Challenges and successes in exposing community college students to field work and undergraduate research in a new introductory field biology course at the College of Southern Nevada

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Introduction

Few of the College of Southern Nevada (CSN) students I interact with consider careers in field biology. When asked why, most report they do not know much about field biology because too few opportunities exist. Knowing this, and the importance of attracting students to STEM careers, I solicited input from potential employers and developed a new course called *Introduction to Field Biology* (BIOL 211). BIOL 211 was approved by the Nevada System of Higher Education (NSHE) during 2012 and I offered it for the first time during the spring semester of 2013. It is a 4-credit lecture/lab course that meets six hours per week. The assessment plan for BIOL 211 is summarized in Table 1.

Eleven sophomores and juniors enrolled in BIOL 211 during spring 2013. All maintained 4-14 credits of science and math and most worked an average of 30 hr per week.

Table 1 Assessment plan for BIOL 211 at CSN.

Assessment	Weight	Assessed
Assignments	35%	Lecture content; Exercises
Midterm Exam	20%	Lecture content; Exercises; Mock tortoise survey report; Mock field project proposal and BLM sampling permit application
Final Exam	20%	Lecture content; Exercises; Skills retention assessment (compass, GPS, maps, following protocol)
Poster Project/ Presentation	20%	Grasses Project (*Bromus* and *Bouteloua* student teams)
Extra-curricular	5%	Make sampling frames, bait balls, equipment lists, prepare data sheets, *etc.* or volunteer for NDOW[1] or SNAP[2] projects

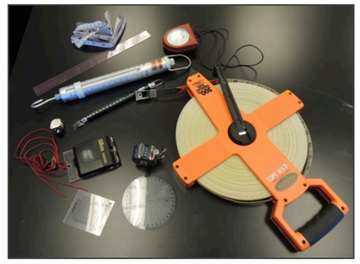
[1]Nevada Department of Wildlife; [2]Southern Nevada Agency Partnership

Course Overview

BIOL 211 is organized into lectures (*e.g.*, field safety, geospatial data, fieldwork), demonstrations (*e.g.*, RFID tag reading, telemetry, post-correction of GPS data), on-campus exercises, off-campus field excursions, and major field projects. I limited the number of lectures in the course to yield more time for hands-on learning. Geospatial data are an integral part of field work. Consequently, this topic was addressed thoroughly in the course (Figure 1).

Figure 1 Students learned how to use coordinate systems, topographic maps, map tools, a compass, GPS receivers, and GIS applications.

On-campus Exercises included:



1. Pacing 100 meters
2. Topographic map reading
3. Using a Silva® Ranger 515 compass for transects, slope, and aspect
4. Using Garmin® Rino® 650 and Trimble® Juno® 3B GPS receivers to collect geospatial data, navigate, and enter field data into a data dictionary
5. Measuring with rulers, tapes, calipers, spring scales, map tools, *etc.*
6. Use of ESRI® ArcMAP™ 10.0 and IBM® SPSS® V. 21 software
7. Mock tortoise transects using U.S. Fish and Wildlife Service 100% coverage and probabilistic sampling protocols and tortoise replicas

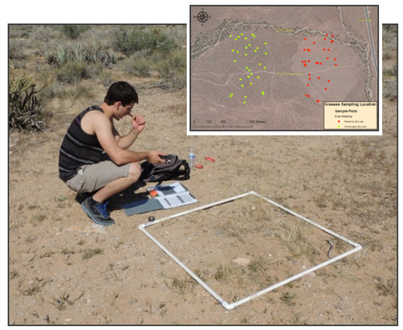
Off-campus Field Excursions

Students participated in two field excursions to practice field safety, develop field appropriate behaviors, and to learn how to key out taxa.

1. Plant identification at a field site near Jean, NV
2. Visual encounter survey and lizard identification on the Boulder City Conservation Easement

Major Field Projects

Grasses: Students compared invasive (*Bromus rubrens*) and native grass (*Bouteloua barbata*) density in recently and historically burned 1 m^2 plots in Yucca and Blackbrush dominated habitat within Red Rock Canyon National Conservation Area. They also explored the relationship of grass density and distance from a trail.



Trees: Students surveyed tree density using the point-centered quarter method and assessed tree health in a Ponderosa Pine-White Fir community in the Mt. Charleston Wilderness Area within the Spring Mountain Range.

Animals: Students conducted two nocturnal and two diurnal small animal surveys using pitfall sampling arrays and Sherman live trap transects at two different sites on the Springs Preserve. Captured animals were measured for length, weighed, sexed, and examined for the presence of ectoparasites.

Instructor Challenges

1. Devising activities varied in scope, design, equipment requirements, habitats, and taxa to give students some breadth of experience during a single semester
2. Coordinating the varied activities including scheduling, agency permitting, land-owner permissions, and prepping equipment
3. Accumulating the appropriate reading materials
4. Transportation to field sites
5. Supervising 11 students in the field without assistants
6. None of the students had completed college statistics

Student Challenges (data derived from exit survey responses; *n*=11)

1. 5/11 reported how challenging it was to wake up on time
2. 4/11 reported how challenging it was to work in the field because of poor fitness level and rough terrain
3. Others reported lack of understanding of statistics, using a compass, and taking care to eat and drink enough while working in the field

Successes (most data derived from exit survey responses and final exam; *n*=11)

1. 10/11 were *very satisfied* with their decision to enroll in BIOL 211
2. 9/11 were *extremely likely* to recommend the course to others
3. 6/11 had their first experience with research while in BIOL 211
4. 11/11 had their first experience using statistics to interpret research data
5. Most reported that after completing BIOL 211 they are now *likely* or *extremely likely* to pursue field biology, graduate school, and research (Figure 2)
6. Most reported moderate to major improvement in field skills (*e.g.*, items 1-5 in On-campus Exercises); skills retention performance support perceived improvement
7. Numerous learning opportunities from field observations (*e.g.*, explaining the most likely reason for why a lizard was impaled on a *Yucca* leaf)

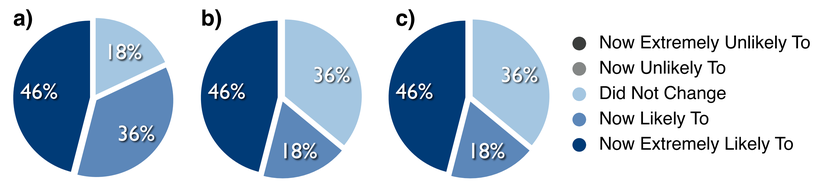


Figure 2 Percentage of student exit survey responses to the question: *How has taking BIOL 211 changed your decision to...* **a)** *consider a career in field biology?*, **b)** *go to graduate school?*, and **c)** *pursue a career in research?* (*n*=11)

Final Thoughts

The positive impacts BIOL 211 has had on its first cohort of students make it worthwhile to continue to offer the course and address its challenges. Early data suggest the course will attract more local students to careers in field biology or other STEM careers. BIOL 211 will be offered again during Spring 2014.

Acknowledgements

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