The Flexible Learning Initiative in First-Year Biology: Assessment of the Pilot Phase

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Flexible Learning in First-Year Biology

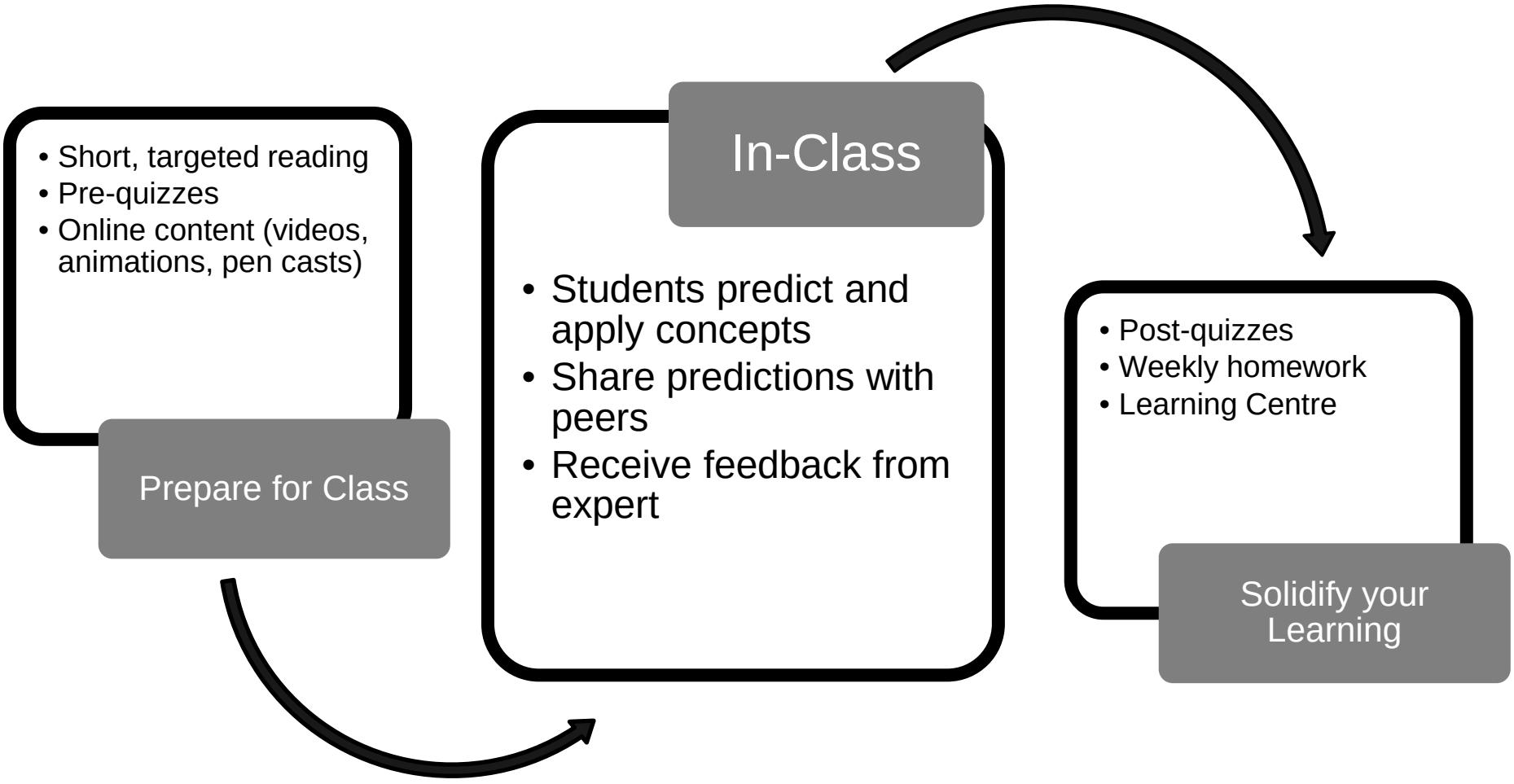


Figure 1. The "learning path" visual used to provide a visual for biology's approach to the FLI. The learning path was also used to present weekly course content to students on Connect.

