

Advancing Science and Engineering through Laboratory Learning (ASELL) in Victorian Schools

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Deakin University

A national project

- Improve STEM practical learning in years 7-10.
- Teacher professional development.



Australian Government

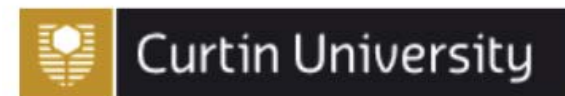
Department of Education and Training
Office for Learning and Teaching



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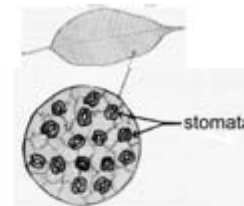
Australian Government

Department of Education and Training
Office for Learning and Teaching


- Forge partnerships among STEM groups:
 - Teachers, PSTs and school administrators
 - University academics in education and STEM
 - Practicing scientists and engineers
 - Science-education associations.



Take a school-nominated lab activity and develop/rework it, drawing on school, university, and professional expertise. Then test it in a workshop.



3 Pillars of ASELL in Schools

- Contemporary science 
 - Reimagining Maths and Science Teacher Education Programs
- Good pedagogy in laboratory learning activities.
 - Inquiry
 - Representation construction
- Professional development for teachers

Representations explain some aspect of nature.

Representations are the means by which we understand, and communicate our science understandings

Thanks to Russell Tytler and Peter Hubber
STEM Education Group,
Deakin University.

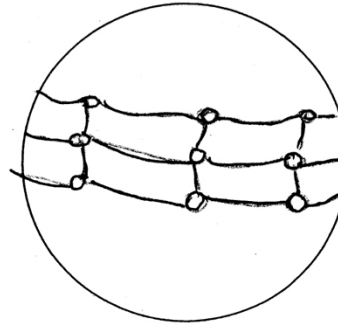
What we see

A rubber band is able to be stretched without breaking.

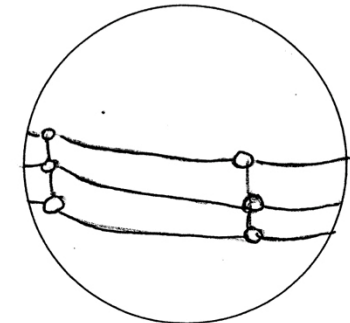


What we imagine

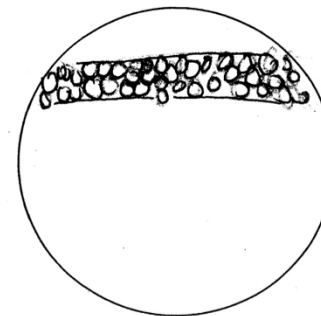
RUBBER BAND REPRESENTATION BEFORE STRETCHING



