia
Achieving International Excellence

Department of Agriculture and Food

Is GMO Biotechnology an Answer?



"What are you wearing?"

Art4Agriculture Young Farming Champion Hollie Baillieu asks

"What are you wearing?"

- http://www.youtube.com/watch?v=nQMUMVNbjic&feature=related

(Start from 3 mins 10sec. Total of 4 minutes presentation from this point)

“The Cotton Club” - Landline

- Cost
- Environment
- Integrated Pest management
- Irrigation
- Water use efficiency
- Nitrogen efficiency
- Technology – Pickers

- http://www.abc.net.au/landline/content/2010/s3217227.htm 15/5/2011 – Landline, (9 mins 30 secs)

How strong is your cotton?

- 1. Using your sample of ‘Cotton Lint’ try and pull it apart with your hands . - How strong is the cotton?
- 2. Now try and twist your sample of ‘Cotton Lint’ with your hands and then pull it apart! – How strong is the cotton now?
- What else can you investigate with cotton?

Appendix 8

PICSE USQ and PICSE UNE 2011 Teacher PD Programs

UNE PICSE Teacher Professional Development

Securing the future of food, fibre and water– Science providing solutions

Thursday December 1

Time	Session	Venue
9.15-9.40am	Registration, Tea & Coffee	Ground floor labs, Agronomy & Soil Science (AGSS) building, UNE
9.40-10.00am	**Ms. Susanna Greig, UNE PICSE** Update and introduction to UNE PICSE opportunities for science teachers and students.	
10.00-10.30am	**Dr Chris Guppy, UNE** Setting the scene, introduction to the impetus for and the recommendations presented in the parliamentary paper 'Australia and Food Security in a Changing world'	
10.30-11.00am	Morning tea	
11.00-11.30am	**Dr. Gururaj Kadkol, Tamworth Agricultural Institute** Food Security- Agricultural Science providing some solutions	
11.30-12.00	**Ms. Belinda Pine, Quality Teaching - Later Years Consultant, NSW DEC** Australian Curriculum update, Resources and support to assist implementation	
12.00-1.00pm	Lunch	
1.00-1.15pm	**Ms. Susanna Greig, UNE PICSE** Launch of PICSE national's latest resource developed. 'Chemistry & Biology Interactive lessons'	GIS Computer Lab, Natural Resources building, UNE
1.15-2.15pm	**Ms. Susanna Greig & Ms. Carissa Green, UNE PICSE** Overview and opportunity to investigate a suit of resources developed for science teachers by the PICSE program.	
2.30-3.00pm	**Mr. Vic Dobos, Susanna Greig & Carissa Green, UNE PICSE** Data Logger resource for classroom science	AGSS, UNE
3.00-3.30pm	Afternoon tea	
3.30-4.00pm	Transferring content from sessions into classroom teaching programs	
From 6.00pm	Evening dinner function	Archie's on the Park
7pm Guest speaker	**Prof. Iain Young, Head of School, Environmental and Rural Science, UNE** 'Food Security, the issue and how science is finding solutions'	

UNE PICSE Teacher Professional Development

Friday December 2

Time	Session	Venue
9.45-10.00am	Registration, Tea & Coffee	AGSS, UNE
10.00-10.30am	**Dr. Daniel Brown, Animal Genetics Breeding Unit & Susanna Greig, UNE PICSE** Science supporting understanding the genetic merit of animals	
10.30-11am	Morning Tea	
11.00-11.30	**Dr. Darryl Savage, UNE** Australians working in Cambodia: An example of how beef cattle contribute to food security and improve the livelihoods of those most in need	
11.30-12.00	**Dr. Mike Bange, CSIRO, Australian Cotton Research Institute,** Cotton in a climate of change, securing the future	
12.00-1.00pm	Lunch	
1.00-2.45pm	**Dr. Darren Ryder, UNE** Actively assessing Riparian ecosystems.	Lake Zot, UNE
3.00-3.30pm	Afternoon tea and event evaluation	AGSS, UNE

UNE PICSE Teacher Professional Development

The details...

Thursday Dec 1

Ms Susanna Greig	Susanna will offer a UNE PICSE update and an outline of opportunities for science teachers and students.
Dr Chris Guppy	Chris will set the scene for the theme for this event by discussing the food security issue and will outline the recommendations included in the parliamentary paper 'Australia and Food Security in a Changing world' which Chris was a contributing author.
Dr. Gururaj Kadkol	Gururaj will discuss how food security can mean many different things depending upon the level being considered, global, national or regional. At many levels given the current situation in agricultural production the solutions are in the social/political domain because there is enough food being produced but buying capacity and distribution are the problems. In future it is likely that food production might not be adequate to feed the world's population and production could involve higher costs to growers and the environment due to climate change and higher energy costs. Solutions based on science for food security could involve 1) improvements in efficiency of food production, 2) sustainable food production through alternative production methods. Efficiency of production could be increased through development of better crop varieties that are adapted to moisture and temperature stresses and can take advantage of higher CO_2 for increased photosynthesis. A complementary route to achieving higher efficiency is through better and more appropriate crop management practices. Sustainable alternative production methods could involve replacement of petroleum and other energy intensive inputs with naturally available materials, better management of nutrient cycles in crops and pastures and better production systems that take into account true costs of inputs and costs to the environment.
Ms Belinda Pine,	Belinda will outline the support and resources available for teachers in all schools to implement the Australian curriculum.
Ms Susanna Greig	PICSE national's latest resource, 'Chemistry and Biology Interactive lessons' has been developed by science teachers, scientists and PICSE SEOs. The resource provides technological advances and industry examples of the science supporting primary production. Each section of the resource is presented as an interactive activity for students and supporting the activities are laboratory or classroom activities and assessment tasks.
Ms Susanna Greig and Ms Carissa Green	Teachers will have an opportunity to peruse and investigate the range of resources for science teachers, developed by the PICSE Science Education Officers working with teachers and scientists. All teachers will have the opportunity to order those of interest.
Evening dinner function	Guest speaker, Prof. Iain Young, Head of School, Environmental and Rural Science, UNE will discuss 'Food Security, the issue and how science is finding solutions'

UNE PICSE Teacher Professional Development

Friday Dec 2

Dr. Daniel Brown	Daniel will introduce an exciting example of science supporting the understanding of the genetic merit of animals through the development of the Australian Sheep Breeding Values (ASBV). A resource developed which introduces the ASBVs. This resource has been developed with biology teachers in mind to support the teaching of 9.7 Option — Genetics: The Code Broken?
Dr. Darryl Savage	Through Australia's aid program science is helping poor farmers in Cambodia produce desperately needed red meat, improve their livelihoods and increase the educational opportunities for their children. This will be a presentation showing examples of the work and its impact in Cambodia.
Dr. Mike Bange,	Mike will explain change has always been present, but the cotton industry like all Australian agriculture in general is facing change at an unprecedented rate and from different causes. In this presentation we consider a number of changes that the cotton industry is facing, specifically those associated with: 'climate change' in the meteorological sense; regulatory issues relating to reductions in water availability and carbon emissions trading; rising costs of production; and competition from other commodities. We present the impacts of these changes on cotton production systems and highlight specific research and management options being implemented to cope with change.
Dr. Darren Ryder	Darren will provide teachers with the information and fresh new outdoor activities which will allow students to assess and better understand aquatic ecosystems. This session will firstly describe wetland and riparian habitats. Teachers will measure chemical attributes of the water to describe water quality. We will also measure aquatic invertebrate life to determine aquatic ecosystem health. To support this session all teachers will be provided with water monitoring chemical assessment kit, a student work sheet and new ideas for continuing this activity with students. While this session will investigate Lake Zot, UNE the concepts can be applied to any aquatic ecosystem near your school. This session is designed to support biology teachers teaching 8.2 - A Local Ecosystem

