

GRC FINAL REPORT

1. GENERAL INFORMATION:

a. **Your name:** Rachel Bowes

b. **Course number & name:** BIOL 415: Field and Lab Methods in Ecology

2. OVERVIEW: *An Independent Research Project was incorporated into the BIOL 415: Field and Lab Methods in Ecology course, students then reported the results of their projects in both a final research paper as well as in an oral presentation to their peers.*

3. BACKGROUND:

a. **Course description:** *This course gives students the opportunity to learn basic methods for studying ecology, both in the field and the laboratory. In the process, they are exposed to basic facts and concepts about numerous ecosystems and their inhabitants, surrounding KU and beyond. Key objectives of the course are to expand critical thinking skills, learn to analyze multiple data sets quantitatively, apply the scientific method to address important ecological questions, and report results in the appropriate manner. After taking this course, students are well equipped to think critically about many ecological issues and examine data sets in a statistically rigorous manner.*

b. **Typical students:** *Students have limited experience doing research prior to this course. Although the typical student is a junior/senior, few have had any experience doing formal scientific research or reading primary literature in the field of ecology.*

4. GOALS & OUTCOMES:

a. **Need for project:** *Students, prior to this course, have little experience, if any, doing formal research. Some have read any primary literature, a very limited number know how to use any sort of statistical software, and few know how to ask scientifically meaningful questions or design and implement an appropriately scaled experiment to test certain hypotheses. The GRC project enabled students to get hands on experience doing science, from start to finish, and then disseminating the information they gained from the project in a coherent and meaningful way.*

b. Learning goals & objectives:

LEARNING GOALS	CORRESPONDING LEARNING OBJECTIVES
Students will be able to apply their knowledge of research and experimental methodology to answer research questions	Students will be able to conduct a simple experiment to test research hypotheses on an appropriate scale to completed for this course in the allotted time frame
Students will understand the importance of disseminating information and how to communicate their findings effectively	Students will be able to produce a written scientific report and an oral presentation detailing the results of their study and present them in class to their peers
Students will improve in their ability to disseminate information in the form of a written scientific paper	Students will improve in their scientific writing skills, in particular in their Introduction and Discussion Sections, as quantified by the "Writing Assignment Rubric"

5. IMPLEMENTATION:

- a. Activities:** *Students built up their research skills throughout the semester, with free-thinking, open-ended assignments all formatted similar to the independent research project/paper (same 6 questions each assignment, just pertaining to the different topics covered in that lab period: 1. Background, 2. Questions/Hypotheses, 3. Methods, 4. Assumptions, 5. Results, 6. Discussion), culminating finally at the end of the semester in the Independent Research Project. Students were provided with the "Steps to Creating an Independent Project" document, a "Timeline" in which to generally follow to complete the project in a time-efficient manner, an "Independent Ecology Project Reading Assignment and Hypotheses/Predictions" assignment to complete prior to beginning data collection, and both the oral presentation and the written report rubrics (all attached). With the Independent project, students were encouraged to ask questions in any area of ecology they were interested in and perform a small scale experiment to answer that/those question(s).*

b. Activity log:

ACTIVITY	# HOURS (estimate; leave blank if not applicable)
1. Facilitating activities in class.	
2. Meeting with students individually.	24 (One-on-one meetings with students to discuss their projects, progress, difficulties, experimental design and developing testable hypotheses, etc...)
3. Facilitating group activities outside of class.	2 (Gathering equipment for individual projects)
4. Developing activities & assessments.	4 (Development of rubrics, guidelines, timelines, etc...)
5. Providing written feedback to students (through email or written comments).	8 (revisions of rough drafts and initial hypotheses and predictions)
6. Developing online content for students.	
7. Evaluating student final products.	12 (Evaluation of oral presentations and evaluation of final written reports)
8. Coordinating instruction from other KU units (libraries, CUR, etc.).	
9. Meeting/planning with main instructor of course.	
10. Other (please list).	
TOTAL HOURS: 50	

c. **Assessment:** *Students reported the results of their independent research projects in both a final research paper as well as in an oral presentation. Rubrics attached.*

The rubric was developed in order to clearly articulate the expectation of the instructors for the composition of the two scientific writing assignments to the students in BIO 415. This rubric enables teachers to see specific areas of scientific writing students need additional instruction. It also allows us to observe improvement students make from the first writing assignment given mid-semester to the second writing assignment given at the end of the semester, and after meeting one-on-one with the GRC. The rubric also makes it possible to compare the performance of students between years to gauge the effectiveness of different teaching strategies.

