

Realistic, and Potentially Unrealistic, Goals in a Freshman Anatomy and Physiology Course

I teach a one-semester freshmen-level human anatomy and physiology course to under prepared students, i.e. developmental education, at the University of Minnesota. The class meets in three settings: a 160-seat lecture hall, a 40-student computer lab, and a small-group wet lab. (The wet-lab is lead by teaching assistants.) Over the past ten years our program has used a vast array of activities to help students learn, e.g., cooperative groups, book projects, and even art projects. Our most popular learning tool is an Internet site called “WebAnatomy” which helps students memorize the names of bones, muscles, etc. (Professional science educators correctly describe the site as “drill and kill.”) The site receives over three million hits from users around the world and student evaluations reports it as the “best learning tool” in the course.

All major exams in the course involve 80% knowledge and comprehension questions and 20 % analysis and synthesis questions, i.e., questions that require higher order thinking skills. Knowledge and comprehension questions typically require simple memorization. (Example: What is the largest component of the brain? Name the neurotransmitter secreted by a neuron at the motor end plate?) Analysis and synthesis questions require students to deduce information that they have not directly received in class; information that I do not expect them to have written in their notebooks or available in their text. (Example: Given the following list of molecules, which one contains the most nitrogen atoms?)

Two personal goals for my students are: 1, to improve students’ ability to answer knowledge and comprehension exam questions, and 2, improve students’ ability to answer analysis and synthesis questions.

Evidence of attainment of these two goals has been gathered by tracking student performance on both sections of the exams. More specifically, each student receives three scores for each exam: score on the knowledge and comprehension component, score on the analysis and synthesis component, and a total score. Next we group students into performances levels (A, B, C, etc.) for each component and measure changes both within and between groups over the four exams during the semester.

Successes

Students use of and interest in the WebAnatomy materials brings to mind Marshall McLuhan’s *The Medium is the Message*. Are students more interested in learning anatomy or using the median (i.e., the computer and the Internet)? For most students it’s probably a combination of both. For example, you can predict a student thinking, “I have to learn the anatomy of the heart, but at least I can use a computer to do it.” The fact that WebAnatomy is a computer tool, as opposed to less sexy, old-school learning technologies such as paper and pencils, has greatly increased the chances that students use it, and thus maybe increased their chances of learning anatomy.

Our program has achieved success in developing class and individual activities that help students improve their performance on knowledge and comprehension questions.

Our data indicates that if a student is willing to work, e.g., show-up to class, participate in cooperative groups, use WebAnatomy, etc., they can improve their ability to memorize anatomical structures or learn the steps to a simple physiological process.

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Vexes

At this time our program has achieved very limited success at helping students improve their performance on analysis and synthesis questions.

Methods used to measure students' changes in performance on analysis and comprehension questions involve the comparison of scores on the first and last exams of the semester. Though no inferential statistical tests have been used, the descriptive data clearly indicates that students who perform at the "C" range on these question on first test are still in the "C" range on the last test. Likewise, students' performing at the "A" range on the first test remains in the "A" level on the last test. Individual students who show either great improvement, or a sharp decline, in performance have been informally interviewed and most all state the lack of preparation for a specific exam as opposed to some innovative form of study. Student test data, and my gut, tell me that we can do little to help students increase their ability to solve analysis and comprehension questions during my course.

Student use of WebAnatomy programs obviously does little to help students prepare for analysis and comprehension questions, but we've also tried more pedagogically advanced methods such as cooperative testing, where student see other students solving analysis and comprehension questions. Additionally, analysis and comprehension questions are modeled each week during lecture, and the course study-guide contains example synthesis and comprehension questions for each chapter.

Many times during the semester that I want give-up my goal and simply teach material that I know students can learn (memorize?). By setting very tangible student goals, e.g., learn the bones of the skull, and creating fun learning activities, e.g., WebAnatomy programs on bones of the skull, I know I can receive good teaching evaluations and my administrators, and even a few colleagues, will be impressed. But in my gut I know that I'm not accomplishing all that much; students are simply learning more and more facts about the human body. What I really want to do is help students improve their ability to answer / solve analysis and synthesis questions – I want to help improve their thinking skills.

A fellow anatomy and physiology instructor, Dr. Rod Seeley at Idaho State University, has told me that helping students perform better on analysis and comprehension questions is difficult in two semester courses, and almost unrealistic in a one-semester course.