**Research Questions & Data Collection**

- What variety of teaching practices are currently used in the biology program at UBC?
- What are the relationships between specific classroom practices & student learning?

**Classroom characterization**

**Goal:** identify these relationships to inform teaching practice

**Classroom styles in our biology courses**

- **Mostly lecture** (n=7)
- **Extensive group work** (n=17 courses)
- **Emergence of group work** (n=17 courses)

- Classrooms assessed from clustering averaged COPUS data.
- Evidence-based, active learning teaching practices are quite prevalent across the biology program.
- Most active classes are large-enrollment, lower division courses.

**Student performance and classroom styles**

- **Students** in ‘extensive work’ classes perform significantly higher than students in other classes.
- This is consistent with an overall trend: evidence-based, active learning practices contribute more to student learning than traditional lecturing.

- Error bars are SEM * p<0.05.

- "Student Performance" is the effect size of the difference between pre- and post-test diagnostic scores within each class section, calculated using the standardized mean gain effect size formula.

**Time spent on group work, but not lecturing, predicts student performance**

- Consistent with literature, classes with more student-centered time have higher performance.
- Maximum % group work observed was 63% of class; unknown impact beyond that.

**Worksheets & peer instruction support student learning**

- In our classes, the most common student-centred activities are:
  - Clicker questions (peer instruction)
  - Worksheets
  - Individual problem-solving
  - Asking answering questions to the whole class

- Students in classes that include any worksheets or any clicker questions significantly outperform those that do not.

**Comparison to departments in other universities**

- Student-centered practices at UBC: less lecturing, more group work
- Impact of Science Education Specialist (SES) model of educational change: Significant, multi-year institutional initiatives with departmental support for the integrated SES individual(s)

**Observational & performance data collected**

<table>
<thead>
<tr>
<th>Course level</th>
<th># of courses</th>
<th>Total # of matched students</th>
<th>Observation of course enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>13 (2)</td>
<td>1431 (47%)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>9 (4)</td>
<td>1723 (64%)</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>5 (5)</td>
<td>463 (33%)</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>6 (6)</td>
<td>111 (25%)</td>
<td></td>
</tr>
</tbody>
</table>

- Each course was observed for a “typical week” (~3 hours).
- 17 diagnostic tests consisting of a total of 145 questions, compiled largely from validated questions in the literature.
- Matched students wrote the test pre- and post-course.

**Science Education Specialist, Model**

- Students centered practices at UBC: less lecturing, more group work
- Impact of Science Education Specialist (SES) model of educational change: Significant, multi-year institutional initiatives with departmental support for the integrated SES individual(s)

**Conclusions & Next Steps**

- We have quantitatively linked program-wide class observational data with student outcomes.
- Suggestion: introduce worksheets or peer instruction into your class.
- Questions: How to get the most out of the rich, time-series data?
- How to visualize / display the data, to encourage educational change?

**Questions & ideas from you?**

- Research:
  - How would you approach this analysis? What questions would you ask?
- Teaching:
  - How might these results impact your own teaching practices?

**Thank you to…**

- Many Biology Instructors & students for their participation.
- Leah MacFastyn & the LAVA group for discussion on analysis

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**Is more activity always better?**

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

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**References**