Evaluation plan

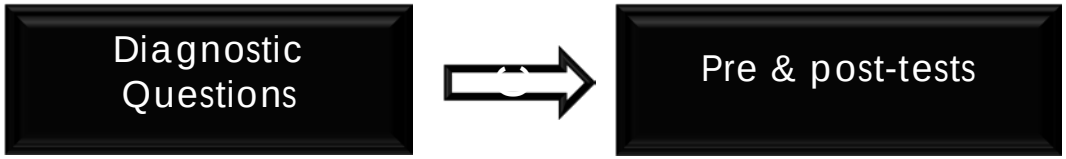
Two Classes:

Biology 112: Biology of the Cell – 4 sections, 1200 students

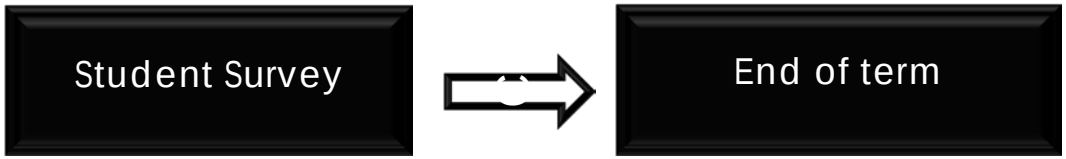
Biology 121: Ecology, Evolution, Genetics – 3 sections, 700 students

Measures:

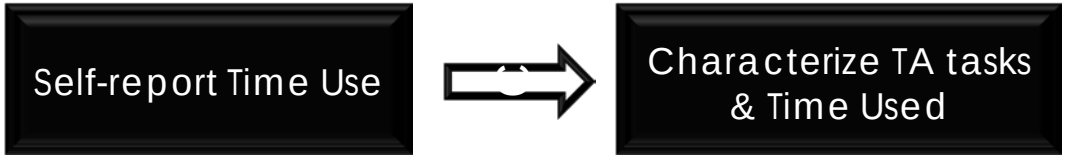
1 Student Learning



2 Student Perspectives



3 Use of TAs in FL Classroom



Biology 121:
Comparison between sections

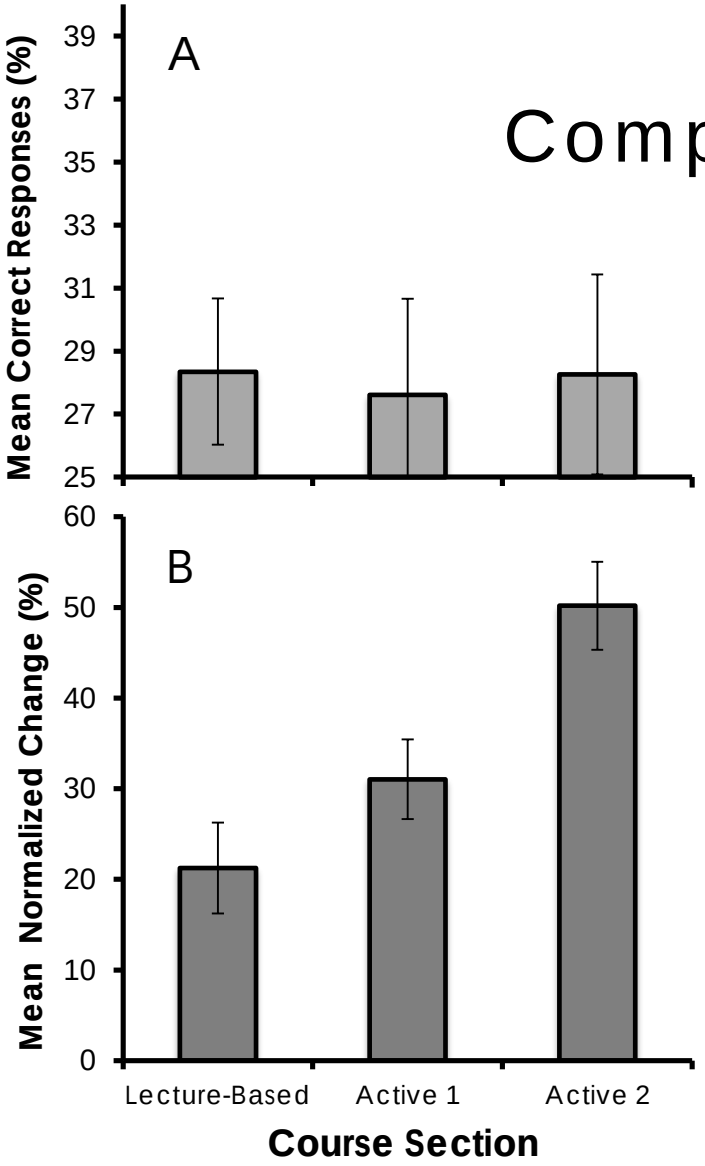


Figure 2. A. Matched mean correct responses (%) for Bio121 students on the pre-test CI in three sections of the course (Lecture-based, Active 1 and Active 2). **B.** Mean normalized change (%) for students on the post-test. Error bars represent 95% CIs. N = 136 (Lecture), N = 164 (Active 1), N = 148 (Active 2)

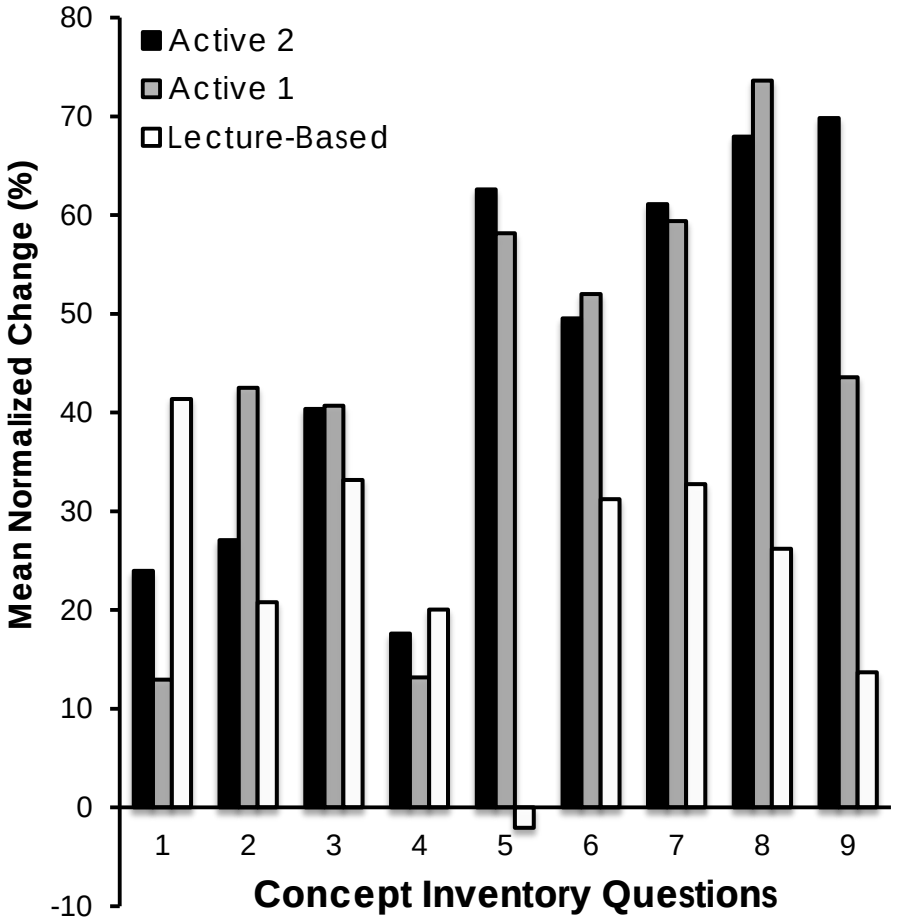


Figure 3. A. Matched mean normalized change (%) for students on the CI by question. Error bars represent 95% CIs. N = 136 (Lecture), N = 164 (Active 1), N = 148 (Active 2)

1 Student Learning

Biology 112:
Diagnostic development

- Compiled from several validated concept inventories, and/or developed in-house. Three pre-tests deployed during term at beginning of major course units (23 questions total); subset of these questions as post-test (16 questions).
- Continued development ongoing; finalized for Fall 2014.