The science of food and fibre security

Monday 5 December

TIME	TOPIC	PRESENTER	LOCATION
8.00 – 8.25 am	Registration and Welcome	Professor Grant Daggard	R113
8.30 - 9.30 am	Travel to Warwick by bus (1 hour)		Japanese Gardens entrance
9.30 - 9.50 am	**MORNING TEA** **+ overview of Hermitage Research Station**		**Hermitage Research Station**
9.50 – 10.40 am	Presentation/Demonstration		Hermitage Research Station, 604 Yangan Road, Warwick
10.45 - 11.30 am	*Travel to Stanthorpe (45 mins)*		On bus
11.35 am – 12.15 pm	**LUNCH**		Qld College of Wine Tourism (QCWT)
12.20 -1.15 pm	Presentation and Activity	Ursula Kennedy	QCWT
1.20 – 2.05 pm	Travel to Warwick		On bus
2.10 – 2.40 pm	**AFTERNOON TEA**		Jacqui's Café 8 Albion Street, Warwick
2.40 - 3.40 pm	*Travel to USQ (1 hour)*		On bus
6.30 pm	Vista Restaurant and Wine Bar	Professor Lindsay Brown	39 Margaret Street, Toowoomba

Tuesday 6 December

TIME	TOPIC	PRESENTER	LOCATION
8.15 – 8.30 am	Early coffee/tea		
8.30 – 9.00 am	Talk on Genetically Modified (GM) Food	Professor Grant Daggard	T120
9.05 – 9.40 am	**Field to Fabric, Mini Gin**	Trudi Staines – Cotton Catchment Communities CRC	T120
9.40 – 10.10 am	**MORNING TEA**		T120
10.15 – 11.00 am	Spice Up Your Life: Spices as Antibiotics in Foods	Bernadette McCabe	D305
11.00 – 11.45 noon	Data logging in the classroom (Keepad Interactive)	Kay Lembo	D305
11.50 – 12.10 pm	*Travel to Club Glenvale*		On bus
12.15 – 1.15 pm	**LUNCH**		**Club Glenvale 564 Boundary Road, Toowoomba**
1.15 – 1.30 pm	*Travel to Stahmann Farms*		On bus
1.35 – 2.25 pm	Tour Stahmann Farms		Cnr McDougall St & Industrial Avenue, Toowoomba
2.30 – 2.50 pm	Travel to USQ		On bus
3.00 – 3.30 pm	Computer resources for classrooms	Kay Lembo	D113
3.30 – 3.50 pm	**AFTERNOON TEA and Evaluation**		USQ

USQ GRAPHICS (11-1030) • USQ PHOTOGRAPHY

FOR MORE INFORMATION (07) 4631 1526 • picse@usq.edu.au • www.usq.edu.au/sciences

Appendix 9

Teacher PD Travelling Scholarship Report and Letter of Thanks

TO WHOM IT MAY CONCERN

This just a short note to thank the Cotton Research and Development Cooperation for sponsoring my travelling scholarship to the University of New England in Armidale NSW. It was a great opportunity to hear from some outstanding scientists and the work they are doing with regard to food and fibre security.

I gained a large amount of information which I am looking forward to sharing with my students in the New Year.

Yours sincerely

EDGAR COOPER

Edgar Cooper

Awarded Travelling Scholarship to University of New England from University of Western Australia funded by Cotton Research & Development Corporation (CRDC)

Cotton Catchment Communities CRC

PENRHOS COLLEGE
STRIVE FOR THE HIGHEST

School: Penrhos College, Perth WA

Wednesday the 30th of November came around very quickly and I was on my way to Armidale. I left Perth and 9.50 am and arrived in Armidale at 8.20 pm, it was a long day. I was greeted at the airport by a very effervescent Susanna who was extremely welcoming.

Susanna drove me to my hotel which was lovely. It was set in the middle of some very lush grounds, which I have not seen for a while coming from a very dry Perth. I was quite tired from the day so went to bed ready for an early start the next day.

Carissa picked me up the next morning. It had been raining all night and it looked like it was going to continue for a while. The drive to UNE was fabulous, Armidale looked like something out of an English post card it was so green and manicured. The university was quite well spread out through the town.

We got to the lab that we would be working in and I was introduced to the other teachers who were there for the PD on Food and Fibre Security. They were all very nice and I was looking forward to getting to know them over the next two days.

The PD started and our first speaker was Dr Chris Guppy who took us through a parliamentary paper on food security in Australia. This was very interesting. Some of the statistics that he shared with us were really not what I had imagined. It was great to hear that some of the ideas that we are trying to instill in our students were coming out in this paper. I felt that we were on the same page with the way we thought Australia is positioned in this changing world. I was interested to hear that Chris is going to Burma to look at soil quality and help the Burmese with some of their agricultural issues. This was just one of the few times that I would hear about how our scientists are giving back to other communities.

Food Security: All people at all times have physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life.

This was how food security was defined in the parliamentary paper, which gives a very holistic view on what we mean by food security.

Dr Guruaj Kadkol was the next speaker and he stated that we needed to produce 30% more food by the year 2050. What was very inspiring about listening to Guruaj is that he did not see a problem with hitting that target. He shared some of his work and his visions that he is working on at the Tamworth Agricultural Institute. Absolutely amazing and the students that go to school in that area have such an amazing resource by having that institute on their doorstep.

Back to the hotel for a rest before dinner. Dinner was at 6 in the dining room of the hotel. Before dinner started we had Professor Iain Young speak to us. What a passionate and

inspiring man and not to mention extremely humorous. Iain gave us a snapshot of Australia and its issues with food and fibre securities. One thing that really did surprise me was when he said that our fisheries were really not very secure. This is due to our very old soils which provide very little nutrients to the waterways. This was a connection that I had not made before.

The dinner was brilliant and I really got a chance to get to know some of the other teachers. I was amazed that most of them had grown up in the area, had gone to University and then had come back to the area to teach. They had a definite sense of belonging. They showed a great deal of passion for their teaching and more importantly teaching the students in that part of NSW. They were a very inspiring group of people.

The next day we started off with Dr. Daniel Brown who spoke to us about his work with the animal genetics and breeding unit. One of the studies involves designing sheep to have fewer creases in them so that they are not badly affected by blow flies. When he was talking to us it was easy to understand that what we are teaching in class is not that far off from the basics that they start with when looking at modifying organisms. I certainly felt that my Biology students had such a variety of pathways to pursue in this area.

