Is more activity always better?

A department-wide study of relationships between classroom practices and student performance in biology

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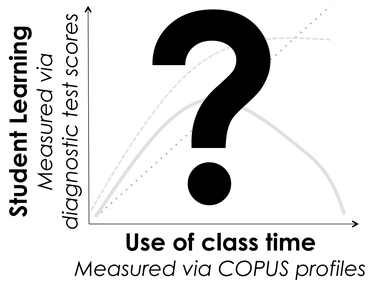
a place of mind

Research Questions & Data Collected

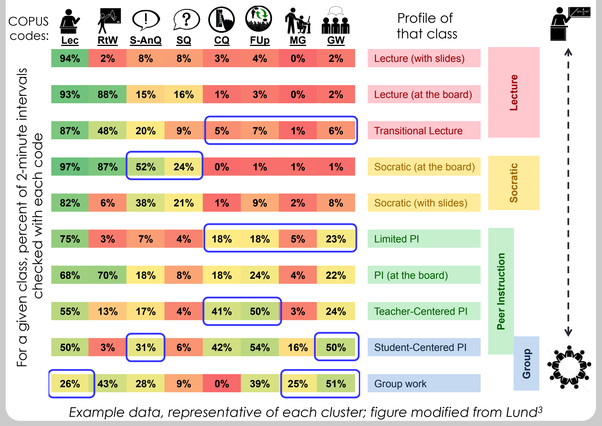
- What variety of teaching practices are currently used in our program?
- What are the relationships between specific classroom practices and student learning?



Goal: identify these relationships to inform teaching practice

Characterizing Classrooms using COPUS[1,2]:

During a classroom visit, student and instructor activity codes are checked off in 2-min intervals. Each classroom can then be characterized:



Example data, representative of each cluster; figure modified from Lund[3]

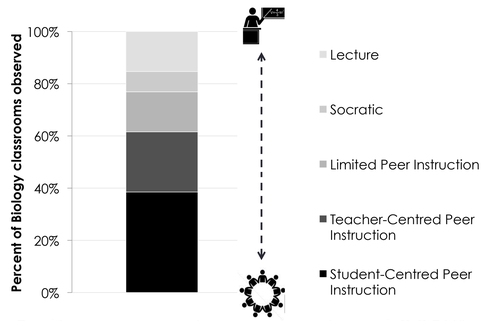
Data collected

Course Level	# of Course sections			# of Students		
	Term 1	Term 2	Total	Term 1	Term 2	Total
100	7	6	13	966	880	1846
200	7	5	12	1052	865	1917
300	2	3	5	197	260	457
400	2	3	5	51	85	136
Totals:	18	17	**35**	2266	2090	**4356**

- Each course was observed for a 'typical week' (~3 hours)
- **16** diagnostic tests consisting of a total of **242** questions, compiled largely from validated questions in the literature.

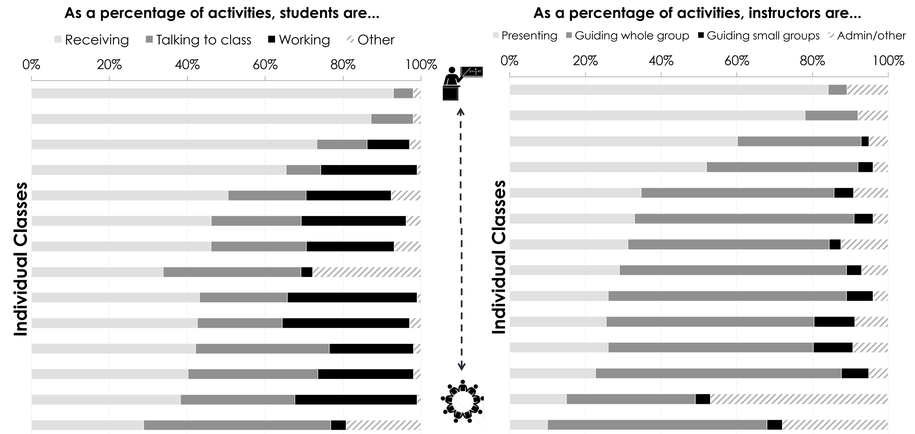
Departmental Characterization

Profile of classroom types



- Profiles were created from analysis of COPUS observations.
- Active learning teaching practices are very prevalent in the courses observed.

Overall Student & Instructor Practices



In our classes, the most common student-centred activities are:

- Worksheets
- Clicker questions
- Individual problem-solving
- Asking/ answering questions (talking to class)

Classroom Practices & Student Learning

Student Performance and Classroom Types

- Student Performance here is defined as the Percent Normalized Change on the diagnostic test: (postscore-prescore) / (1-prescore) if post > pre.

Student Performance Positively Correlated with Group Work and Clickers

- As expected[4], classes with higher levels student-centered peer instruction result in higher performance
- There may be a 'sweet spot' for the amount of lecturing – need to analyze the rest of the data to see.

Conclusions & Next Steps

Preliminary Conclusions and Next Steps

- We can now quantitatively link program-wide class observational data with student outcomes.
- Still to analyze: term 2 data

What to make of the inconclusive data? e.g....

Questions for you, with this rich dataset:

Research:
How would you approach your analysis? What would you look for? What questions would you ask?

Teaching:
How might these results impact your own teaching practices?

Thank you to...

- the many Biology Instructors and students for participating in this research.
- Leah MacFadyen & the LAVA group for helpful discussion on COPUS analysis.

References

[1] Smith M *et al*, CBE - Life Sciences Education (2013) 12(4):618-627.
[2] Smith M *et al*, CBE - Life Sciences Education (2014) 13(4):624–635
[3] Lund TJ *et al*, CBE - Life Sciences Education (2015) 14(2) *in press*.
4 Freeman S *et al*, PNAS (2014), 111(23):8410-5.