
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.



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Create change

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^q

- 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)^r

- 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 _____



(scoring)

Method: Teaching Practices Inventory

Target

- **Courses or units of study**
- Completed by course coordinators

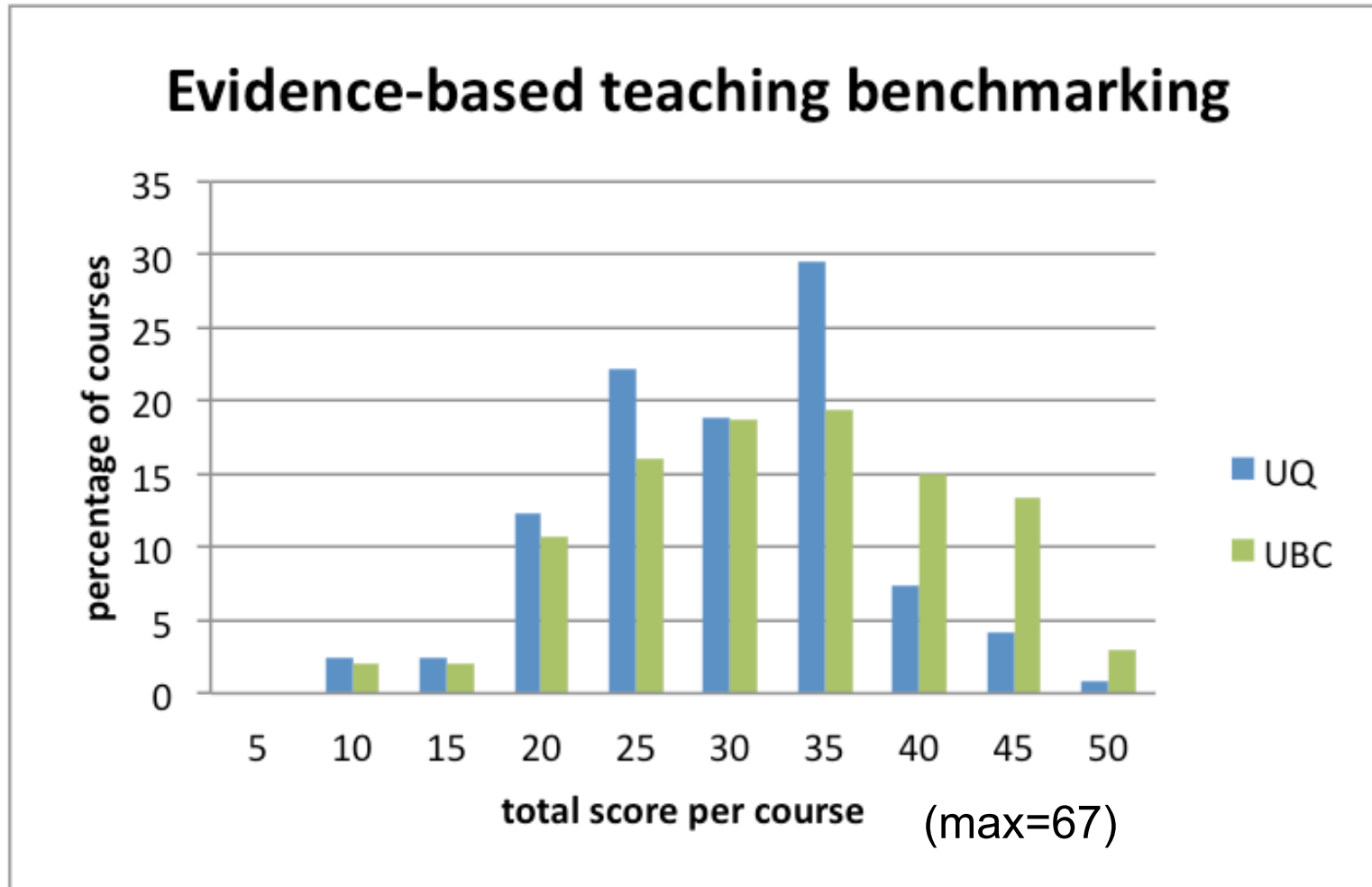
UQ course selection

- 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

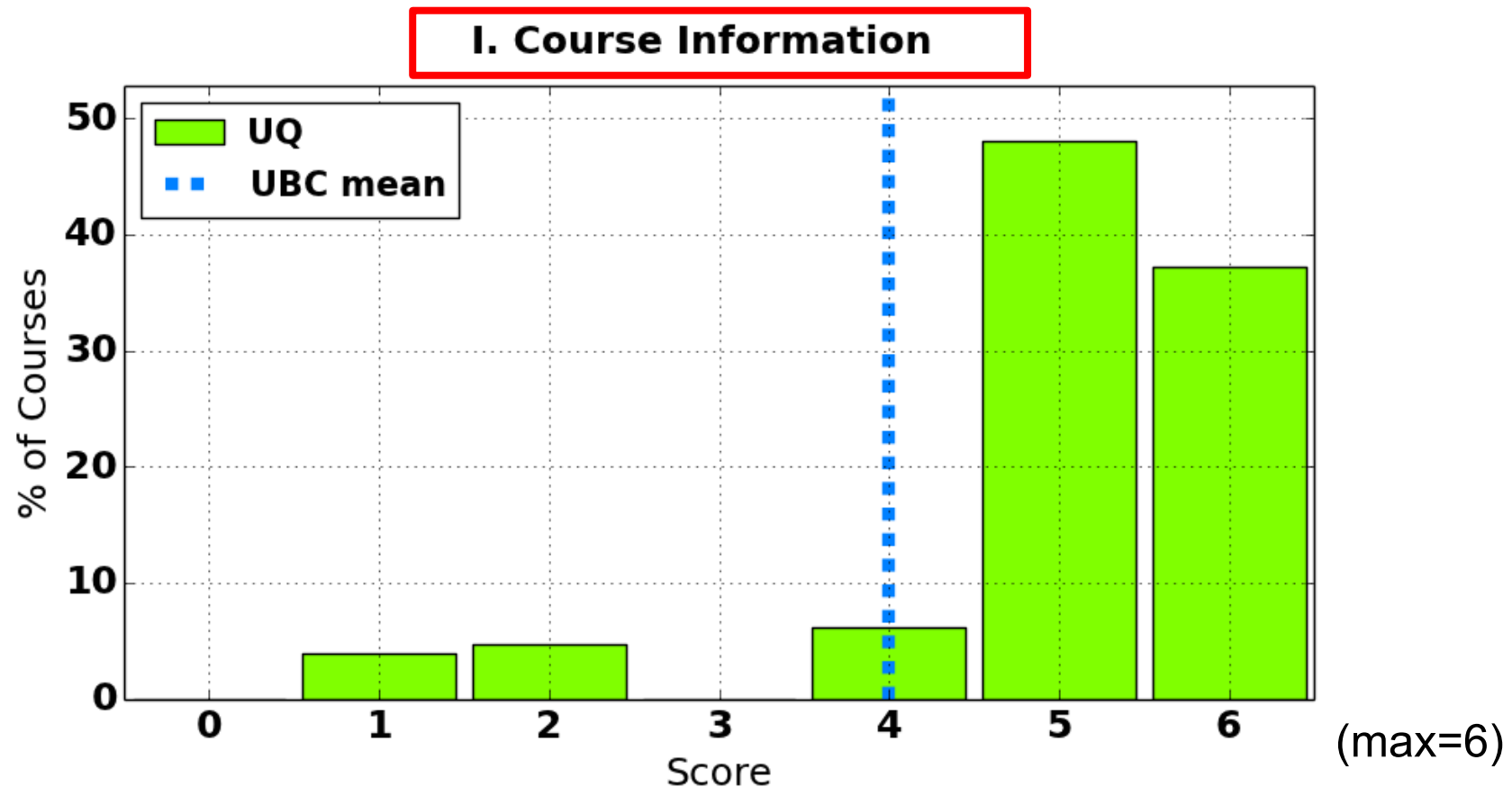
Results – total scores



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)