Dr. Darryl Savage talked about Australians working in Cambodia. This would have to have been one of the most illuminating pieces of work that was shared over the two days. By the questions and interest shown by everyone I was not the only person that felt this way. Darryl had been working through an aid program in Cambodia trying to get them into the mindset that their cows could make them money. Basically they started in one province showing the framers that if they grew proper food for cows instead of feeding them rice grass which has very little nutritional value they would be able to sell their cattle. The farmers started planting a grass cultivar and feeding their cattle this idea was quite successful and they were able to sell their cattle which now were not just bones to the Vietnamese who have a big tourist trade demanding more beef on the menu. This idea went from one province to 24 provinces. One of the major positives to this was that children who normally looked after the cattle (having to look for feed) did not have to spend as much time as before. So their labour hours were reduced by two thirds, this meant they were able to attend school for longer periods of time.

Dr. Mike Bange from the Australian Cotton Research Institute spoke to us about GM and the cotton industry. It was fantastic to hear some of the breakthroughs and studies that were going on with the cotton industry. I was surprised to learn that Australia in the sixth largest producer of cotton in the world and the third largest exporter of cotton in the world. It is worth billions to the Australian economy. One of the very interesting things that Mike mentioned was that we have the ability to continue to keep genetically modifying cotton, however, the cost that goes into the research and development is starting to become so high that the return for the end product is not as healthy as it used to be. Obviously we need to keep modifying as the pests keep changing so the inbuilt pest control genes become less effective.

Lastly I would like to say I thoroughly enjoyed this experience and I would like to thank PICSE and the Cotton Research and Development cooperation would for choosing me to attend this PD. In particular thanks go to Belinda Pope and Jeffrey Hon for organising all my travel arrangements so thoroughly and to Susanna Greig and Carissa Green for being so welcoming and friendly when I was in Armidale.

Appendix 10

PICSE USQ and PICSE UNE IPS Camp Programs

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Monday 12th Dec

Time	Place	Activity
8.30am-10.00am	Echidna Gully, Armidale	Drop bags into rooms, housekeeping & introductory session. Echidna Gully
10.00am-10.30am		Travel to UNE
10.30am-11.00am	AGSS, UNE	Morning Tea
11.00am-11.30 am	Seminar room, Homestead building, UNE	Genetic Improvements in the pig industry – Dr. Susanne Hermesch
11.30am-12.00pm		Genetic improvements in the sheep industry – Dr Andrew Swan
12.15pm-12.45pm	VHR,	VHR presentation, Dr. Rad Nielsen
1.00pm-1.45pm	AGSS, UNE	Lunch
1.45pm-2.45pm	UNE campus & college tour	Mrs. Kim Burton
2.45pm-3.15pm	Echidna Gully, Armidale	Travel to Echidna Gully
3.30pm-6.00pm		Raft Building & Regatta
7pm		Dinner
8.00pm		Guest speaker, Kerry Johnson, (Cargill) & David Gale (NSW DPI), social games and trivia

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Tuesday 13th Dec

Time	Place	Activity
8.00am- 9.50am	Glendon, Tamworth	Travel to Tamworth
9.50am-10.45am		Morning tea and travel to Glendon
10.45am-12.15pm		Glendon Poultry system – Mr Bede and Mrs Narelle Burke
12.15-12.45pm		Travel to TAI
12.45pm-1.45pm	Tamworth Agricultural Institute	Group A - Gel electrophoresis, Dr Robin Gunning & Group B – Lunch
1.45pm-2.45pm		Group B - Gel electrophoresis, Dr Robin Gunning & Group A – Lunch
2.45-3.20pm		Travel to Viterra Malt
3.20-4pm		Tour of Viterra Malt, Damien Puyenbroek and Julie Miller
4pm- 6pm		Travel to Echidna Gully
7.00pm		Dinner
8.00pm		Public speaking skills session & preparing for the PICSE scholarship reporting back.

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Wednesday 14th Dec

Time	Place	Activity
8.30am-9.00am		Travel to UNE
9.00-9.50am		Outline of methane emissions in livestock research at UNE Tour of animal house, UNE, Dr Robert Herd Demonstration of the CAT scanner, Graham Chaffey
9.50-10.20am	AGSS, UNE	Morning tea
10.20am-12.15pm	East West EnviroAg, Tamworth	Travel to East West EnviroAg
12.15pm-1.15pm		Intro at East West EnviroAg, Mrs. Stephanie Cameron, Tim McLean and Tyler Berrigan
1.15pm-2.00pm		Lunch in Tamworth
2.00pm-3.30pm	Walcha Dairy	Travel to Walcha Dairy
3.30-4.30pm		Tour of Walcha Dairy
4.30pm-6.00pm		Travel to Echidna Gully
6.30pm		Dinner
7.00-8.00pm		PhD insight, Munique Webb, Michael Reid; information about early entry, scholarship opportunities and courses at UNE, Assoc. Prof. Robin Jessop, Jeff Hinch, Mr. Craig Birchall, Nigel Andrews Mr. Rex Glencross Grant

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Thursday 15th Dec

Time	Place	Activity
8.30am-9.00am		Travel to UNE
9.00am-10.30am	Woolshed, UNE	Investigating wool quality measurements, Ms. Sara Bowers, Dr. Rachelle Hergenhan
10.30am-11.00am	AGSS, UNE	Morning tea
11.00am-11.30am		Travel to Kirby
11.30am-1.00pm	Kirby Farm, UNE	Taggle tracking system, Dr. Mark Trotter
1.00pm-1.50pm		Lunch at Kirby
1.50pm-2.20pm		Insight into current research, Sheep CRC, Mrs. Deborah Maxwell
2.20pm-4.10pm		Sheep CRC activities, Mrs. Deborah Maxwell; Dr. Daniel Brown; Luke Stephen; Jim Meckiff & Mr. Paul Arnott
4.10pm-5.00pm	Echidna Gully, Armidale	Travel to Echidna Gully
5.30-8.00pm		Paintball
8pm		Dinner

PICSE Science to Industry Camp
(Dec 12-16, 2011)
Friday 16th Dec

Time	Place	Activity
8.00am-9.00am	Tomato Exchange, Guyra	Travel to Tomato Exchange
9.00am-10.00am		Tour of Tomato Exchange glasshouse complex– Paul Butterworth, Tal Kanety, or Ray Nutt
10.00am-10.30am		Morning tea in Guyra
10.30am-11.15am	Research Station, Glen Innes	Travel to Glen Innes Research Station
11.15am-12.15pm		Long term Rotational trial and soil analysis– Dr. Carol Harris Glen Research Station
12.15pm-1.00pm		Lunch at Glen Innes
1.00pm-2.00pm	Echidna Gully, Armidale	Travel to Echidna Gully
3.30pm		Afternoon tea and wrap up with parents

