Learning by Design in Immunology

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Introduction
Immunology Course
- Was MIC 406 combined lec/lab 4 credits
- New MIC 330 lecture 3 credits
Offered fall/spring
Required course for Microbiology, Clinical Laboratory Science
Popular elective for Biology, Pre-Health Professions
Enrollment 60-80 students/semester
MIC 450 now a separate Immunology Laboratory course (2 credits)

Autoimmune Disease
be4er with methods shown by latest research to enhance student learning.

• lecture therefore needed to become more interactive, with more problem-solving activities
- Approach to problem-solving posted on D2L
- Aligned problem-solving practice with critical thinking questions on quizzes, exams

Rationale for Change in Course Offering
• Prior combined lec/lab format had a restricted enrollment based on lab space & resources
• Prior combined lec/lab format required 6 hours/week — a potential deterrent for an elective
• Growing importance of immunology — want more students to have access
• Immunology useful for careers in health professions, research and development
• Immunology beneficial for personal health

Rationale for Redesign of Immunology Lecture
• In prior lec/lab format, problem-solving activities, group work and interactive learning methods were used in the laboratory but not the lecture part of the course
• Survey of students from prior lec/lab course indicated the importance of interactive learning methods, e.g. NBOS students cited moderate to large learning gains from critical thinking questions and discussing problems with classmates in the lab portion of the course. The new lecture therefore needed to become more interactive, with more problem-solving activities
• New lecture has one more hour per week than prior lecture — offered opportunity to include in-class activities aimed at improving student learning
• New lecture format offered opportunity to re-think entire teaching approach and align it better with methods shown by latest research to enhance student learning.

Approach to Redesigning Immunology Lecture
• Backwards design i.e. identify desired learning outcomes first, then work backwards to develop learning strategies and assessment tools proven to be effective by research
• Learning by Design course with CATL in summer 2013 provided structure, expertise and a fun group of people to share ideas with while focusing in on key details of “How Learning Works”

What about this topic do I want students to really understand?
What concepts do students need in order to make sense of the content?
What about the topic is important yet difficult to understand?
What are one or two major issues or questions to explore in the topic?
Given all I will teach, what one idea should they come away having learned?

2. Take into account that students’ prior knowledge can hinder learning
- Need to clear up prior misconceptions before new knowledge can take hold
- Embedded wrong ideas are more effectively abolished by hands-on experience
- Use interactive in-class problem solving activities

Example: Immune system cell circulation around the body

Problem: Students’ prior internal picture of the blood circulatory system can throw them off track in regard to immune system cell circulation between tissues and blood via lymphatic system vessels.

Approach to overcoming problem:
Following mini-lecture and animated video on immune system cell circulation, give students a “Map Quest” exercise that mimics how they might display travel directions using an internet site. Students must work in groups to draw the line of travel taken by an immune cell from point A to point B, labeling the type of vessels traveled on and in which direction. They are provided with a “map” of the human body that shows blood vessels but not lymphatic vessels. Using knowledge they have just gained from the mini-lecture and video they must include lymphatic as well as blood vessels in their drawing.

Future Goals
- Analyze assessment data on student learning outcomes, home teaching approach in response
- Improve efficiency in handing in class problem solving and grading
- Explore a “crowd-sourcing” approach to involving students in a communal research project

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