The rubric is broken down into the major sections of a scientific publication. To the right of the section, all major components of each section are listed. This format allows us to simply check off the components that are present in the student's writing assignment. These components often contain language that specifies the expected quality of each components and/or list subcomponents students will need to include. To the right of the components column, we have provided a comments column that serves two function: 1) Decreases the amount of time spent by the instructors writing similar comments on many different assignment that are often identical or very similar and 2) provides the student even more information for the expectations of each component within a section that acts as "what not to do" for the students. This makes it clear to the student why partial credit was given for a section or component. The last column on the right specified the number of points earned out of the total number of points possible. The last row in the rubric leaves room for general comments for instructor about the writing assignment. Here positive comments are particularly encouraged.

6. STUDENT PERFORMANCE:

a. Narrative description of student learning: *The first writing assignment was given mid-semester, and had more of a limited range of hypotheses that the students could choose from and instructors guided them through the research process. The second writing assignment was given at the end of the semester, where students had a free range of topics to conduct a research project on and were required to meet one-on-one with the GRC prior to and during the entire process. Students were encouraged to turn in rough drafts of their papers to the GRC, but this was not required. During one-on-one meetings the GRC met with students individually and gave feedback about the projects in specific, but also about writing and presenting scientific research in general. Assessing the mid-semester reports through the use of the rubric, the GRC was able to recognize the areas in which needed more attention, and provide additional supplemental information to assist the students in troublesome areas. Students improved in almost every section of the scientific paper (Figure 1).*

b. Visual representation of student learning:

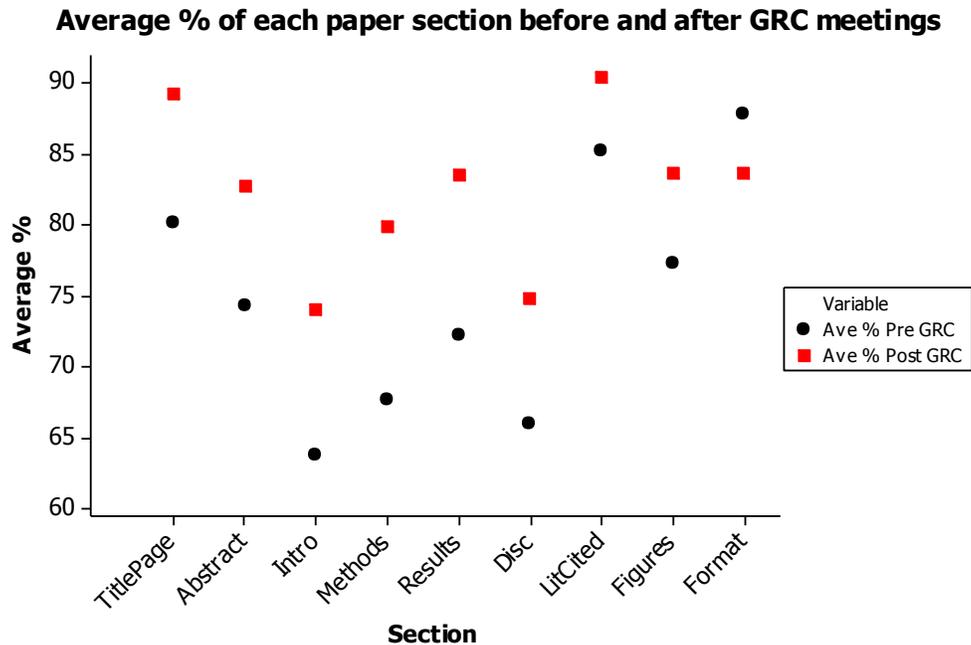


Figure 1. The average grade (percent) students in BIOL 415 (2014) received on each section of two different scientific papers they wrote. The students improved in almost all sections on the second writing assignment, after GRC meetings.

7. DISCUSSION:

- a. **Effectiveness of research project:** Overall, the GRC project was a great success. The learning objectives and goals were achieved. Prior to the GRC, there was no consistent format in the way this course was taught, no continuity in what is emphasized or assessed from year to year in the course, and no long-term tracking of student learning. Now there is a bank of information and resources for the next course instructor to use in the future.
- b. **Plans for revision:** Students were highly variable in their level of preparedness and research skill sets (i.e. the basic skills in research design and statistical analysis). Introducing statistical tests only when the students need to use it would be helpful, instead of introducing possible/general tests all at once in the beginning of the course. Assignments should have an increased level of direction and “hints”, to guide students in the correct direction, in the beginning of the semester and gradually wane in the amount of assistance throughout the semester.

- 8. PERMISSION:** Please indicate in which of the following ways, if any, that you would be comfortable with the Center for Undergraduate Research sharing this report with others.
- a. I am willing to have this report shared on the Graduate Research Consultant Blackboard site (for future GRCs and instructors). We would include your name with your report.
 - b. I am willing to have this report shared with others on a public website (on CUR website, etc.). The Center would contact you and the instructor of the course for final approval before publishing content online. *Note: if you are willing to share this report on our website and have any photos of class activities, please email us those photos along with this report.*