PBL: A whole of degree perspective

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Background – perfect storm

2013 brought a lot of boogie men and women

- □ Nationally: TEQSA
- □ Nationally: Discipline standards
- □Locally: Competition
- QUT: new rules around degree accreditation
- QUT: new faculty of science and engineering

The Bachelor of Mathematics

□ 3 year FT degree

16 maths/stats subjects + 8 options (could also be maths/stats)
 6 core, 10 major

□ Majors in App/Comp Maths, Decision Sci, Stats Sci

□All pretty standard so far...

But...

Greater focus on communication skills

Graduates need to be capable of collaborating, cooperating

Improve work readiness, real world focus

n% of students will have WIL experience in their QUT degree

Etc!

So, the goal

□Keep it "real world" (authentic)

Engaged, student-centred

Transition to industry/workplace

...but still mathematics and statistics

An injection

□ Fairly happy with "content" and mathematical nature of the degree

How to deal with this other stuff?

□ The brand + Problem-based learning = WIN!

- 3. Authentic, workplace problems
- 2. Modelling, reporting and presenting
- 1. Applying, writing, speaking

Use the storm to power the change

- □ We were REQUIRED to reaccredit our degree
- □New rules were imposed
- Motivated academics
- Guidelines and rules could be *interpreted*
- L&T staff skilled and competent



Vital

In order to prepare **students** for their final year, industryoriented problem, they had to be prepared:

Backward map skills throughout degree

In order to prepare the **problem based learning experience**, academics had to be prepared:

Communication, teamwork, "shoe leather"

Problems

So the structure was in place... what goes wrong?
Many things!

- Academic's micro level view need understanding, buy in
- Understanding whole of course connections is important
- New academics arrive in departments communicate
- Industry problems not easy to source (ask people who've run MISG)
- Students need to understand why as well
- We haven't gone far enough: prep for project management/delivery

Example: Watercarting & seqwater

UWIL, Decision Science/Operations Research, 3rd year, semester 2

Led by Paul Corry and Kirsty Kitto, Joseph Tam (industry partner)

- Student AND industry focussed (small groups work w/ partner)
 Industry presentation & brief scopes the problem
 - Students develop simulation/model approaches to support decisions
 - Project delivery model
 - Present to industry
- Real problem stimulus led to unexpected learning good!

Example: Groundwater modelling & AGEC Pty Ltd

UVIL, App/Comp Maths, 3rd year, semester 2

Led by Ian Turner and Elliot Carr, Andrew Durick (industry partner)

Guest lecture on groundwater aquifers

Small groups work to develop numerical methods solving PDE models of groundwater flow

Build knowledge & skills as a group w/ problem providing stimulus

Interim and final reports and presentations to industry partner

Example: GLMs and Bank of Queensland

□WIL, Stat Sci, 3rd year, semester 2

Led by James McGree and Miles McBain, Burton Wu (industry partner)

Coaching approach, rather than teaching

Credit risk as motivation

Real data = real problems

"Brutal" but "fun"

Example: Modelling daylight hours over a year

First year level, intro functions and calculus

- More scaffolding
- Real data daylight hours for cities around the world
- Students investigate
 - Data visualisation, software
 - □ Functions (trig mostly of course)
 - Parameter forcing
 - Differentiating and integrating functions that mean something

Thanks!

Questions?

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Check this out: <u>http://research.amsi.org.au/teaching-seminar-series/</u>