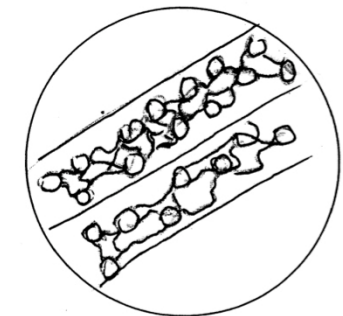
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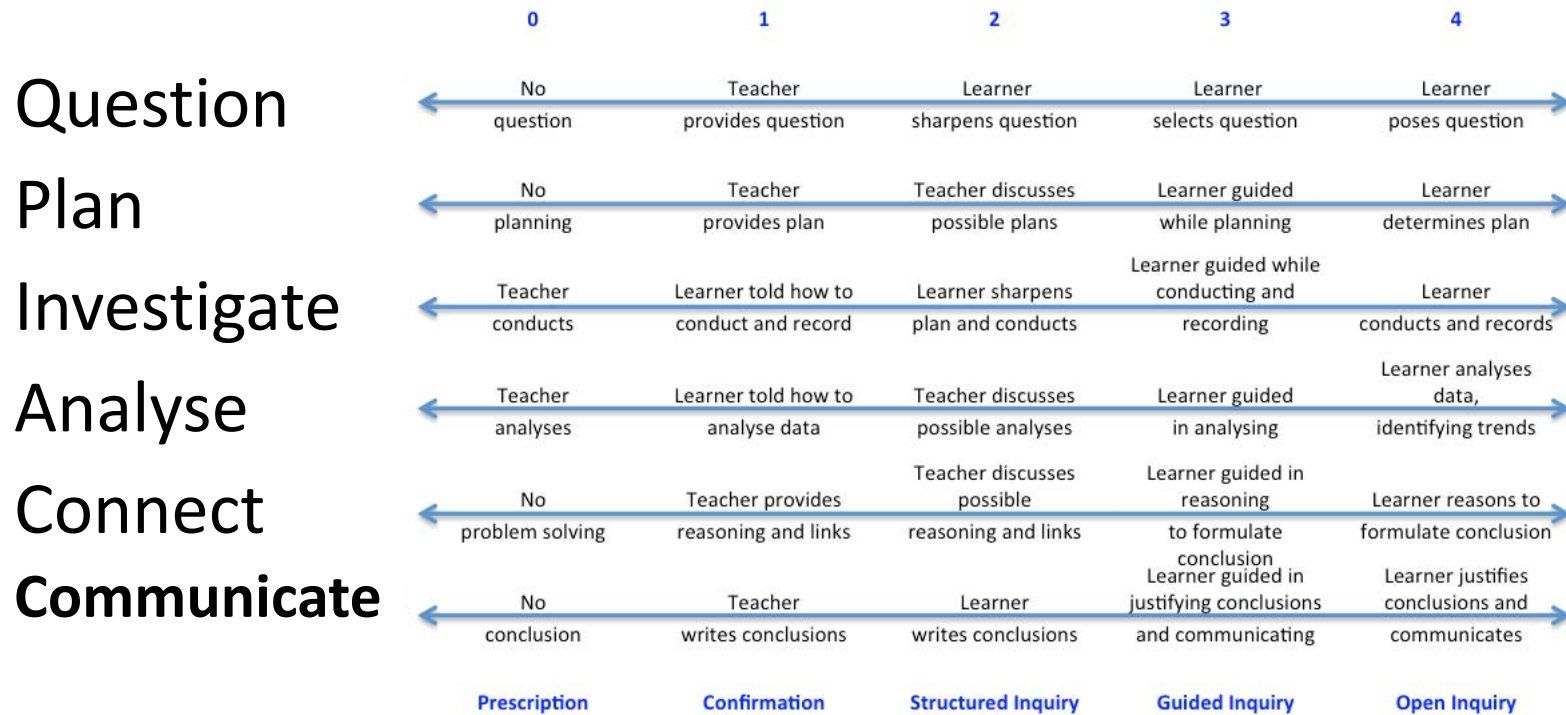


Inquiry is forefront as a pedagogical process in the workshop and modelled in the LLAs.

This is the most challenging aspect of ASELL in Schools.



Extent of inquiry vs aspects of inquiry



- National Research Council (2000). *Inquiry and the national science education standards: A guide for teaching and learning*. Washington DC: National Academic Press.
- Bruck, L. B., Bretz, S. L., & Towns, M. H. (2008). Characterizing the level of Inquiry in the undergraduate laboratory. *Journal of College Science Teaching*, 38(1), 52-58.

Mooroolbark College: A case study



The problem

A chemistry laboratory-learning activity (year 9).

- The laboratory-learning activity **didn't work** in a convincing enough way to **engage the students.**

Reaction of acids with metals

Chemistry pre-service teacher tested the activity as it was conducted by the school using materials from the prep room prepared by the school's lab technicians.



- **1. Ensure reactions occurred**
 - Use metals that worked and demonstrate some metals with stronger acid (later suggestion - warm acid).
- **2. Put the activity in a real world context**
- **3. Add an inquiry component**
 - A local company plans to use some of their excess metal to produce cans for food and soft drink storage. They are aware that some metals are highly reactive on contact with the acids in food while others are not. They have asked for your help in sorting the group of metals based on their reactivity. The company asks you to recommend one or more metals for can production.