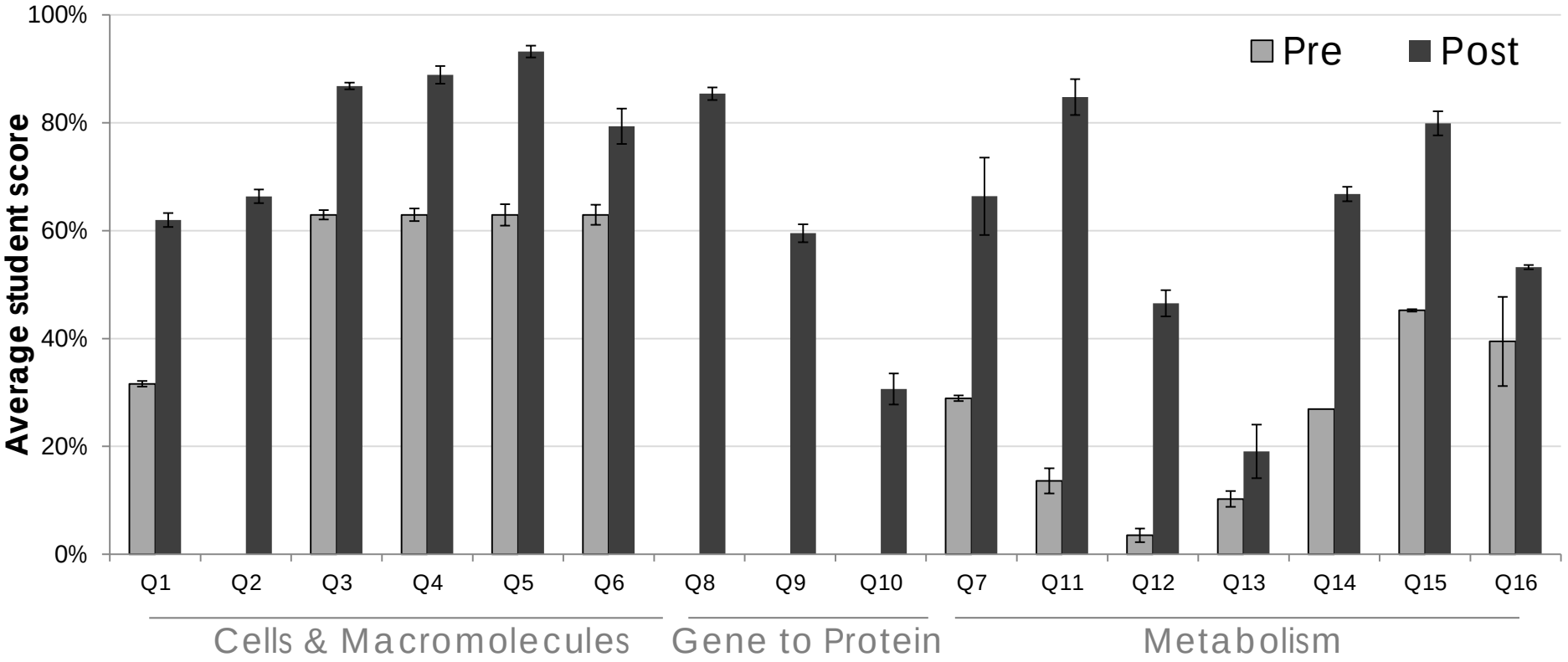


Figure 4: Biology 112 scores over sixteen questions deployed across four sections. Error bars are standard error between section averages. Due to time constraints in the course, no pre-data for some questions.