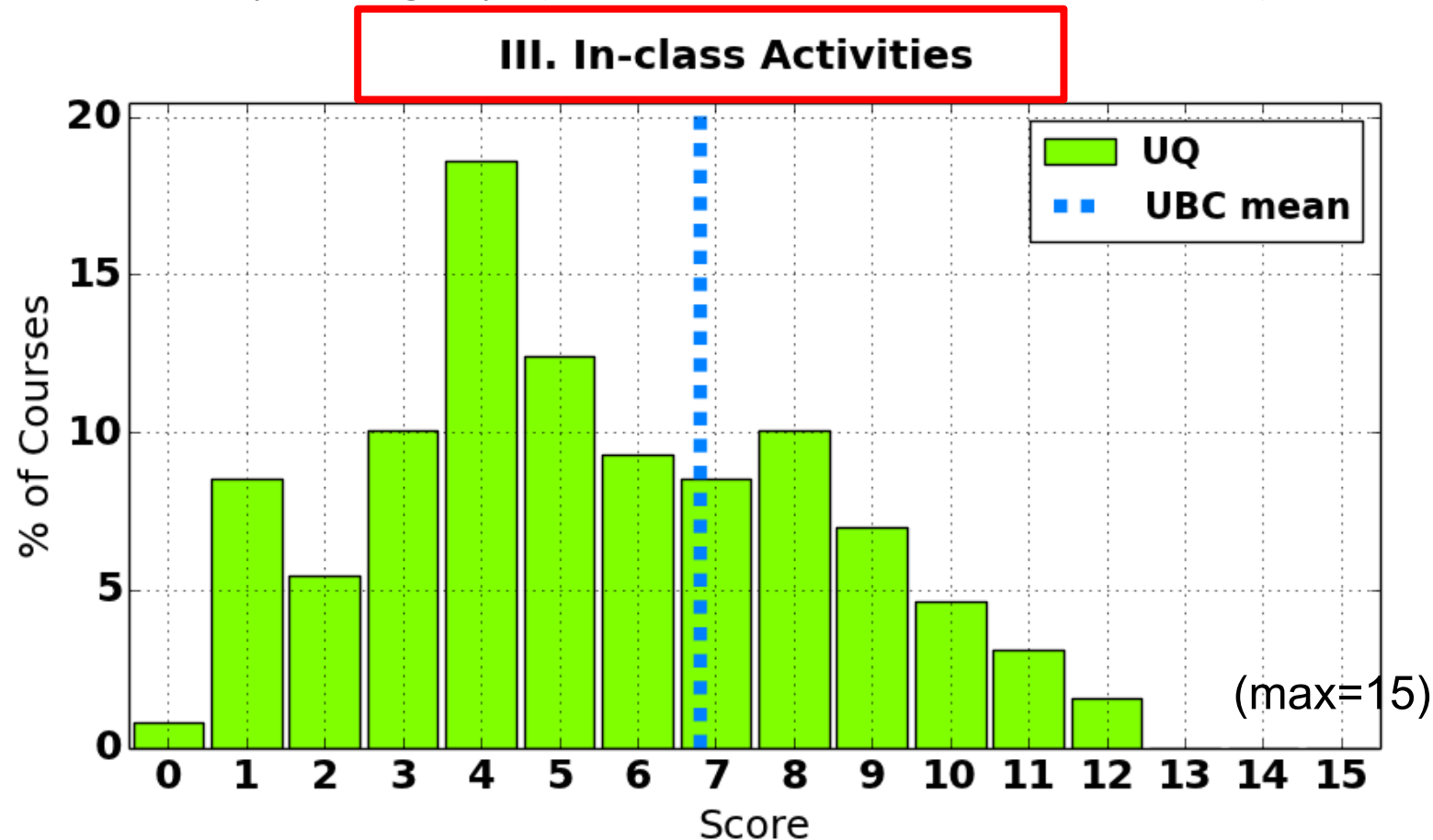


E.g. “list of topic-specific competencies” (UQ: 91% “yes”)

- 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)



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”

