

## Reform of Introductory Science Courses for Non-Majors

### Interim Report Guidelines

#### For Mini-Grants Awarded October 2005

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**Institution:** Birmingham-Southern College

**Title of Project:** *Integrating PRS and the Learning Cycle into Explorations in Biology for Non-majors*

**Date(s) of Project:** Summer 2006 – Summer 2007

**Amount Awarded:** \$2500

#### 1. Original Goals and objectives

Effectively teaching science to non-science majors is increasingly important, especially considering the planet's current environmental state. Concepts that students learn effectively will shape the way in which they view the world, and the knowledge that they acquire as undergraduates (whether or not they realize it) will affect how they interact with the world in the future, including what type of car they drive and who they vote for in local and national elections. In most cases, non-science majors at Birmingham-Southern College will take one or sometimes two natural science courses above the high-school level. Thus, it is imperative that we give them the knowledge that they will need to become informed and responsible members of society.

The Biology Department at BSC is currently facing a curriculum change, which will result in the elimination of a heavily-enrolled introductory biology course (BI 105 Population and Ecosystem Biology) that serves both biology majors and non-majors. As a result, we must update our current non-majors course (BI 101 Explorations in Biology, current enrollment: 20 students every other semester) to accommodate those students who would have otherwise enrolled in BI 105. Although we do not plan to alter the list of general topics covered in BI 101 (mostly in the realms of ecology and evolution), the course will require substantial redesign, as it will now be taught every semester, and will accommodate approximately 60 students in each lecture section. Because of this increased demand, I will be assigned to teach this course for the first time beginning in the academic year of 2006-2007.

The main challenge that we face in revamping BI 101 is changing our pedagogy to cater to a class size of 60 rather than a class size of 20. In general, smaller class size encourages more class participation, and in larger classes, it is much more difficult to keep students engaged in the learning process. It has been well-established that learning is negatively affected by increases in class size (e.g., Prais, 1996), so developing teaching methods to engage individuals in large classes is essential.

Although in larger classes they may be difficult to identify, all students are equipped with prior knowledge about how the world works, and this prior knowledge may affect the way that each student integrates information that he or she receives in

science classes. Non-majors courses typically contain students of varying knowledge, and with a broad range of misconceptions. Identifying and teaching to misconceptions can be an effective way to bring order to students' understanding of basic biological processes (Ebert-May et al., 2004). I propose to enhance the BI 101 course at Birmingham-Southern College by integrating the "learning cycle" teaching model (Bransford et al., 1999; Possner et al., 1982) for at least 12 (approximately 1/3) of the lecture periods and incorporating the use of an electronic Personal Response System (PRS) to all class meetings. The goals of this approach are two-fold: (1) to bring out and clarify varying perspectives and misconceptions from a large non-majors class with diverse prior knowledge and (2) to enhance learning of all students by increasing class participation through interactive exercises, including PRS.

## **2. Any changes made in goals/objectives to date**

None, but see (4)

## **3. Activities underway and/or completed to date.**

I have currently identified and am developing 5 new class lessons to be incorporated into BI 101, which will utilize the learning cycle. The topics of the current class lessons are:

- Invasive species: Fire ant control invasion and control by a parasitoid
- Genetically modified plants: Ecological impacts of plant biotechnology
- Human impacts on ecology: What is killing the coral reefs and sea grasses?
- Disturbance ecology: Fire ecology
- Population ecology: Ecological impacts of high deer density

In addition, I have made plans to attend the 91<sup>st</sup> Annual Meeting of the Ecological Society of America in Memphis (Aug 6-11 2006), where I will attend a workshop entitled: *Innovative teaching and active learning in the biological sciences*. I will use the information from this workshop to develop additional lessons for BI 101 (description below):

Organizers: Diane Ebert-May, Janet Batzli, Douglas Luckie

We invite postdoctoral fellows, graduate students, and early career faculty to participate in a workshop modeling 'scientific teaching', learning, and assessment in undergraduate science courses. We especially want to meet the needs of these future faculty and faculty early in their teaching careers. The workshop is based on current research about undergraduate science curriculum reform, how students learn, and how assessment improves student learning. We will focus on teaching in both large and small courses and address the hows and whys to: (1) actively engage students in learning in classroom and laboratory environments, (2) use cooperative learning, (3) develop multiple kinds of assessments based on goals that provide substantive data about student learning, (4) analyze and use assessment data to improve instruction, (5) use technology-based tools to improve learning, and (6) use an assessment database. We also will address the realities of time (again and again), student course evaluations, faculty evaluations, and establishment of networks for intellectual and practical support in teaching. By the end of the workshop, participants should be ready to design their first course and implement these ideas on the first day of class this fall!

#### **4. Any snags or unanticipated delays encountered**

A substantial snag has occurred, as I am not slated to teach BI 101 during the next academic year (2006-2007), and I will be on sabbatical during the fall of 2007. Therefore, the first time that I might teach BI 101 is Spring 2008, and it has not yet been determined if I will teach it then. However, I continue to work on this project as if I were teaching the course next year, and the new modules will be disseminated to the appropriate professor(s). The professor who will teach this course for both the fall and the spring of this coming academic year has agreed to incorporate both the modules and PRS into his course in Spring, 2007, so I may be able to compare the results of course evaluations before and after implementation of the project, which is a more rigorous comparison than that stated in the original proposal. However, dissemination of the results of the study will likely be delayed until after I may teach the course

#### **5. Approved budget/ 6. Financial Accounting from receipt of funds through October 30, 2006, showing amounts spent to date and for what it has been spent.**

As of yet, I have not utilized any of the money in the approved budget, although I should be receiving a summer stipend of \$1500. Human resources has assured me that the problem is currently being addressed. The remaining \$1000 will not be used until the time that appropriate dissemination is possible.

#### **7. Any other information you think will be helpful to include.**

Because I revised my original grant proposal, I do not know under which granting cycle I officially fall. Therefore, I was not positive that now was the correct time to send this Interim Report. However, I thought it was important to inform you of the "snag" reported above. Please let me know what further action I should take to request an extension for travel and dissemination of my results.