2 Student Perspectives

Student perspectives are positive overall

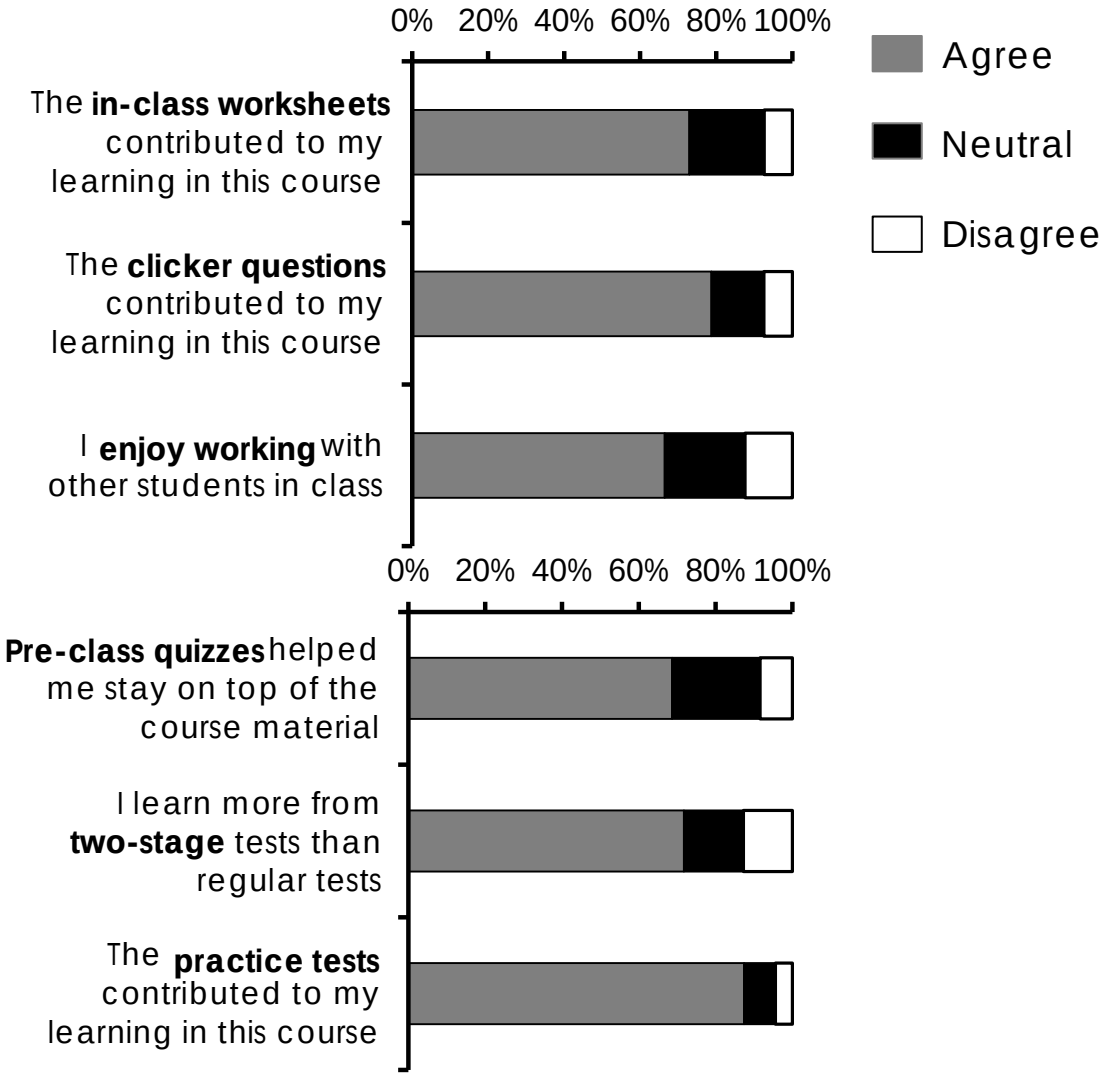


Figure 5. Data from student survey. All data from 6 'flexible/active' sections in Biol 112 & 121; N = 521 students. Scores between 112/121 were consistent, with S.E.s between classes < 10% for each question.

Student Comments:

I think the clicker questions are extremely useful and get us thinking rather than just sitting and listening to someone lecture.