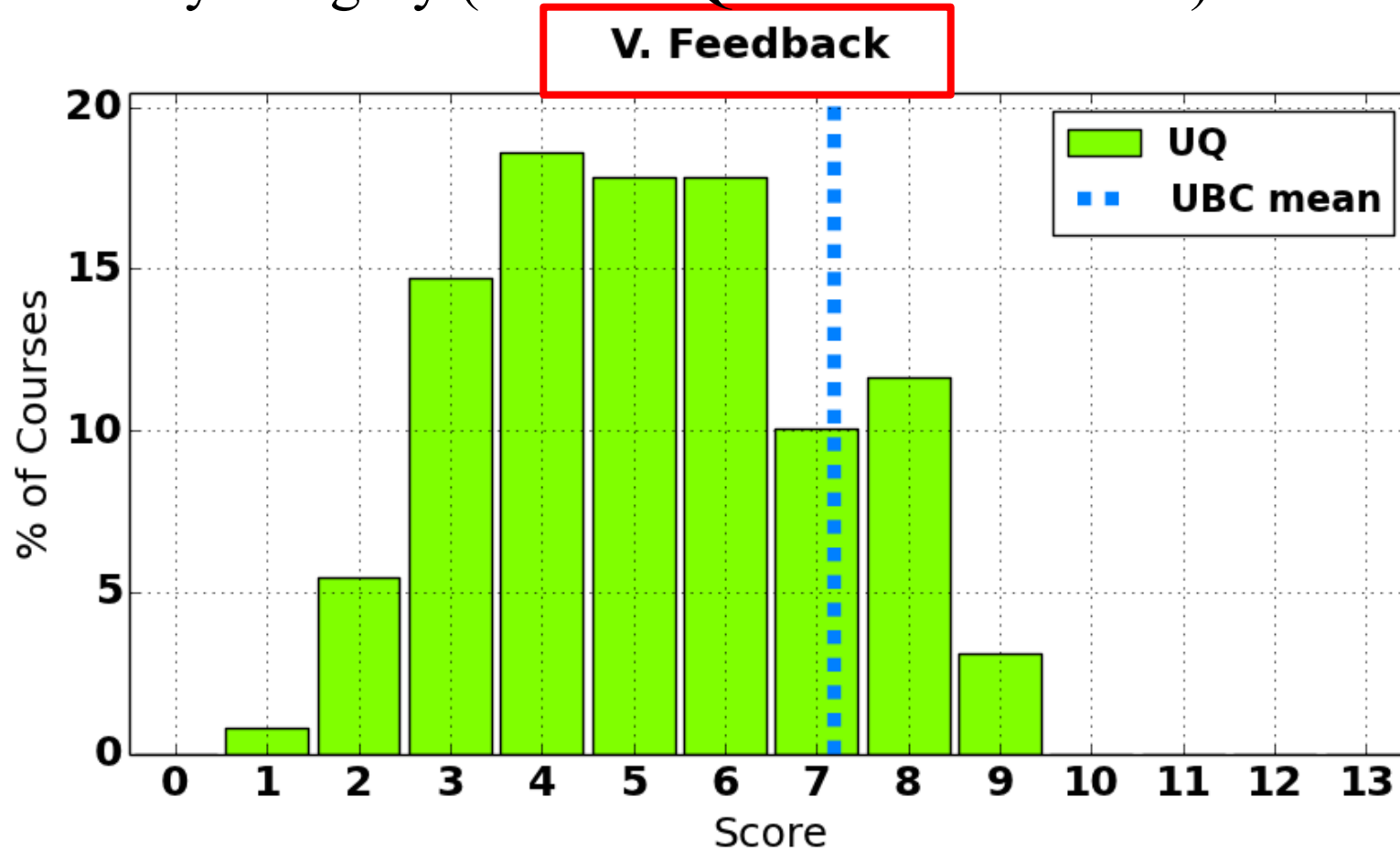
75% ask students to prepare for class

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)



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%)