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Monday 12th December

Susanne Hermesch, AGBU	Animal genetics is an exciting area of science. With Susanne, we will explore this area of science and take a close investigation into the study of genetics in pigs
Andrew Swan, AGBU	Is it only your genes which determine your appearance and performance? Andrew will introduce us to the basic principles of genetics and the science has allowed us to better understand the genetic merit of sheep.
Rad Nielsen, Veterinary Health Research	VHR performs large animal research trials for a number of national and international animal pharmaceutical companies. Students will be given a tour of the business and a presentation outlining current projects
Kim Burton	A tour of UNE will be provided. This will include taking a look at some of UNE's new facilities, the colleges and sports union as well as Booloominbah where you will return to on the 6th of February for the PICSE scholarship reporting back session.
Raft and Regatta	When it is time for getting to know everyone there is no better way than to form groups build a raft from basic materials provided and then work out who has designed the most efficient raft in a regatta. There will be races to the end of the dam. Good Luck!
Guest Speaker, Kerry Johnson social games & trivia	Kerry is employed as HR Manager Teys Australia - a Cargill Joint Venture at the Tamworth Plant. Kerry is degree qualified in HR and has recently completed her second degree in Organisational Development and Adult Education. She has approx 15 years of experience in HR, OHS and L&D practice and will share insights and experience to explain what industry has to offer graduates and new entrants to careers in regional Australia. Kerry was recently appointed as an Ambassador (one of eight) and will undertake a twelve month program with AgriFood Skills Australia, and will be active in helping to promote a positive image of the professionalism of people in the agrifood industry, the diversity of career opportunities and pathways available, and highlight the contribution it makes to the Australian economy and culture. David is a Graduate Officer with the NSW Department of Primary Industries and is a member of the NSW Farmers Association Young Farmers Council. He has an Honours degree in Agricultural Science (Agronomy), through which he has developed his media skills working with radio, television and newspapers.

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Tuesday 13th December

Bede Burke, Glendon	At Bede Burke's poultry farm 'Glendon' we will be taken on a journey 'from the paddock to the plate' tour of agricultural production. Glendon is an efficient, self sufficient enterprise where feed for the poultry enterprise is grown and produced on site.
Robin Gunning	Insects can become resistant to pesticides by using enzymes to metabolise pesticides and render the pesticides harmless. In many pests, such as the cotton bollworm, esterase isoenzymes are the most important enzymes causing resistance. Together we will work with Robin to separate cotton bollworm proteins by polyacrylamide gel electrophoresis and strain for esterase enzyme activity.
Tour of Viterra Malt, Tamworth, Damien Puyenbroek & Julie Miller	Damien Puyenbroek and Julie Miller will offer a guided tour of the Viterra Malt factory in Tamworth. Viterra Malt is Australia's largest malting company converting barley into malt for food and beverage products. The sheer volume and scale of production at this plant is impressive. We will observe the steeping, germination and kilning processes. Furthermore, we will have the opportunity to view the recently developed water treatment plant. This new facility allows the waste water produced through producing malt to be purified to the quality of drinking water and reused for cleaning and steam generation for the kilning process. This is an example of an industry leading the way in efficiency, productivity while reducing its environmental impact.
Public Speaking Skills	Public speaking plays an important role in a range of careers and every group includes those who are more or less confident with this skill. On completion of the PICSE Industry Placement Scholarship (IPS), students will offer a short presentation describing the PICSE IPS experience. In this session, we will provide some advice and tips to improve public speaking skills and have a practice at public speaking.

Wednesday 14th December

Livestock methane research and UNE animal house complex, Dr. Robert Herd & Graham Chaffey	Cattle and sheep naturally produce methane, a potent greenhouse-gas (GHG), as a by-product of digesting grass in their rumen (stomach). This methane is breathed out and burped up naturally throughout the day and contributes almost 10% of Australia's GHG emission. Our government will expect farmers to try to reduce these emissions. One option being investigated in Armidale is to see if there are bulls and rams whose progeny naturally produce less methane, and if so, in the future farmers may choose to use these bulls and rams to breed cattle and sheep that naturally emit less methane. During the visit the students will receive a short talk on livestock and GHGs and then inspect our brand new cattle animal house to see the chambers we use to measure methane produced by cattle, and walk through the animal house complex where research on sheep and poultry is being conducted.

East West Introduction, Stephanie Cameron	Stephanie Cameron will outline the work completed and demonstrate the scientific techniques and equipment at East West EnviroAg, including the Atomic Absorption Spectrophotometer and other new equipment. Stephanie will also encourage us to think about the quality of water in the Tamworth area. Tim McLean and Tyler Berrigan will also chat with us about their tertiary studies and setting up their career planing.
Tour of Walcha Dairy, Leon McCabe and Clinton Ballough	The recently established Walcha dairy is at this point, the only dairy in the New England region and the dairy at the highest altitude in Australia. Currently producing approximately 24,000L of milk/day and capable of milking 400 cows/hour, at this point, milking 800 cows twice daily, with cows themselves walking onto and off the rotating platform where they are milked. This is a 'State of the Art' dairy design. We will be offered a farm tour, a look at the calving shed, a display of milking in action and an overview of the breeding management and the computer operating system in place.
PhD Talks, scholarship, Early Entry and course information,	Guest speaker, Munique Webb will outline what PhD studies entail, the pathway, the opportunities following as well as an insight into her own PhD. Information will also be provided detailing scholarship opportunities, the early entry program and course information at UNE will be provided by Robin Jessop, Craig Birchall, Nigel Andrews and Rex Glen-Cross Grant. Make sure you come armed to this session with loads of questions you would like answered.

Thursday 15th December

Emma Doyle	The students will have the opportunity to see different types of raw wool samples. We will then measure the quality of the wool sampl es, as would be done at the Australian Wool Testing Authority. We will measure length and strength, fiber diameter and yield. We will also see a demonstration of the new 'comfortmeter' machine recently developed by CSIRO and the Sheep CRC. The machine has been designed to measure wool fabric for next-to-skin comfort, to address the strong negative association of 'wool' and 'prickle and itch'.
Mark Trotter	"Where the dang are the cows?" Real-time spatial livestock tracking allows graziers to remotely see where their cattle are located on an i-phone! This cutting edge technology uses radio beacon triangulation ear tags to geo-locate animals and then transmit this information back to the farmers lap top or smart phone. In this session students will learn about how scientists are using GPS tracking technologies as a research tool to uncover the secret behaviours of animals. They will also learn about how commercial real-time ear tag based tracking technologies are being developed for the livestock sector and how farmers can use these systems to locate their animals and a whole lot more!!!
Deborah Maxwell, Sheep CRC	The Cooperative Research Centre for Sheep Industry and Innovation is at the cutting edge of research and advancements made in the sheep industry. Deborah Maxwell will provide us with an insight into the latest research and developments in the sheep industry. In keeping with the previous session, we will be involved in activities investigating the radio frequency identification (RFID), sheep classing and wool classing at Kirby, (one of the UNE farms).

PICSE Science to Industry Camp
(Dec 12-16, 2011)

Paintball	Now is the time to decorate your friends with colour. That is if you can catch them! Paintball is an optional, but highly recommended activity. It really is a heap of fun! A round of paint balls starts at $55, you can buy larger packets or more can be purchased if you run out. For this activity you will be required to wear a long sleeved shirt and long legged pants.