The pre-reading with the quizzes really helped me learn the material before the lectures so I could apply that knowledge.

At first I thought the whole idea of doing homework in class was nonsense, but further on in the course I found it very unique and helpful.

From the data, areas to consider:

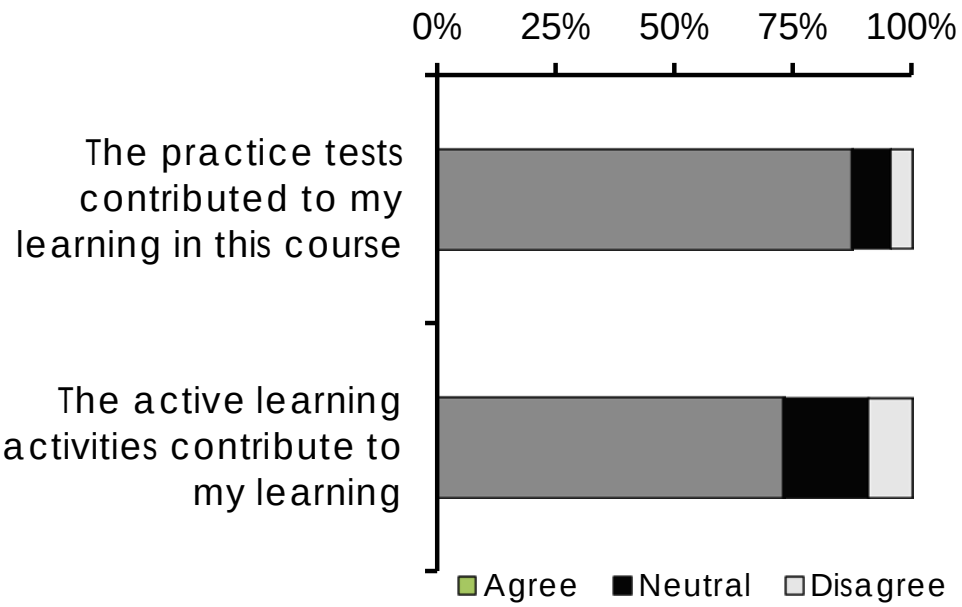


Figure 6. Data from student survey.

Student Comments:

The time for in-class activities is sometimes too much and sometimes not enough

If a person did not do the readings before class, they would be totally lost in lecture.

