ACELL: Improving Student Learning in the Laboratory Environment

Justin Read, Simon Barrie, Mark Buntine, Robert Bucat, Geoffrey Crisp, Adrian George, Ian Jamie, and Scott Kable

19th International Conference on Chemical Education
Monday 14 August 2006

Outline

- Aims of ACELL
- Brief History of APCELL
- Workshop Process and Student Learning
- Achievements to Date

ACELL
Australasian Chemistry Enhanced Laboratory Learning

All of Chemistry – ACELL

- Three principal aims
  - Database of educationally and chemically sound experiments, that have been tested by both academic staff and students
  - Provide for professional development of chemistry academic staff
  - Facilitate the development of a chemistry education community of practice

ACELL
Australasian Chemistry Enhanced Laboratory Learning

History – APCELL

- Project began 1999
  - Physical Chemistry focus
- Potential benefits from lab work
  - Develop technical skills
  - Make theory more concrete
  - Engage students in the practices of science
- Challenge: Providing a lab program that
  - Lives up to its potential
  - Doing so within existing constraints

ACELL
Australasian Chemistry Enhanced Laboratory Learning

APCELL

- Bring departments together
- Build on established effective experiments
- Provide resources needed to implement new experiments easily
  - Technical Notes
  - Demonstrator Notes
  - Student Notes
  - Results Proforma

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Methods – Educational Template

- Section 1 – Summary of the Experiment
- Section 2 – Educational Analysis
  - Learning outcomes in areas
    - Theoretical and Conceptual Knowledge
    - Scientific and Practical Skills
    - Thinking Skills and Generic Attributes
- Section 3 – Student Learning Experience
- Section 4 – Documentation

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Educational Analysis

- For each learning outcome:
  - What should students learn?
  - How will students learn it?
  - How will staff and students know that students have achieved the learning outcome?

ACELL
Australasian Chemistry Enhanced Laboratory Learning

February 2006 ACELL Workshop

- 33 academic staff
- 31 undergraduate students
- 27 universities from across Australia and New Zealand
- 33 experiments
- 3 very full days

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Workshop Program

	8:30 am to 9:00 am	9:00 am to 10:00 am	10:00 am to 1:00 pm	1:00 pm to 2:00 pm	2:00 pm to 5:00 pm	5:00 pm to 5:30 pm	5:30 pm to 6:00 pm	6:00 pm to 7:00 pm	7:00 pm to ???
	Lecture Theatre 4		Level 3 and Level 5 Laboratories	Lecture Theatre 2 Foyer and Chemistry School Courtyard	Level 3 and Level 5 Laboratories			"The Pub" Royal Hotel	
Monday 13 Feb	Registration	Welcome and Introduction	Experiments	Lunch	Experiments	Clean Up and Set Up		Review of Experiments	Dinner at Royal Hotel
Tuesday 14 Feb	Forum on Student Refereeing	Panel Discussion	Experiments	Lunch	Experiments	Clean Up and Set Up		Review of Experiments	Dinner at Royal Hotel
Wednesday 15 Feb		Panel Discussion	Experiments	Lunch	Experiments, plus Clean Up	Final Discussion, LT4		Review of Experiments	Workshop Dinner at Buon Gusto

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Laboratory Testing

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Collaborative Work

ACELL
Australasian Chemistry Enhanced Laboratory Learning

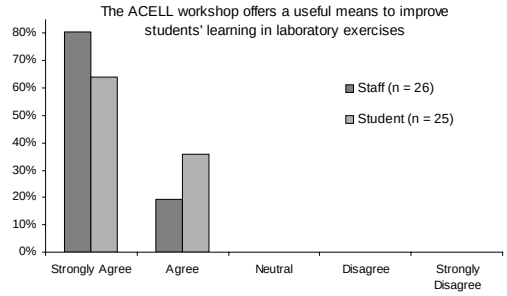
Group Discussion

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Evening Debrief Sessions

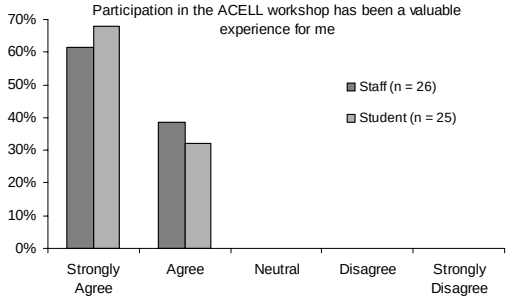
ACELL
Australasian Chemistry Enhanced Laboratory Learning