Friday 16th December

Tomato Exchange Paul Butterworth/Tal Kanety/Ray Nutt	Tomato Exchange is an award winning horticultural enterprise. This glasshouse complex is 201,600 square meters and produces on average 12,000,000kg's of tomatoes each year. Placed side by side these fruit could line the road from Brisbane to Alice springs! Students will be offered a guide tour of this impressive glasshouse enterprise looking at the systems in place for the large scale production of high quality tomatoes in glasshouses at Top of the Range Tomatoes in Guyra. This is horticulture at its best!
Glen Innes Research Station Carol Harris	The Glen Innes long-term rotation (LTR) experiment (established in 1921) is an unique resource that demonstrates the long-term implications of cropping systems on soil chemical, physical and biological fertility. The maintenance of soil fertility is fundamental to crop production and sustainability. The LTR experiment at Glen Innes comprises 7 rotations; 3 of which are exploitive continuous cropping rotations of maize and forage oats, the other four rotations contain a legume (red clover) ley. The rotation treatments as initiated in 1921 have been adhered to and data has been collected annually. Continuous cereal crops have exploited soil fertility resulting in declining organic matter, soil carbon, soil nitrogen content, deterioration of soil structure and increased soil erosion. Over the 87 years rotations with a legume ley have not only resulted in increases in crop yield, quality and stability but also improvements in soil health including soil carbon, soil nitrogen, soil physical parameters and soil biological activity. The excursion to Glen Innes in January will include an inspection of the LTR experiment and a hands on comparison of aspects of soil health (soil pH, soil texture, soil erosion and biological activity) between exploitive and non-exploitive rotations. The inspection of the LTR will conclude with a discussion of why it is crucial to monitor soil health and how these important aspects of soil health change over time.
Afternoon Tea at Echidna Gully & wrap up session with parents	Afternoon tea will be provided at Echidna Gully for parents and family members who have come to pick up students who have completed the PICSE Industry Placement Scholarship. At this time, we will provide an overview of the events from the week.

PICSE Science to Industry Camp
(Dec 12-16, 2011)

USQ UNIVERSITY OF SOUTHERN QUEENSLAND
Faculty of Sciences

picse

2011/2012

Industry Placement Scholarship Program

GRDC
Grains Research & Development Corporation

Australian Government
Department of Education, Employment and Workplace Relations

2011/2012 Supporters

USQ UNIVERSITY OF SOUTHERN QUEENSLAND
Faculty of Sciences

CSBio Centre for Systems Biology

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VINTESSENTIAL LABORATORIES

Queensland Government

Leslie Research Centre

Queensland Government

Robert Wicks Pest Animal Research Centre

qcwt
queensland college of wine tourism

2011 PICSE Camp Program

Monday 28 November			
Time	**Activity**	**Presenter**	**Venue**
8:00am	Meet at Ruthven Street Motor Inn – USQ	Mary McGilvray	Ruthven Street Motor Inn
8:15am	Welcome and Program Induction	Mary McGilvray	D305
8:30am	Safety Discussion & Lab Introduction	Mr Pat McConnell Laboratory Manager Department of Biological and Physical Sciences	D305
9.00 – 10.00 am	Public Speaking – how to prepare for the reporting back session	Mr Graham Christensen	T112
10:10 – 11.00 am	Morning Tea + travel to Leslie Research Centre	Mary McGilvray	
11.00 am – 12.30 pm	Leslie Research Centre – different areas of research – weeds, soils, phenology, frost work, pathology, wheat breeding and trialling	Richard Uebergang, Michael Widderick, David Lester, Troy Frederiks, Cassy Malligan, Douglas Lush	Leslie Research Station
12.30 – 1.30 pm	Lunch on bus	Mary McGilvray	
1.35 – 2.35 pm	Coominya – Olive Products Australia	Jenny Neels & Vicki Bourchier	
2.40 – 3.30 pm	Travel to USQ		
3:30pm – 5:00pm	Lab Activity	Noel Knight Postdoctoral Research Fellow, Centre for Systems Biology, University of Southern Queensland	D305
5:15pm – 5:45pm	Settle in time		Ruthven Street Motor Inn
5:45pm – 6:45pm	Dinner		Ruthven Street Motor Inn
7:00pm – 9:00pm	10 pin bowling	Mary McGilvray	Sunset Superbowl 531 South Street, Toowoomba

Tuesday 29 November			
Time	**Activity**	**Presenter**	**Venue**
7:00am	Breakfast	Mary McGilvray	Ruthven Street Motor Inn
8:00am – 10:00am	National Centre for Engineering in Agriculture & Faculty of Engineering and Surveying lab activities – GPS Tracking and Unmanned Aerial Vehicle (UAV) demonstration	Troy Jensen	
10:15am – 10:45am	Morning Tea		
10:45pm – 11:00 pm	Travel to Pacific Seeds		
11:00am – 11:45am	The science of seeds - presentation	Andrew Easton	Pacific Seeds – Anzac Avenue
11:45am – 12:30pm	Tour of Facility and activities	Neil Muller	Pacific Seeds – Anzac Avenue
12:30pm – 12:45 pm	Travel to USQ		
1:00pm – 2:00pm	Lunch		McDonald's – Bridge Street
2:15pm – 2:30 pm	Travel to Monsanto		
2:30pm - 4.00 pm	The life cycle of Helicoverpa – presentation and lab activities	Kym Deaves Kristen Knight	Monsanto
4:00pm – 4:15pm	Travel to accommodation		Ruthven Street Motor Inn
4:15pm – 6:00pm	Free time		Ruthven Street Motor Inn
6:00pm – 7:00pm	Dinner		Ruthven Street Motor Inn
7:30pm – 8:30pm	Meet your future! Getting to know you session with current Faculty of Science undergraduate & post graduate students		Ruthven Street Motor Inn

201 PICSE Industry Placement Program

Wednesday 30 November			
Time	**Activity**	**Presenter**	**Venue**
7:00am	Breakfast	Mary McGilvray	Ruthven Street Motor Inn
8:00am – 10:00am	Travel to Stanthorpe		
10:00am – 11:30am	Tour of wine making facilities –the science of soils, soil structure and "terroir"	Mr Mike Hayes	Symphony Hill Vineyards
11:30am – 11:45am	Travel to QCWT		
11:45am – 12:30pm	Tour and presentation	Bill Morgan	Queensland College of Wine Tourism
12:30 pm– 1:30pm	Make your own Gourmet Lunch		Queensland College of Wine Tourism
1.30 pm – 2.30 pm	The science of wine making	Bill Morgan	Queensland College of Wine Tourism
2.30 – 4:30pm	Travel to Toowoomba		
4:30pm – 5.30 pm	Liquid Nitrogen Ice-Cream	Dr Mark Lynch Lecturer in Chemistry/Biochemistry	T110
6:30pm – 7:30pm	Dinner		Ruthven Street Motor Inn

Thursday 1 December			
Time	**Activity**	**Presenter**	**Venue**
7:00am – 8:00am	Breakfast		Ruthven Street Motor Inn
8:00am – 8:30am	Pack up rooms for travel to Inglewood		
8:45am – 9:00am	Travel to Vanderfield		
9:00am – 10:00 am	What's inside the big shed – the business behind Precision farming	Ian Daniel & Richard Harris	Vanderfield
10:00am – 12:00pm	Travel to Inglewood Research Station		Inglewood
12:15pm– 1:00pm	Lunch and settle in time		Robert Wicks Pest Animal Research Centre Inglewood
1:00pm – 5:00pm	Safety Induction and Tour of the facilities. Three group activities. 1. Setting up non-toxic bait plots, 2. Radio-tracking and 3. Assessing a rodent trial or collecting blood samples from rabbits. Each group will spend about an hour on each activity and will rotate through them.	Peter Elsworth, David Aster, Andrew Granzotto and Michael Brennan	Robert Wicks Pest Animal Research Centre Inglewood
5:30pm – 6:30pm	BBQ Dinner		Robert Wicks Pest Animal Research Centre
7:00pm – 8:30pm	Video Presentation, Frog Spotting/or Rabbit spotlighting activity (depending on conditions)	David Aster, Andrew Granzotto and Michael Brennan	Robert Wicks Pest Animal Research Centre