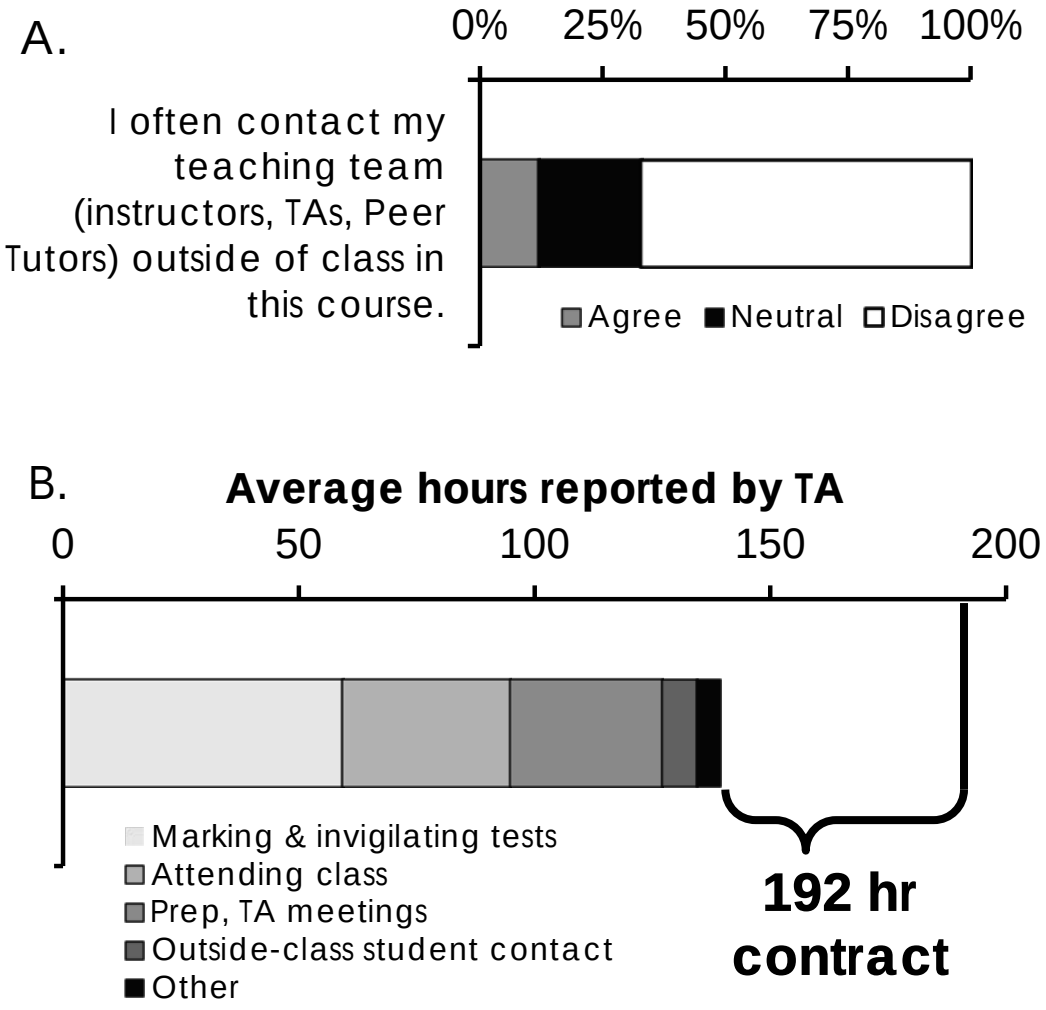
I like the engaging atmosphere, but at this point in time, still undecided whether that is better for me than a regular class

Some students don't see as much value in the active-learning methods. Ideas to address this:

- Tighten alignment between tests and activities inside and outside class
- Improve timing & choreography of in-class activities
- Explicitly reinforce the value of active-learning practices

3 TA Roles & Time Usage

Students value TAs, but they are under-used



Student comments:

The professors and TAs are extremely nice and helpful. I would love to continue biology in the future.

There is ... a lot of professor and TA involvement to aid the students' learning.

Having multiple TAs in the classroom was also a great advantage.

I wish that there were more lectures available (maybe put on by the TAs?).

Figure 7. **A.** Survey data from Bio121 and 112 students about contacting the teaching team. **B.** Self-reported TA data, N = 8 TAs, from both courses. Standard error, comparing between Biol 112 and 121 total workloads = 1.9 hours

Ideas for effective use of TA time & increased student-TA contact:

Develop learning centre-specific materials – integrated into course structure

Biol 112 - Small pilot ongoing, larger plan for Fall 2014

Use TAs across courses to support and invigilate 2-stage testing

Will help increase instructor/admin buy-in for large 2-stage tests

Develop other course materials:

Evaluate, modify class materials *(e.g. online quizzes, worksheets).*

Have variety of TA roles in team

Develop course extras:

Develop & run tutorial series, skills workshops for returning students

Piloted Biol 112, 121 this term; larger plan for Fall 2014

Conclusions

- Student learning (% normalized change in CI score) is higher in the active learning classrooms than in the lecture-based classrooms.
- Students value many of the instructional approaches known to support learning (peer-instruction, practice exams, clickers). There are some approaches (e.g. pre-readings) they don't perceive as contributing to their learning as much.
- TAs are an under-used resource in first year biology; there many more ways they could be used to support student learning.

Future Directions

- Currently collecting instructor data/perspectives
- Evaluating data from Winter 2014
  - Reproducibility
  - Correlating with COPUS observations
  - Improved student survey
- Continued implementation for “final” transformation, Fall 2014
  - Data-informed course decisions

Questions for you…

- Different ideas for analysis?
- Other types of data that we could collect?
- Something we haven't considered yet?

Thank you to:

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