

**Nord Grant Proposal 2014-16**

Barbara Kuemerle PhD

**Title:** Longitudinal Study to Assess Learning Retention- A Comparison of May Term (3 week course) to Fall Semester (15 week course)

**Overview:**

Is it beneficial for students to participate in a course that necessitates the mastery of a large amount of academic material in a 3 week period? Will students retain a significant knowledge base from such a rigorous course offering when compared to students enrolled in the same course offered over a full semester? The principal purpose of this study is to address questions such as these by assessing the retention of primary concepts from Biology 216 when taken over the course of a 15 week semester in comparison to the same class taken over the course of a 3 week semester, with both classes having the same number of classroom hours (i.e., “seat hours”). This assessment will be done, in part, by comparing student grades, administering a pretest at the start of each course followed by a post-test given at the end of the course, and two “retention exams” given to students 3 and 10 months after they have completed the course. Second, in order to determine whether particular topics may necessitate more time for student comprehension or more thorough instruction, student performance will be assessed with regard to specific topics in each course offering.

**Background**

Biology 216 is the final class in a series of three courses required of the Biology major. It is designed to provide an overview of fundamental biological processes by examining the complexity of interactions controlling reproduction, development and physiological function in animals. This lecture course is offered both in the regular 15 week Fall Term (meeting 2 days/week, 75 minutes/class, with a total of 4 exams and two assignments) as well as in the 3 week May Term (meeting 2.5hrs/ class Mon.-Thurs, with a total of 3 exams (given each Friday) and two assignments. The learning outcomes for this course are as follows. After completion of Biology 216, the student should be able to:

1. Demonstrate a basic knowledge and the synthesis of facts, terms and concepts in Physiology. Develop a solid comprehension of the physiological processes that underlie animal body function.
2. Recognize interrelationships and interdependence among the 11 organ systems. Understand the physiological integration of the organ systems to maintain homeostasis.
3. Provide exemplars of the evolution of adaptations in the design of organ systems among differing organisms (especially when comparing organismal complexity).
4. Realize the interplay (and significance) of form and function. Note how the design of each physiological system is optimized for function.
5. Acquire a solid comprehension of normal physiology to serve as a foundation for the understanding of pathophysiology. Apply knowledge to the analysis of case studies of authentic physiological conditions, and to the critical review of the primary literature.

These learning outcomes will serve as the basis for the design of the questions on the standard course exams, as well as the pre-test, post-test, and the retention exams.

### Modes of Assessment

Three types of assessment will be utilized to compare student insight and retention outcomes in each course offering. They are: the CWRU course evaluations provided by students via the internet, an individual questionnaire given to each student to address additional issues that are not included in the course evaluations, and the grades on course assignments and course exams, as well as pre-test, post-test and retention exams. Appropriate incentives will be offered to promote student participation in this study. A schedule of exams is shown below.

Course: Biol 216	Pre-test	Post-test	Retention Exam 1 (3 months)	Retention Exam 2 (10 months)
Full semester	9/24/2014	11/26/2014	3/1/2015	10/1/2015
May Term	5/11/2015	5/29/2015	9/1/2015	4/1/2016

### Direct Benefits

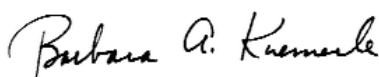
Students choose to enroll in the May term semester for a variety of reasons, which include the following:

1. Repeating the course to achieve a higher grade.
2. Enrolling in the course for the first time to remain on the recommended curricular schedule (e.g., if they chose not to enroll in Biol 214 the first semester of their freshman year).
3. To advance their studies, so that they have the requisite courses to enroll in upper level Biology courses starting their sophomore year, affording flexibility in their future schedules.
4. To review for the MCAT, DAT, or their forthcoming coursework in Medical or Dental School.
5. To gain knowledge of the course topics (i.e., students majoring in biomedical engineering often enroll in Biology 216)
6. To complete a rigorous, requisite core course in a brief 3 week period (which greatly appeals to many students).

This course is not simply an elective course designed to introduce topics in biology to students who will not likely focus on this material in the future. Regardless of the specific reason (as noted above), for the vast majority of students enrolled, the retention of the course information is highly advantageous, as these students will likely need to call upon it and build on it as they pursue their future endeavors.

Attempting to master a large amount of material in a short period of time, with little opportunity for review and reflection, may indicate a statistically significant, negative effect on retention. If this is indeed the case, an alternative pedagogical approach could be applied to, and tested in the attenuated May term course. In this regard, it is likely that students may have more prior knowledge of certain course topics and therefore, find them to be more intuitive and less challenging to master than others. If assessments indicate that students' performance is inferior on specific topics after the 3 week course, instructional methods can be redesigned. For example, if students consistently provide a similar number of correct answers on questions pertaining to the digestive system after both course offerings, but perform worse on questions pertaining to the nervous system after the 3 week term, more time may need to be allotted to the instruction of nervous system topics. Further, if there is a substantial discrepancy in overall retention capability, major changes in the Biology curriculum may be necessitated (e.g., the May term offering may be designated as pass/no pass and used by students for review, etc. but may not suffice for full Biology core course credit). Similarly, observation of a significant difference in retention may beget analysis of other courses offered in the attenuated summer terms. Thus, this proposal may serve as a model to evaluate numerous courses and could be utilized as preliminary analysis for a larger, NSF funded initiative.

Sincerely,



Barbara Kuemerle, PhD  
Instructor, Department of Biology  
[barbara.kuemerle@case.edu](mailto:barbara.kuemerle@case.edu)



Christopher Cullis, PhD  
Chairman, Department of Biology  
[Christopher.cullis@case.edu](mailto:Christopher.cullis@case.edu)



**Budget:**

Research assistant(s): \$1250

Statistician: \$3750

Total: \$5000

I. Research Assistant(s) will be paid 10 USD per hour for 125 hours (total, \$1250) to do the following:

1. Develop and evaluate a questionnaire given to students to assess influencing factors, such as:

- a. Student GPA
- b. Student Major
- c. Student Year
- d. MCAT/DAT Prep course( thus more recent exposure to course related material)
- e. Lab course (additional exposure to course material)
- f. Enrollment in additional Physiology course(s)
- g. Employment as a UTA, SI, tutor (more recent exposure to course related material)
- h. Prior knowledge: AP/IB Biology, completed Biol 214 only or both 214 and 215.

2. Assist with copying exams, grading, data entry and similar clerical tasks.

II. Statistician will be paid 25 USD per hour for 150 hours (total \$3750) to design and apply appropriate statistical analysis to the data obtained.

**\*Note:** I have completed the Human Research Curriculum, Group 2 Social & Behavioral Research Faculty, Staff and Students Basic Course/ 1 of The Collaborative Institutional Training Initiative (CITI)