Friday 2 December			
Time	**Activity**	**Presenter**	**Venue**
7:30am – 8:45am	Breakfast and pack up for trip back	Mary McGilvray	Robert Wicks Pest Animal Research Centre
9:00am - 11:00am	Check the bait plots that were set on the Thursday to determine what animals have removed the baits	David Aster, Andrew Granzotto and Michael Brennan	Robert Wicks Pest Animal Research Centre
11:15am – 1:15pm	Travel to Toowoomba		
1:30pm	Students to be picked up in the foyer of USQ Recreation Centre		

Appendix 11

IPS Travelling Student Reports and Letters of Thanks

28/02/2012

To the Cotton Research and Development Corporation,

I would just like to thank you for funding my travelling scholarship from the Sunshine Coast to the University of New England and return. It was an amazing experience where I learnt valuable information about science and was able to meet fellow young people with similar interests as me.

The travelling scholarship allowed me to gain an insight into the agricultural side of science. One such placement was the *Glenn Innes Research Station* where they research the long-term implications of cropping systems on soil chemical, physical and biological fertility. The long-term rotation (LTR) experiment at Glenn Innes comprises of 7 rotations; 3 of which are exploitive continuous cropping rotations of maize and forage oats, the other four rotations contain a legume (red clover) ley. When we visited the Glenn Innes station, I was able to inspect one LTR experiment as well as having a hands on comparison of the aspects of soil health, including soil pH, texture, erosion and biological activity.

For my industry placement I went to the Maroochy DEEDI Research Station in Nambour, where I worked on the current ginger trials. After successfully completing year 12, I hope to go onto the University of the Sunshine Coast to study a Bachelor of Science. Once I have completed my university degree, I would like to go into a career in horticulture.

Yours Truly,

Susanna Imarisio

Susanna Imarisio

Awarded Travelling Scholarship to University of New England funded by CRDC

School: St John's College, Nambour QLD

Industry Placement: Maroochy Research Station (DEEDI)

The Industry Placement Camp

The PICSE residential camp that took place at Alexandra Park Conference Centre was an amazing experience and was beneficial to the way I viewed Primary Industries within the Sunshine Coast. The camp gave me the opportunity to meet and befriend students of the same age who have similar future goals. The activities on the camp made the experience all the more memorable as through them we were able to learn more about the other students. A highlight was the public speaking activity as it demonstrated everyone's individual personalities.

Highlights of the camp included the Health and Food Sciences Precinct in Brisbane and the DEEDI Maroochy Research Station. The Health and Food Sciences Precinct is an establishment that focuses on innovative food research. Some of the topics in this particular industry that interested me included the project that is looking at the effects of zeaxanthin on human macular degeneration which is a major disease and the testing of Tough Fish Syndrome found in Saddletail Snapper and Barramundi. I particularly enjoyed the tour of the DEEDI Research Station as I was able to see the many different pathways in future science. Seeing the various projects including tissue culture and the affects of pathogens on strawberries was educational and appealing. Ian Layden demonstrated the management side to horticulture science and we completed a quick quiz on agriculture.

Another highlight was being selected for the travelling scholarship to attend the PICSE camp at the University of New England in Armidale. This camp gave me a whole new outlook on Science, especially Agricultural Science. As insects can become resistant to pesticides, Robin Gunning showed and gave us the opportunity to separate cotton bollworm proteins through gel electrophoresis to find the enzymes that cause the resistance. Dr Robert Herd is conducting research on cattle and sheep methane emissions as these are two of the largest animal producers of this particular greenhouse-gas. We learnt about his research to reduce the levels through selective breeding programs, where animals whose progeny naturally produce less methane are favourable. These theories are tested in chambers where the animals are kept for two weeks and all gas emissions are measured. Viterra Malt was another highlight as it gave us a look into Australia's largest malting company. Through the extensive tour, we were able to see the full process of the barley, from where it came into the factory in the trucks, through the steeping, germination and kilning processes and where it was taken away as malt for food and beverage products. This industry was an example of a efficient workplace as the waste water used in the process is purified to the quality of drinking water in the company's new water treatment plant and reused for cleaning and steam generation for the kilning process. Meeting new people who have similar

interests as me in agricultural science as well as the activities such as trivia, paintball and the regular game of ping pong each night were a lot of fun and they made the camp more enjoyable.

My Industry Placement at Maroochy Research Station (DEEDI)

For my Industry Placement I went to the DEEDI Maroochy Research Station and worked with Dr Mike Smith and Rob Abbas on current trials on ginger for the disease Pythium. This placement gave me a broader understanding about horticulture science and applied science which I will use to help determine my future career.

Working with Dr Mike Smith and Rob Abbas in the field on the DEEDI Ginger Trials was one of the best experiences I had during my industry placement as I got to see the practical side to science. During the day we spread fungicides and granulated fungicide onto different sections of the trials to formulate whether one fungicide would work better in removing the disease Pythium from the Ginger. Later, I was shown how many different career paths science offers when Rob Abbas took us to an Avocado farm where we took soil and sap tests that would be sent up to Bundaberg for analysis. We also took soil and sap tests of ginger from the Templeton's ginger farm. Here we sprayed the current appearances of Pythium in the DEEDI trials and marked areas and placements of the Pythium 'hot spots' for further analysis.

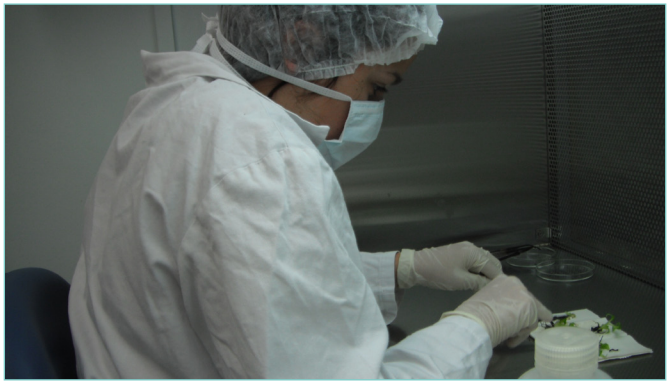
While I was at the Research Station, I spent a day with Liesa Bradburn in the tissue culture laboratory where I made 4 Litres of media for the tissue culture production. One of the ingredients added to create the media was sucrose which is used as future nutrients for the growing plant. After successfully creating the media, the pH levels had to be tested and Hydrochloric acid added because plants need a pH of 5-6 to grow. New media has to be made for each new batch of plants to keep everything sterile as the plants are fragile growing in this delicate environment. Finally, we separated banana tissue culture plants for further growing and development and placed these in new jars with new media.

