Assessment of course design, student learning outcomes, and student attitudes in a combined human anatomy lecture and lab course

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Abstract

Undergraduate students that apply to professional schools (nursing, dental, optometry, pharmacy, etc) are required to complete a human anatomy lecture (and sometimes lab) course prior to admission. In order to meet this growing demand at the University of California, Irvine, a novel combined human anatomy lecture and lab course has been developed and was taught for the first time in the Spring 2014 quarter. Students received a combined grade for this highly structured course that included three hours of lecture a week, three hours of lab a week, daily pre-class assignments, active learning activities in class, and weekly review quizzes. Students were asked to evaluate the lecture and lab components, including Mastering A&P, an online virtual cadaver (Practice Anatomy Lab), Learning Catalytics, and lab activities using anatomical models. Student performance in the course was evaluated based on prerequisites (prior completion of a human physiology lecture and/or lab course), major (biological sciences versus nursing sciences), and other student demographics (GPA, year in school, etc). Students were also asked to self-report their confidence in being able to achieve the course goals and their attitudes towards the anatomical sciences in a pre-post-test format and these data were compared to student performance on summative assessments in the course. The results from this study will be of interest to instructors who currently teach human anatomy lecture and/or lab courses as it aims to identify best practices for teaching human anatomy.

Course Description and Goals

A combined human anatomy lecture and lab course was designed and offered to 96 students in Spring 2014 at UC Irvine. The students were ~2/3 biology majors and ~1/3 nursing science majors and all had a human physiology lecture pre-req. The course goals (below) were modified from those developed by the Human Anatomy and Physiology Society (HAPS).

Course Goals

1. Use appropriate terminology to effectively discuss human anatomy
2. Identify anatomical structures in the major organ systems of the human body and explain how form and function are related
3. Recognize and explain the interrelationships within and between the anatomical systems of the human body
4. Predict physiological consequences using anatomical principles
5. Evaluate real-world clinical case studies by applying anatomical principles
6. Work effectively in groups to evaluate and analyze clinical case studies
7. Use models and computer resources to identify and describe anatomical structures

Study Design and Assessment

The objective of this study was to assess student attitudes, confidence levels, and performance in the new Applied Human Anatomy course at UC Irvine. Students completed a pre- and post-survey on the first and last day of class, respectively, that assessed their confidence and attitudes towards anatomy using Likert-type scales. To simplify presentation of data, average Likert-scale responses are provided (+/- STD). Student exam scores (lecture and lab) were also analyzed to address performance variables.

What was the course like?

Lecture component

The lecture component of the course met MWF for 50 minutes each time, 10 weeks total. The lecture component was taught in a **highly structured format** with daily pre-class homeworks (Mastering A&P), in-class **active learning** group activities, and weekly review quizzes (Mastering A&P). There were three midterm exams and a cumulative final exam. All body systems were addressed in the course.

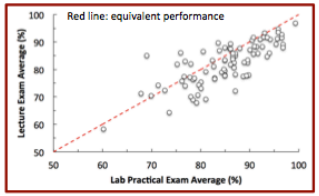
Bio Sci D170: Spring 2014 lab session

Lab component

The lab component of the course met once a week for 3 hours at a time. Students worked in groups with physical models, virtual histology slides, and a virtual cadaver (Practice Anatomy Lab, via Mastering A&P). There was a midterm practical exam and a final lab practical exam.

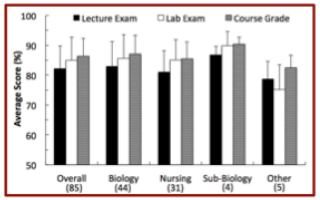
1 Is lecture and lab performance related?

Student performance on lecture and lab practical exams was highly correlated ($R^2 = 0.59$) but overall students performed slightly better on lab practical exams than on lecture exams (averages of 85.1 vs 82.1, $p < 0.05$).



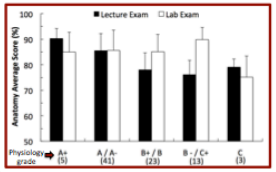
2 Does student major affect performance?

Student performance in the class varied slightly by major, with students majoring in biology sub-areas (e.g. neurobiology) scoring significantly higher on exams, whereas those in other majors (e.g. public health) scored significantly lower ($p < 0.05$).

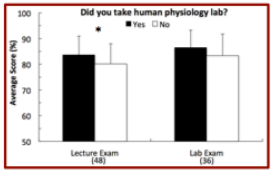


3 Do physiology pre-reqs affect performance?

Student performance on the lecture exams in human anatomy was directly related to student performance in the human physiology lecture pre-requisite course.

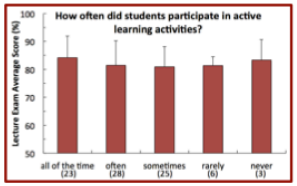


Students that had passed a human physiology lab prior to taking human anatomy performed slightly better on lecture exams than students that did not take the lab ($p < 0.05$).



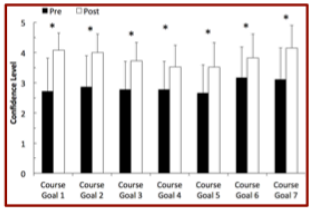
4 Does participation in active learning activities affect performance?

While the course was essentially flipped, not all students always participated in active learning activities. However, lecture exam scores were higher for students that participated in 100% of the active learning activities.



5 Did students' confidence change?

Student' self-reported confidence in being able to achieve the course goals (listed in left panel) significantly increased after taking the human anatomy course. Significance was determined by Wilcoxon Signed Ranks test. Asterisks denote significance at the level of $p << 0.001$.



6 Did students' attitudes change?

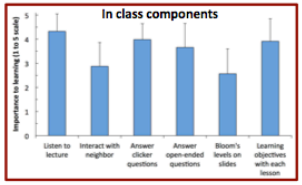
Students were asked on the pre- and post-surveys to rate their agreement (1 to 5) with 16 attitudinal statements regarding their interest in health careers and their views and attitudes towards human anatomy. After the course was over, only the following four statements resulted in significant shifts ($p < 0.05$).

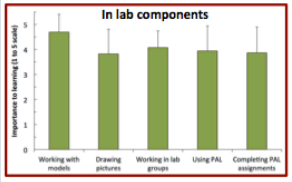
- **Anatomy is one of my favorite subjects** (positive shift)
- **I feel comfortable looking at drawings of the human body** (positive shift)
- **I am comfortable with talking about the human body** (positive shift)
- **When I think of anatomy, I think of evolution** (negative shift)

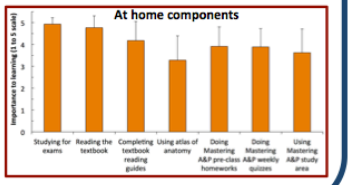
- For copies of class materials, please email: j.shaffer@uci.edu -

Evaluation of Course Components

On the last day of class, students evaluated the following course components with regard to how much they contributed to learning the course material on a Likert scale of 1 to 5, where 1 indicated "very unimportant" and 5 indicated "very important." To simplify data presentation, average Likert scores (+/- STD, n = 90) are presented.







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