Restructuring Microbiology 325: Microbial Genetics

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Recently Microbiology 325, a third year microbial genetics course, was completely restructured. Previously the course used a traditional lecture and tutorial based learning model, but now incorporates an active learning model. This new version of the course employs clearly defined learning objectives, pre-class readings, in-class group oriented clicker-based problem solving, and very little lecturing. A concept inventory was used to measure the learning gains achieved by the students in the restructured course, with an average learning gain of 50% being observed.

Microbiology 325: Microbial Genetics

Microbiology 325 is a third year microbial genetics course that was added to the curriculum in 2010. The course covers, in depth, a range of concepts in microbial genetics including plasmid, phage and cloning vectors, gene transfer, genetic maps, genetic analysis, and microbial gene expression. In particular students spend a great deal of time with the concepts involved in gene expression, and the analyses related to these concepts.

The initial iteration of Microbiology 325 primarily involved a traditional lecture-based learning model.

- Students spent two hours a week listening to the instructor summarizing or expanding upon the salient points covered in the course readings.
- An additional hour each week was used for a tutorial-type session during which students would work on practice problems and receive varying amounts of feedback. These tutorials often used a combination of worksheets and clicker questions.

The Restructured Microbiology 325

For the January 2012 semester Microbiology 325 was completely restructured to employ a learning model based heavily on active learning within the classroom with minimal lecturing from the instructor. In particular, the new version of the course relies upon:

- Detailed learning objectives that were provided to the students.
- Just-in-Time-Teaching methods involving pre-class reading and homework to prepare the students for each week's material.
- In-class group work and discussion based on solving challenging problems, often using clickers.

Measuring Learning Gains in Microbiology 325

The Operon Concept Inventory (developed at UBC) was used as a pre-test in January and as a post-test in March. This inventory comprises 22 questions regarding bacterial gene regulation and expression.

- The learning gain was calculated for each student as (post-pre)/(22-pre).
- The average learning gain for the class was found to be 0.50 or 50%.
- With other inventories, typical learning gains for traditional lecture courses fall in the range of 10-30%, whereas active learning based courses have typical learning gains of 20-70%.