How My Placement has Influenced Me

My placement at the DEEDI Research Station has helped clear and broaden my ideas about possible future careers. Through the range of tasks that I was able to perform during my industry placement, I have been shown how many opportunities there are with a science degree. For example, at the Maroochy Research Station I saw several different jobs such as Dr Mike Smith with the ginger research and Liesa Bradburn with tissue culture, as well as the wide range of opportunities that are presented. Dr Mike Smith was able to travel to the Pacific and not only help the farmers there but present his findings at conferences and workshops.

Thanks

I would like to thank Sue, Kristin and Marina who organised the camp and made it one of the most memorable experiences for me and Alise and Jesse who helped us throughout the camp. I would like to thank the DEEDI Maroochy Research Station, my mentors Dr Mike Smith and Rob Abbas for giving me this opportunity to learn more about science in many different ways. I would also like to thank Cotton Research and Development Corporation for giving me the opportunity to travel to the University of New England and extend my knowledge of agriculture science.



Appendix 12

Selection of IPS Student Reports from Students on Cotton Focused Industry Placements

Alana Johnson

School: Calrossy Anglican School

Industry Placement: Australian Cotton Research Institute, (ACRI), Narrabri

My Highlights from the Industry Placement Camp

The Industry Placement camp was an enjoyable and memorable experience and allowed me to gain more information about jobs available in Primary Industries, as well as develop contacts with students that have similar interests and that hope to be involved in the industry. The wide variety of excursions opened up new possible career paths and it never ceases to amaze me the speed of change in technologies being developed throughout primary industry.

The whole week covered many aspects of Agriculture sciences. Some of the highlights for me were the Walcha Diary farm, where technology plays a large role in the whole farm operation, as well as the animals maintaining a low stress level in such an intense activity. Another highlight was the Guyra Tomato Exchange. The size and scale of the glass houses and the mass production of the tomato's opened up another area that I would certainly be interested to learn more about.

What I did and saw while on Industry Placement

My interest in cotton brought me to the ACRI, which I was extremely excited about. ACRI run various trials and research projects that contribute to maximising cotton yield in variable and adverse conditions. Some of these trials are projects that university students are working on to complete their PhD.

For the majority of my time at ACRI, I was assisting researchers and students working on their trials. Most of the work involved collecting data which was done out in the fields. Various measurements were used across many different trials. This included measuring the height of the plant and counting the number of nodes while other more complex measurements were taken using scientific equipment such as an infra-red thermometer, to measure the temperature and a "pressure bomb" to calculate a plant's water stress.

I assisted Dr Nicola Cottee with her current research project focusing upon finding screening methods to detect heat tolerance in cotton cultivars. We collected many leaf disc samples from plots of a cotton breed with high heat tolerance and a breed with a low heat tolerance, as well as the progeny produced from these two breeds. These samples were then taken to the lab where they were placed in different temperature water baths and a series of chemicals were added to the leaf samples over 2-3 days. I had the opportunity to make up some of these chemicals, as well as learning to use different styles of pipettes. These chemicals react within the leaf according to the heat tolerance of the enzymes, resulting in the colour of the leaf changing into various shades of green to red. The heat tolerance of the cultivar was determined by the colour that was extracted from the leaf.

I was fortunate to get a taste of Entomology (study of insects) in the CISRO lab where I assisted in placing tiny caterpillars into diet trays, using a small paintbrush. It was a test of patience, speed and skill as they started to crawl everywhere! The caterpillars live, eat and grow in these trays until they

reach a stage where they can be used in various trials or for research into the resistance of genetically modified cotton.

For the last two cotton seasons, water stress trials and dryland trials have not been completely valid as rainfall has been plentiful and this has resulted in comparable results across both irrigated and dryland cotton. This is good news for cotton farmers, not so much for cotton researchers. Irrigation schedules have had to be set back which affects the end results of some trials. Towards the beginning of my week it had been really wet and hard to gain access to the fields as the tracks were boggy, which shows how flexible and adaptable one has to be when working in this industry.

How My Placement has Influenced Me

This Industry placement has shown me the importance of scientific research to the improvement of agricultural production. The Cotton industry demands high quality and high yields, while dealing with the arising problems of insect resistance as well as weed resistance. My PICSE experience has shown how new varieties of cotton will have to be produced to resolve the resistance problems, as well as allowing cotton to grow in hotter and dryer climates.

This is an industry that I could see myself involved with in the future, as it has been a most enjoyable and memorable experience. It has given me more of an insight into the cotton industry, which is looking for more scientists and researchers. I have made many more contacts in this industry now, which has been very beneficial in helping me towards a career in this industry.

Thanks and acknowledgements

This whole experience has definitely helped me see many of the career opportunities available in Primary Industries. I'd like to thank all staff at ACRI for this most enjoyable experience and making me feel so welcome, especially Trudy, Mike, Jo, Nicola, Sam, Kate, Katie and Dominic. I would also like to thank UNE, GRDC, The Australian Government and PICSE. I say a special thank you to Susanna and Carissa for all their hard work, also to the Dugdale family for being my lovely host family during my placement.

James Elsley

School: Carinya Christian School

Industry Placement: Dow AgroSciences

My Highlights from the Industry Placement Camp

The PICSE Industry Placement Camp was a great experience, comprised of many visits to research stations, businesses and farms. These visits showed us the large range of jobs in the primary industries sector and talks with industry experts on their pathway into their chosen career helped to give us an understanding of the types of courses we would need to do in order to work in these areas.

Some of the highlights of the camp were the presentation of the precision agriculture technology which was enabling producers to best manage their land as well as remotely monitor stock. Other highlights of the camp included Bede Burke's self sufficient farming and poultry enterprise, the tour of the animal house at UNE, Walcha Dairy and the tour of Tomato Exchange glasshouses at Guyra.

What I did and saw while on Industry Placement

I did my industry placement at Dow Agro Sciences research station at Breeza. Dow Agro Sciences is an international company that mainly develops chemicals for use in agriculture but has also just started a wheat breeding program. The Breeza Research station is one of many research station's across the globe that are used by Dow to test and further develop their upcoming and existing products.

During my placement we conducted a trial on the volatility of a broadleaf herbicide produced by Dow called Starane Advance to determine whether it was volatile enough to cause damage to cotton crops. To conduct this trial we placed plastic tunnels over two rows of cotton as shown in the photo. In these tunnels we placed trays of soil which had been treated with four different chemicals, including Starane, which is known to be highly volatile. We left the tunnels on the crop for 48 hours to allow sufficient time for the chemicals to volatilise and then assessed the damage to the crop. The trial will be assessed every week for crop damage for up to eight weeks.

While on my industry placement we also did many assessments of other trials that they had running, including comparing current formulations of Starane with new granular forms of the chemical that the company is in the process of developing. In these trials we were looking to see whether the granular form was as effective as the current formulation in controlling weeds as well as its ease of use. Assessing these trials was done on a visual assessment of crop damage.

While at Breeza I was also given an insight into their new wheat breeding program and the process involved in

selecting plants to produce new breeds. This process can take at least nine years to complete and only results in about ten new varieties being produced from an original 5000 lines. The research station is going into its third year of developing these breeds and is already seeing promising results with increased yields already being seen in some of the lines.