Reactivity of metals



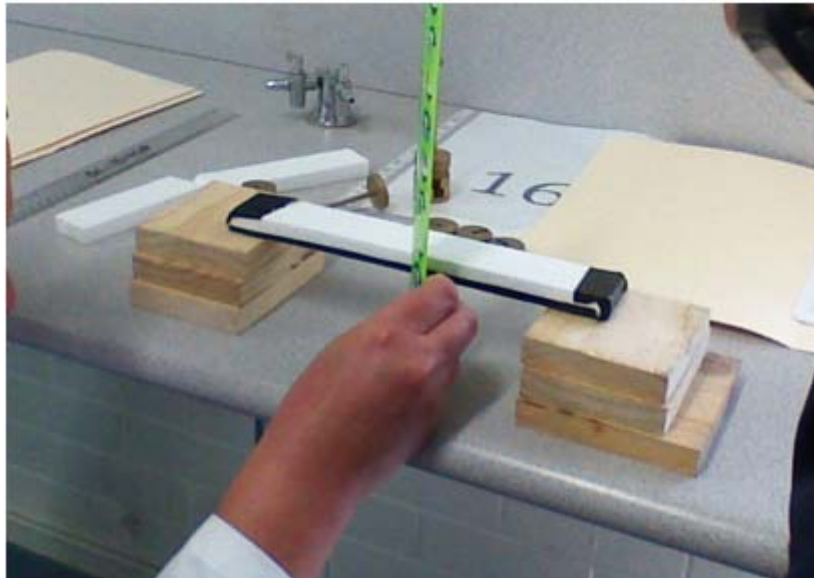
Baghdad Battery





ASELL for Schools Mooroolbark College Friday 20 November 2015		
9:15 – 9:30	Arrival/Registration	<i>Science Foyer</i>
9:30 – 9:45	Welcome and Introduction with A/Prof. Kieran Lim	<i>Science Room 1</i>
9:45 – 10:00	Science Inquiry with Dr. Peta White	<i>Science Room 1</i>
10:00 – 10:50	Laboratory Session 1 - Composite Materials With Dr. Peta White Science Room 1 and Science Room 2 Assigned groups and stations Evaluation for the Laboratory 1	
10:50 – 11:10	Morning Tea in the Science Foyer	
11:10 – 11:55	Teachers: Using Inquiry and Representation Construction Approach in Laboratory Learning With Dr. Peta White <i>Science Room 1</i>	Students: Interview with Dr. Matt Hilder a scientist from the Institute of Frontier Materials Host: Dr. John Long <i>Science Room 2</i>
11:55 – 12:50	Laboratory Session 2A - Which Metal is Best? With Amanda Peters and Denise Raven Science Room 1 and Science Room 2 Assigned groups and stations	
12:50 – 1:30	Lunch in the Science Foyer	
1:30 – 2:15	Laboratory Session 2B - Metals and Batteries With Amanda Peters and Denise Raven Science Room 1 and Science Room 2 Evaluation for the Laboratory 2A+B	
2:15 – 2:25	Teachers: Overall debrief with A/Prof. Kieran Lim and Dr. Peta White <i>Science Room 1</i>	Students: Overall debrief, student feedback, student survey with Dr. John Long <i>Science Room 2</i>
2:25 – 3:00	Teachers: Discussion and Wrap Up Dr. Peta White, Dr. John Long, and A/Prof Kieran Lim <i>Science Room 1</i>	Students: Students Session Video <i>Science Room 2</i>

Composite materials



Rocks from another world



Electric Fan cars






6 workshops to date

8 more workshops scheduled for rest of 2016

More in 2017.



Summary

- Contemporary science 
 - Reimagining Maths and Science Teacher Education Programs
- Good pedagogy
 - Inquiry
 - Representation construction
- Professional development

For more information

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