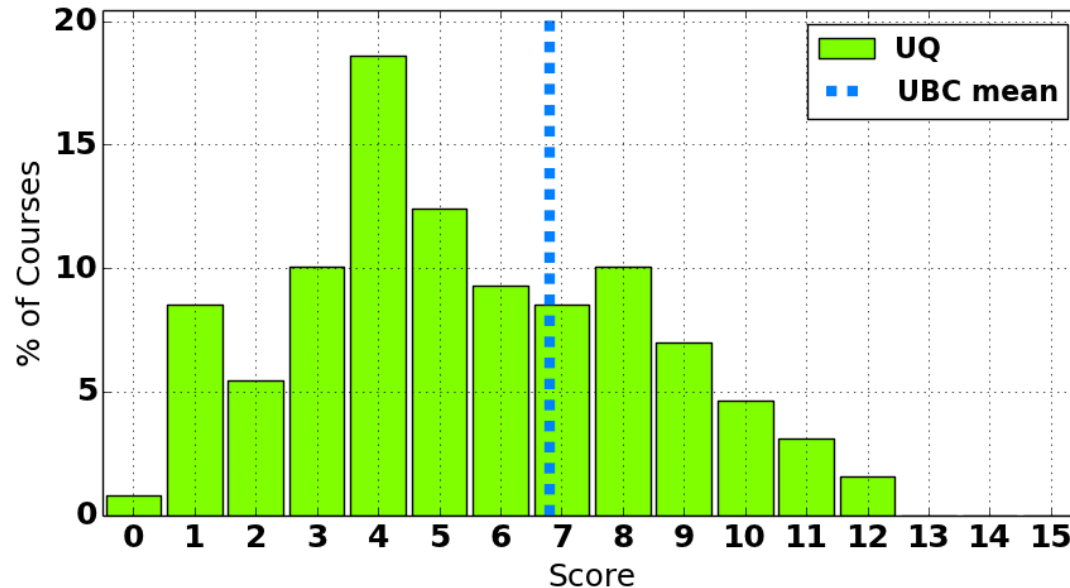
UQ=5.0, UBC=7.2 (T-test $p < 0.005$)

Results: Champions?

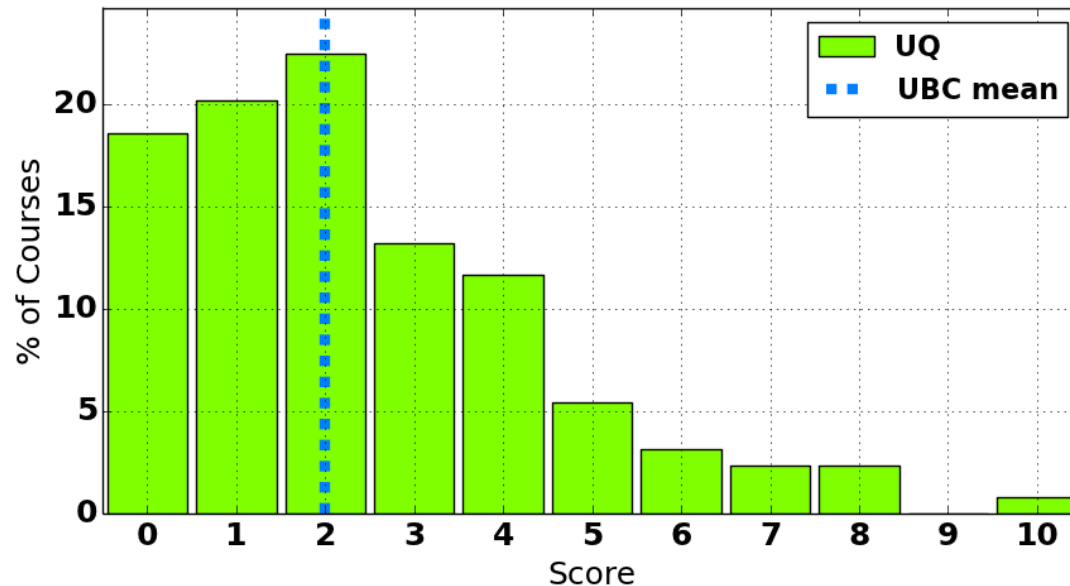
Only two categories are strongly correlated: in-class activity and diagnostics

