Cross-disciplinary coteaching of an applied biostatistics course: equipping pre-health and biology students with more relevant quantitative skills

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Rationale
W&J College is a private, co-educational, national liberal arts college of 1500 students located 30 miles south of Pittsburgh. In the last 10 yrs (2000-2009), W&J has had an average of 271 graduates per yr, with 31 Biology graduates per yr. Of these Biology graduates, 32.1% entered a health professional school. W&J students from any major can register with the Committee on Health Professions (CHP). In this same 10-yr period, 87.1% of the 217 registered graduates entered a health professional school.

Math is not required for Biology students, while either a combination of calculus and prob/stats or prob/stats alone is required for CHP-registered students, depending on their desired health profession. Biology students are inadequately prepared to use and interpret statistical methods in upper-level classes.

An applied biostatistics course is more appropriate preparation for life sciences students for advanced undergraduate and graduate work.

Approach
Coteaching: All aspects of the course were developed and executed jointly. One professor served as session leader during each class, but both professors participated in all classes. An upper-level math major served as a course assistant.

Course Elements/Structure: A typical class period began with homework questions, then consisted of lecture, discussion, and workshop periods. Most calculations were carried out first by hand and then using modern statistical software (SPSS).

Primary literature articles were frequently used to reinforce concepts and to train students in critical reading and analytical skills. Students completed a primary literature article review (individually) and a semester-long research project (in groups of 2 or 3).

Means of Assessment
Curricular assessment: weekly quizzes; 2 exams plus final, including manual and software problem-solving and critical analysis of experimental design in primary literature; critical review paper and presentation; group research project paper and poster

CURE (pre-/post-course; HHMI-funded): data not yet provided by Grinnell College

Mid-semester survey
Anecdotal feedback from students and other faculty

Email survey to course assistant
Online survey to determine current-semester open periods
Student evaluations at end of semester:

Expected Student Learning Outcomes
- Describe data sets using appropriate statistics.
- Critically review experimental design and use of statistics in biological literature.
- Access and use online biological data sets.
- Design and analyze statistically sound experiments.

Results of Assessment
Curricular assessment: Experimental design and confidence interval interpretation troubled weaker students, while all students suffered some difficulties with SPSS mechanics.

Mid-semester survey: Course was adjusted by adding screen shots of SPSS to lecture notes, putting homework answers online, and consciously not rushing at the end of class.

Course assistant: Evening tutoring hours were valuable, presence during class could be less frequent, and an extra session could be focused on problems and SPSS use.

Open periods: Tue/Thur mornings, MWF afternoons

Considerations
Coteaching was valuable because of the two different perspectives and strengths of the professors as well as instant in-class feedback and adjustment.

Continue course every Spring, perhaps more frequently as perceived need drives demand.

Ideal classroom setting has blocked seating arrangements and strong wireless signal.

Use same but updated (2011) text given its abundant biological examples and problem sets.

Continue use of SPSS on laptops.

Add recitation session to enhance proficiency in software use, provide more informal Q&A setting, and host quizzes.

What is the role of the course assistant?

Course title and text
BIO/MTH 245 Applied Statistics for the Life Sciences, Spring 2010, 17 students