Practical advice on developing and implementing inquiry-based laboratories

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Questions for discussion

1. How do we develop a curriculum which fosters a passion for inquiry in the Millennial learner?
2. What are the challenges in moving to inquiry-based learning and how can these challenges be overcome?
3. What support do educators need to implement change in teaching practice?

What is inquiry-based learning?

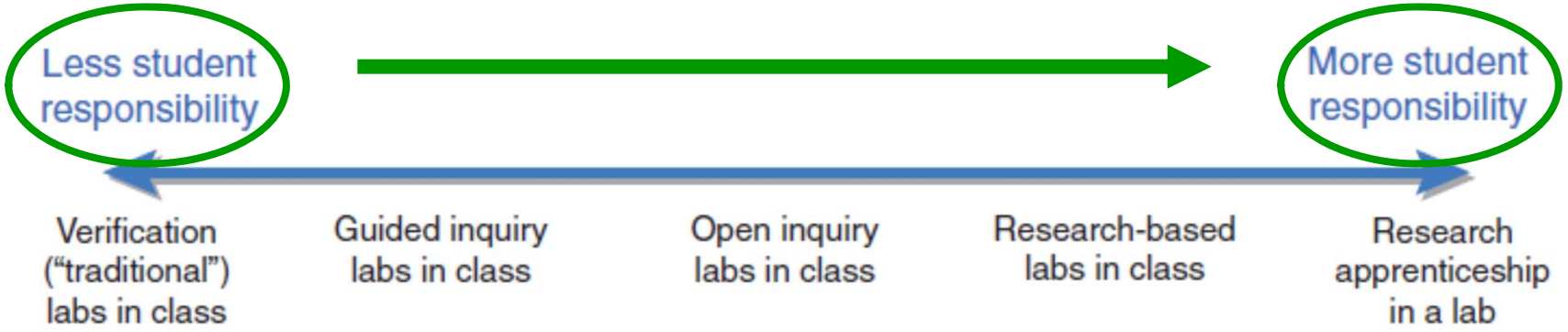
Inquiry

- Teaching method which combines student-centred, hands-on activities with discovery (Uno 1990)
- Educator acts as facilitator of learning
- Learning directed by student
- Increased level of student responsibility

What are inquiry-based laboratories?

Inquiry-based laboratories

- activities that engage students in scientific reasoning



Weaver *et al.* (2008)

Evidence for implementing inquiry-based laboratories

Improve students':

- learning outcomes
- scientific reasoning skills
- understanding of experimental design
- ability to analyse data
- confidence
- scientific literacy

(Beck and Blumer 2012; Brickman *et al.* 2009; Brownell *et al.* 2012; Gormally *et al.* 2011; Lord and Orkwiszewki 2006; Myers and Burgess 2003; Smallhorn *et al.* 2015)

First year biology students at Flinders University

Two topics:
Semester 1 - 850
Semester 2 - 600

Diverse range of study, socio-economic, cultural, age & ethnic backgrounds

39 degree programs

All colleges across the university

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Biology Discovery Centre

Demonstrator groups

- Observations
- Research question
- Design experiment
- Carryout experiment
- Replication
- Analyse data
- Reporting

Case study

Flinders University, College of Science and Engineering: BIOL1102: Molecular Basis of Life

PRACTICAL 3: MEMBRANE PERMEABILITY (WEEKS 3 AND 4)

Situation / Substance	***Risk***	***Safety***
Solvents, ethanol, 70%	Flammable	Keep away from sources of ignition
Detergent, SDS, 10%	Possible respiratory and skin sensitiser	Do not breathe fumes/gas/vapour. Avoid contact with skin.
Water bath, 50°C, 80°C	Steam and hot water may cause burns	Wear suitable heat proof gloves and open water bath carefully

Traditional Lab

Guided-inquiry based Lab

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  - Project 6744 (An investigation into impact of laboratory redevelopment on student learning outcomes