Inquiry Orientated Learning in Physics

My experience of blended and active learning and the pressures placed upon physics departments to reduce face-to-face teaching

Physics Discipline Day ACSME Conference 2\textsuperscript{nd} October 2014

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Inquiry Orientated Learning in Physics: Maintaining quality while cutting costs and managing workloads

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IOL in context of unit development
Original unit 2005 once per annum

- 3 hrs of face-to-face lectures
  - talking head & working through standard problems
- 5 labs (3hrs each) dedicated room
- 5 assignments
- 1 mid-topic test
- 6 tutorials (3 hrs each)
  - go over assignments and some extra questions, revision
- 13 working weeks
2006 Engineers moved in

• Both semesters twice as many students
• Students with different focus
• 2 - 3 tutorial groups
• Same as previous but more structure in the tutorials
  – students discussing things in pairs and giving presentations to the rest of the group.
2007 Reduce to 12 working weeks

• 4 tutorial groups university mandate 15 max

• Same as previous but tutorials starting in the first week
  – Café Chat – discussion and presentation
  – Manjula Sharma’s hands-on activities (2002)
  – Manjula Sharma’s demonstrations (2002)
2008 Smart-boards

• Same as previous with following added
  – Observation of a candle
  – Diagrams from student exams
    • Buoyancy
    • Electrostatics
    • Magnetism
  – Student presentation of a Phet simulation (problematic)
2009

• 5 tutorial groups things added
  – Bouncing ball data analysis
  – Falling cats video appreciation
  – Learning how to use a multimeter
2010 Scientific Report Assignment

- Reduce from 5 assignments to 2 and add scientific report
- Replaced mid-topic test and 3 assignments with 5 multi-choice tests
2011

• Not much happened in tutorials
  – There were too many of them
  – Students were not attending
  – Tutors were not consistently doing the activities
• Brought all the tutorials together into one workshop, 2 h/week and introduced IOL
  – Sticky tape
  – Coefficient of friction
  – Paper towel (later replaced with **Fridge magnet**)
2013 Work It Out

• Diagrams & Formula – this afternoon’s workshop
2014 Student Self-motivation

• Tutorial
  – Promoting Student’s Self-motivation through exploration of self and profession – **poster** at the conference

• More students consistently turning up to the tutorial / workshops than the lectures
2015+

• 2015 long service leave
• 2016 replace 3 hr lectures with another 2hrs of workshops focused on content
  – Talking head part recorded and on website since 2010
  – Lecture demos recorded now on website (YouTube)
  – Retain sims, clickers, demos and hands-on activities
  – Introduce more problem solving
• Improve experience for on-line students
• Use website with on-campus and off-campus students in workshops for true blended learning
  – Slowmation
  – Virtual poster presentation session
  – Video capture of physics and explanation
  – Choose your own adventure
Why?

- In the end all of this development has been about finding ways to get students to communicate within the framework of the discipline and in so doing test themselves and their understanding of basic physics concepts.
- It keeps me engaged, and if I am interested the students are more interested.