Improving Student Learning



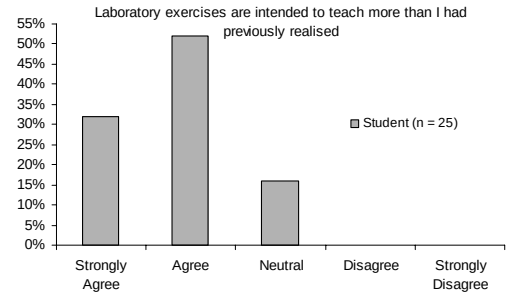
ACELL
Australasian Chemistry Enhanced Laboratory Learning

Valuable Process



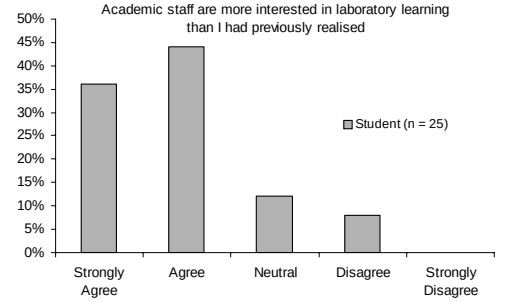
ACELL
Australasian Chemistry Enhanced Laboratory Learning

Content of Lab Exercises



ACELL
Australasian Chemistry Enhanced Laboratory Learning

Changing Perceptions



ACELL
Australasian Chemistry Enhanced Laboratory Learning

Delegate Feedback

- Staff: "It made me sit down and think carefully about what I wanted my students to get out of my experiment, and how I could judge if they had been successful"
- Staff: "The interaction of participants was excellent – so much better than a conference – 'learning in a fun environment'"

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Perceptions

- Student: “I learnt that also there are teachers / lecturers that actually do care about their students and want to improve their learning experience”
- Staff: “That there were so many academics interested in education and student interests”
- Staff: “The enthusiasm with which students engaged in the activities and the thoughtful comments given”

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Improving the Experiments

- Student: “The debrief sessions seem to be the most valuable, since we were all able to critique the experiments and really get our opinion heard, and especially to get changes made to better the experiments”
- Student: “The templates showed me exactly what objectives lecturers were actually trying to get across in practicals”

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Potential of ACELL

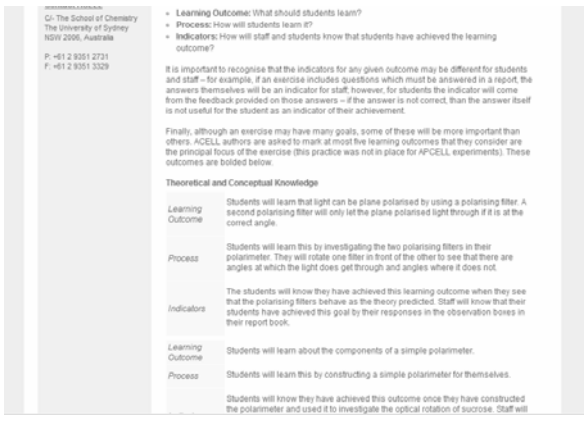
- Staff: “Workshop was excellent and meetings of this type need to be a basis of communication between practitioners at Australian institutions”
- Student: “The workshop was fantastic. I have a deeper appreciation and outlook on practicals and my application to them. If every student could see what happened over these three days, I think all attitudes would change”

ACELL
Australasian Chemistry Enhanced Laboratory Learning

The ACELL Website

- Experiments and their documentation
- Publications, including published papers
  - 13 published experiments from APCELL
- Information on ACELL events
- Education resources for ongoing professional development
  - Process information – content analysis
  - Theory information – constructivism

ACELL
Australasian Chemistry Enhanced Laboratory Learning



Summary

- Database of student-tested, educationally sound undergraduate experiments
- Professional development of delegates
- Provision of educational resources
- Building a community of practice
- A model for other countries and domains

ACELL
Australasian Chemistry Enhanced Laboratory Learning

Acknowledgements

- Staff and student delegates
- HREC at the University of Sydney

Australian Government
Department of Education, Science and Training

THE UNIVERSITY OF ADELAIDE AUSTRALIA

MACQUARIE UNIVERSITY SYDNEY

THE UNIVERSITY OF WESTERN AUSTRALIA

ACELL
Australasian Chemistry Enhanced Laboratory Learning

ACELL Website

http://acell.chem.usyd.edu.au

ACELL
Australasian Chemistry Enhanced Laboratory Learning