- Champions are innovating in class and testing outcomes

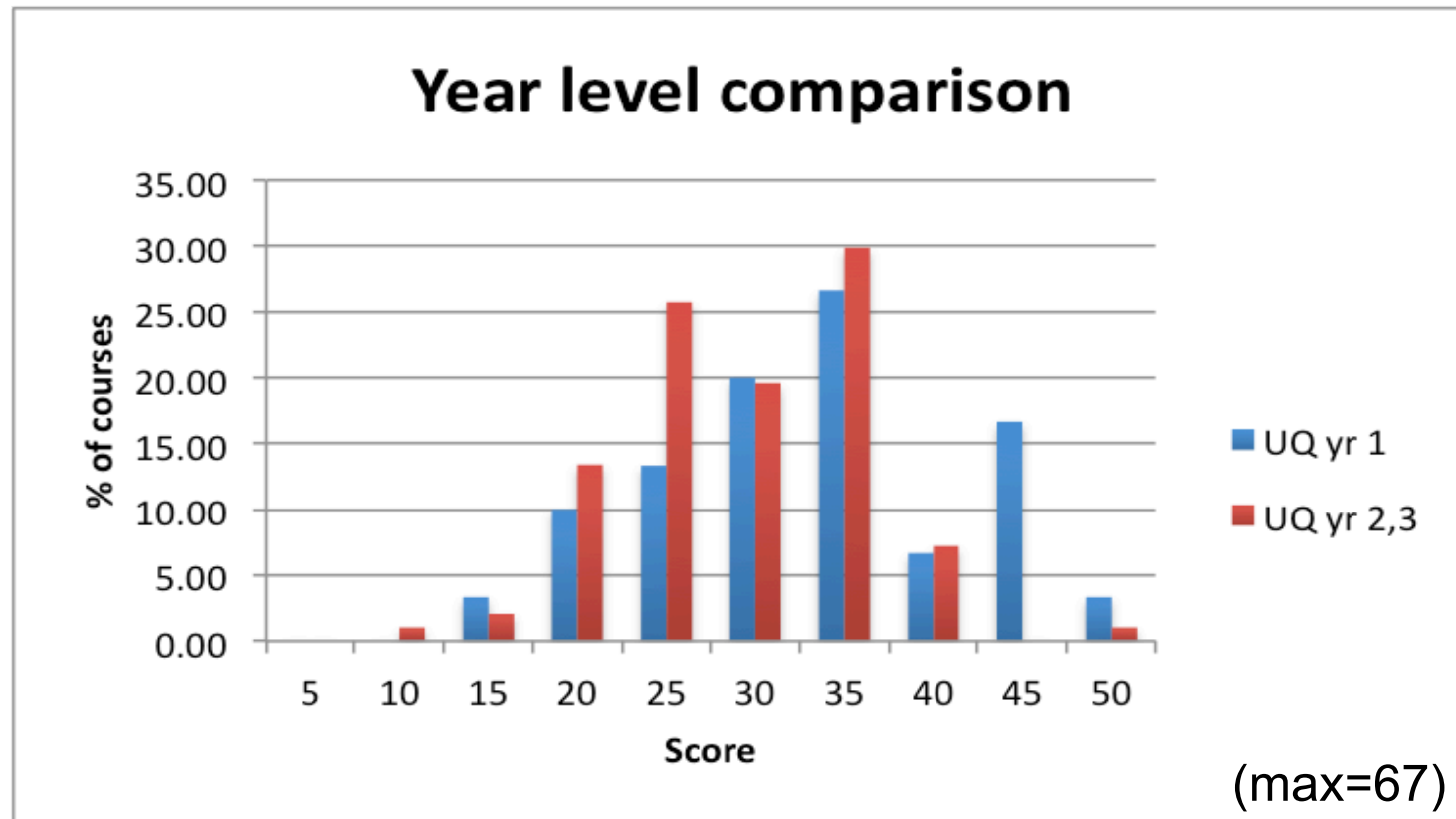
III. In-class Activities



VI. Other (Diagnostics)



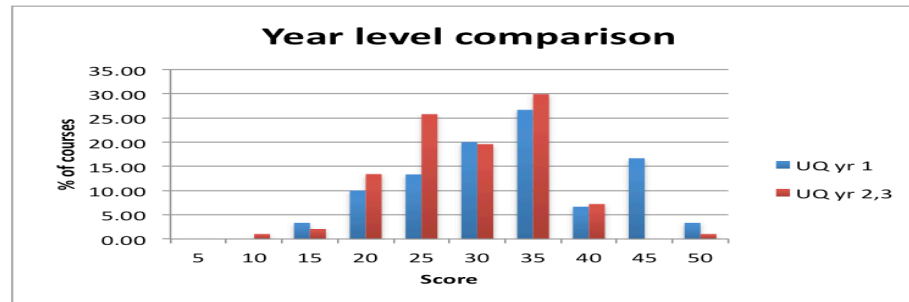
Results – total scores by size & year level



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



(max=67)

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

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

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(scoring)