How do we teach science?
Using the Teaching Practice Inventory in Australia

Please share a handout

- **Motivation**
  - Need to measure how we teach
  - Evidence-based teaching in UQ BSc
- **Methods**
  - New tool: Teaching Practice Inventory
- **Results at UQ**
  - Strong course information
  - Weak in-class activity & feedback
  - Policy changes
  - How you could use the Teaching Practice Inventory

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Image: panoramic view of the theatre at Epidaurus, Greece.
Credit: Hansueli Krapf – Wikimedia Commons. Idea from R. Beichner, NCSU.
Motivation

How many of you have done a curriculum review? What was your experience?
Have you heard of the *Teaching Practice Inventory* (Wieman & Gilbert 2014)?
Has anyone used it?
Has your institution measured teaching practice (not student evaluations) at the program level?
Motivation

Literature

• Overwhelming evidence about effective teaching practices (Freeman et al 2014, ref 4)
• Little measurement of the use of these practices
• *Teaching Practice Inventory* (Wieman & Gilbert 2014, ref 2) measures range of these practices

Context

• The 2015 UQ BSc Review
  – **How** we teach
  – Benchmark against University of British Columbia (UBC: Wieman & Gilbert)
Method: the Teaching Practices Inventory

Wieman & Gilbert (2014) 72-item survey measures evidence-based practices

Categories (see handout)
I. Course information provided (including learning goals or outcomes)
II. Supporting materials provided
III. In-class features and activities
IV. Assignments
V. Feedback and testing
VI. Other (diagnostics, pre–post testing, new methods with measures, etc.)
VII. Training and guidance of tutors
VIII. Collaboration or sharing in teaching

Objective questions, e.g.
“Students asked to read/view material on upcoming class session” (yes/no)
“Average number of times per class: show demonstrations, simulations, or video clips”
Example TPI questions

V. Feedback and testing; including grading policies (check all that occurred in your course)

A. Feedback from students to instructor during the term
- Midterm course evaluation 1
- Repeated online or paper feedback or via some other collection means such as clickers 1
- Other (please specify)
  If you selected other, please specify______________________________________

B. Feedback to students (check all that occurred in your course)
- Assignments with feedback before grading or with opportunity to redo work to improve grade 2
- Students see marked assignments 1
- Students see assignment answer key and/or marking rubric 1
- Students see marked midterm exam(s) 1
- Students see midterm exam(s) answer key(s) 1
- Students explicitly encouraged to meet individually with you 1
- Other (please specify)
  If you selected other, please specify______________________________________
Method: Teaching Practices Inventory

Target

- Courses or units of study
- Completed by course coordinators

UQ course selection

- Semester 1, 2015
- More than 15 BSc students
- Not practical- or field-based
- = 136 courses

Survey deployment

- Survey Monkey
- Email invitation + 2 reminders + local followup
- Completion rate: 95%
- Average time = 11 minutes
- Extensive cleaning of data required
UQ has less high-scoring courses than UBC

Averages similar: UQ=29.8±0.7, UBC=32.4±0.7
Results by category (where UQ differs from UBC)

I. Course Information

E.g. “list of topic-specific competencies” (UQ: 91% “yes”)

- We have a mandatory Course Profile format
- Question: Does your institution require a Course Profile?

UQ=5.0, UBC=4.0 (T-test p<0.001)
Results by category (where UQ differs from UBC)

III. In-class Activities

E.g. pre-reading with a test (30% of UQ courses)
E.g. less than 60% of class delivering content (18%)
E.g. question followed by student-student discussion (22%)
UQ=5.3, UBC=6.8, (T-test $p<0.003$)
We often miss the final step that makes class activities effective:

82% use demonstrations, simulations, or video
only 14% have “students first record predicted behaviour and then afterwards explicitly compare observations with predictions”
75% ask students to prepare for class
only 32% motivate that with assessment
73% ask students for responses in class
only 31% combine that with student-student discussion
Results by category (where UQ differs from UBC)

V. Feedback

E.g. mid-term feedback from students (16% of UQ courses)
E.g. see marked mid-term exam (30%)
E.g. final exam worth 60% or less (97%)
UQ=5.0, UBC=7.2 (T-test p<0.005)
Results: Champions?

Only two categories are strongly correlated: in-class activity and diagnostics

- Champions are innovating in class and testing outcomes
Results – total scores by size & year level

First-year classes score higher (same for classes >200)
Averages: level 1=33.0, level 2&3=29.2 (T-test p=0.014)
Results – total scores by size & year level

Use linear regression to separate effects of class size & year level

Significant effects in these categories:

• Total score: increases for **first year**
  II (supporting material): increases with **class size**
  VIII (collaboration): increases for **first year**

Surprise: tutor training
• 55% replied ‘no’ to “Tutors receive ½ day or more of training in teaching”
• but this is mandatory at UQ!
Responses

UQ initial response
• Results in BSc review submission
• Individual results to staff comparing to their department
• Workshops in each department to promote collaboration

Policy?
• Evidence for staff appraisal

Collaboration
• Survey support (UQ)
• Additional questions for laboratory/field work (Les Kirkup & Karen Burke da Silva)
Summary:

**TPI Survey tells us what we do that the program level**

- Strengths, e.g. first year courses better
- Areas for development, e.g. In-class activity
  - We have a few champions doing in-class & diagnostics who can lead change
- Has informed funding policy at UQ
  - We don’t even have champions in this area

**Future work**

- We can assist you using TPI
- New questions for lab/field work
Appendix: example question

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(scoring)