How My Placement has Influenced Me

My industry placement has influenced me in many ways. The week at Breeza showed me how field research of products plays an important role in their development as a commercial product ready to be used by producers. I found this research both interesting and engaging as the results of many of their trials can be used by producers to improve their farming practices. It has also shown me the many different jobs that are available in this area of primary industries including agronomists, field officers, research scientists, as well as many others in the development of new chemical compounds and the marketing of the products once they have been developed.

Thanks and acknowledgements

This has been an amazing experience. I would like to thank all those who made it possible for me to participate in the PISCE scholarship program including the University of New England, GRDC and local industry partners as well as a special thanks to Natalie Elias and Nicholas Wiley from Dow Agro Sciences for allowing me to do my industry placement with them.

Cotton Catchment Communities CRC

picse

Appendix 13

Executive Summary of National Impact Evaluation Report




Primary Industry Centre for Science Education (PICSE)

Impact Evaluation Report: Executive Summary

PICSE Program

The Mission of the Primary Industry Centre for Science Education or PICSE is to:

"Increase participation in science professions that support primary industries"

The program aims to attract an increased supply of high quality young people into science based primary industries through engagement with them during school years and early university. The Core Activities of the PICSE program are: Science Class Engagement including the Science Investigation Awards (SIA), Industry Placement Scholarships (Camps and Industry Placement, IPS), Teacher Professional Development (PD) and creating teacher resources.

Evaluation Purpose

The purpose of this evaluation report is to capture and analyse the impact on students and teachers from their participation in PICSE activities and make judgements about how well the program has met its objectives. The data used for the report is sourced through the analysis of specifically designed impact questions asked of individual participants across activities at each of the eight Activity Centres.

Findings

Did teachers increase their understanding of workforce needs and student career pathway opportunities?

- The teachers rated the overall usefulness of the PD in assisting with science teaching at a high 8.6/10.
- Eighty-four percent or 129 of participating teachers in 2011 reported that involvement had provided increased value in supporting teachers to help encourage students to continue to study science, while also supporting teachers in being able to better advise students about career opportunities in science based primary industries (85% or 130).
- The PD was highly beneficial in providing teachers with an opportunity to develop relationships with industry scientists who could provide assistance in their teaching (average rating 8.4/10).

Did students develop a deeper understanding of the value of science courses and their relevance to the contemporary workforce?

- Sixty-six percent of 1,000 secondary students who participated in the SIA activity in 2011 indicated that their participation had helped their understanding of science.
- Of the 164 IPS Year 11/12 students, around 85% (140) reported that their attitude on the importance of science in primary industry had positively changed.

Did the program attract students into tertiary science and sciences supporting the primary industries?

- The evaluation data identifies that the program has directly influenced at least 75 students (45%) in their senior years to reconsider their study options towards that of the sciences relating to primary industries.
- Sixty percent (98) of IPS students indicated that, as a result of their participation, they were now interested in science careers in primary industries. If this translated to university studies as the students intend, it would mean that, just through the camp activities in PICSE alone, an extra 75-80 students would start the pathway into science careers relating to primary industries.
- Agricultural, biological and environmental sciences were the types of courses most students indicated as their preferred (Year 11) or actual (some Year 12) study areas. The initial follow up data with students in 2012 showed that the actual study areas generally followed this intention with 31% (67) actually enrolled in agriculture, rural and veterinary science courses; 6% (14) enrolled in environmental science courses; 30% (66) in general, marine or biological related courses; and 11% (25) in medical or health related courses.
- A focus on the 2012 student tracking data of their actions post-PICSE IPS reveals that 212 students across the eight activity centres were attending one of more than 16 universities across Australia. The Universities with the largest number of these respondents were: the University of Adelaide (33); UTAS (31); UNE (29); UWA (16); USQ (16); Flinders (15); and UQ (14).

Future PICSE directions on the basis of the data analysed.

- The impact data shows that the Teacher PD is a very effective tool in strengthening science teaching in schools and positively impacting on teachers' interest and ability to encourage their students to study science, understand the role of science in agriculture and follow careers in biosciences and agriculture. In addition leverage is supplied through the use of Teachers PD Travelling Scholarships. There is a defined multiplier benefit that can be attributed to the Teachers PD.
- It is clearly essential for PICSE to develop stronger relationships with the 7-8 beneficiary Universities of the PICSE program that are not yet partners to maximise benefits from those universities.
- It is noted that the January 2012 Report to the Business/Higher Education Round Table, 'Rebuilding the Agricultural Workforce', Allen Consulting Group, recommends a significant rethink of the agriculture education model and recommends the fourth of the five priorities to be to 'expand the PICSE program'.

Conclusion

The evaluation data clearly indicates that the PICSE suite of activities is working very effectively in terms of achieving the program goals and addressing the issue of ensuring the future scientific primary industry workforce. It is clear that the IPS program is providing a major and significant impetus in terms of students reassigning their study and career options towards the sciences that relate to primary industries. However, given that the indications are that three-quarters of participants had not previously considered this option seriously, then the importance of continuing complementary programs such as the SIAs, Teacher PDs and classroom support is also highlighted.

March 2012

Appendix 14

Executive Summaries of Impact Evaluation Reports for PICSE Cotton Science Investigation Awards

Cotton Catchment Communities CRC

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Impact Data Summary

Cotton CRC
Science Investigation Awards

Primary Industry Centre for Science Education

October **2011**

QualDATA
program planning & evaluation specialists

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DESCRIPTION OF
SCIENCE INVESTIGATION AWARDS

PICSE activity centres run a program of investigation awards with science students throughout the year that culminates in a presentation night in the later part of the year.

Each entry (individual or team) had to pose a question as an hypothesis and then plan and complete a scientific investigation to help answer that question. The project was then written up as a scientific report and displayed as a poster. The report and poster were judged by industry scientists at the Science Investigation Awards and prizes were awarded at an evening presentation ceremony.

EXECUTIVE SUMMARY OF THE OUTCOMES

- One teacher, five students and eleven judges, provided feedback on the Cotton CRC SIA.
- All teachers, students and judges were interested in future participation in the program.

- There was one response from a year ten teacher who felt that the program was having a high level of impact on students' interest in study (rating 8 out of 10); that the Science Investigation Officer was very useful to the programs success (rating 9 out of 10); and the judging process and presentations were valuable (rating 7 out of 10).

- Responses indicated that while overall secondary students enjoyed the program (avg. rating 7.6 out of 10), its impact on they way they viewed science and science studies was moderate (avg. rating 4.2 out of 10).
- Three of the five students indicated the SIA had not helped their understanding of science.
- Comments made by students indicate that those who had not had their understanding helped and gave lower impact ratings, appeared to already have an interest in science preceding the program.
- Secondary students particularly noted they enjoyed the gains in knowledge and practical experiments.

- The judges felt there was a high level of value in the judging process for maximising benefits for students (avg. rating 8 out of 10).
- Judges also commented that the lack of/not being able to see students, made it hard to determine the impact the program was having on them, and as a result only three judges provided ratings on impact of students' interest (avg. rating 6.3 out of 10).
- There was a belief though from ten of the judges (one response of N/A), that students were being engaged in a positive way.