

**Improving student learning and student retention at the undergraduate level
Application Cover Sheet**

Maximum funding for any single grant: \$50,000.

Proposal must be limited to two pages plus a budget page, in addition to the cover sheet.

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Collaborators (other departments, if any):

Chemistry (co-investigators on HHMI grant only)

Title of Your Proposal Improving Retention Rates of Sophomore Biology Majors (Continuation)

Theme of Your Proposal (Support for students; Fostering connections; Enhancing advisement; Other innovations for engaging students in learning):

Support for students; fostering connections

College rating (approved; not approved) APPROVED

PROJECT SUMMARY

Purpose

The Department of Biology serves a large and varied student population. When they first enter the University, many of our 1200+ majors think of the biological sciences in terms of a medical career, but they soon learn that biology offers multiple career opportunities in such diverse areas as research, industry, law, government policy and education. The strategies outlined below are designed to improve the retention rates of our students, particularly as they move from lower division to upper division courses. Regardless of the career paths chosen by our majors, our ultimate goal is to produce students who take charge of their own learning and retain a life-long interest in science.

Goals

During the first round of RPG funding (2006-2007), the Department of Biology was awarded funds to support the following two initiatives:

- a. *Supplemental Instruction (SI)*: training of graduate students and advanced undergraduates to serve as “SI leaders” who provide assistance to biology majors registered in high-enrollment or high DWF courses.
- b. *Sophomore Connections at State (SCS) courses*: development and implementation of “Frontiers in Biotechnology,” an SCS course designed to help students explore the many research and career opportunities, as well as the bioethical questions, brought about by advances in biotechnology and related fields.

Goals for the coming year. The Department is encouraged by the success of the RPG-funded initiatives to date (see attached Interim Progress-Toward-Goals Statement) and will continue to make SI and SC classes available for our students. Our specific goals are:

- to provide our lower division majors with the individualized assistance made possible through the SI program so that they will improve their chances for successful matriculation to upper division courses
- to use our newly developed SCS course to help our students discover the wide ranges of opportunities available to successful graduates with a major in biology

By adopting these two strategies in combination, we hope to produce students who not only have the academic foundation to succeed, but the enthusiasm to excel.

Activities

Supplemental Instruction (SI). During 2005-2006, the Biology Department participated in a university-wide pilot project to test the effectiveness of the supplemental instruction program. The pilot program was limited to non-majors courses with high enrollment or high DWF rates. With RPG funding, the Department extended the scope of the SI program to include courses intended for biology majors. Specifically, we targeted three courses: 1) Biol 2107K and 2108K, the two introductory courses taken by majors as second-semester freshmen and first-semester sophomores, respectively, 2) and Biol 3800 (Molecular Cell Biology), our gateway course to upper division major courses. SI leaders (graduate students or advanced

undergraduates) selected for a specific course sat in on classes, prepared enrichment activities related to the lecture material, and made themselves available to students at defined times during the week. Student participation in SI sessions was voluntary, and students could attend as few or as many sessions as they wished. During the Fa06 semester, RPG funding supported SI leaders for biology courses that served 446 students (an additional 545 students were enrolled in SI biology courses supported through other funds, for a total of 991). Not only did the students attending SI help sessions in our biology courses achieve higher grades (2.95 vs. 2.60, $p < 0.001$), but the WDF rate for these students was also significantly lower (11.7% vs. 24.3%, $p < .001$).

During the Fa06 semester, the Department decided to use RPG funds to add Biol 1110 (Anatomy and Physiology) to the list of SI-assisted courses. Biol 1110 is a high enrollment course designed primarily for health sciences students. Due to its subject matter, however, this course also attracts a sizable number of biology majors (predominantly pre-med). Slightly over 50% of the 157 students in Biol 1110 attended SI help sessions. The mean final grade in Biol 1110 for SI attendees (2.95) was so much higher than the mean final grade for non-attendees (1.77) that we propose to maintain SI assistance for this course during the upcoming year.

Sophomore Connections (SCS). The Sophomore Connections at State (SCS) course in biotechnology, Biol 2430, is in its first semester of implementation. The course has served as an important complement to our Biotechnology Scholars program, a comprehensive program for undergraduate research that recently received a four-year, \$1.5M, grant from the Howard Hughes Medical Institute. Many of our current Biotechnology Scholars have expressed a desire to share their enthusiasm for biotechnology with younger undergraduates in the SCS course; in fact, some have already done so by hosting tours of their laboratories. During the upcoming year, we will schedule additional SCS sessions highlighting the success of our Scholars. In particular, we will arrange for Scholars to lead SCS discussions in which they use their own academic and career paths as examples for carving out a successful future as a biologist.

Assessment

We will continue to assess the effectiveness of our SI courses by monitoring SI attendance, soliciting feedback from students enrolled in SI courses, and comparing the academic performance of SI attendees and non-attendees. In addition, we will conduct longitudinal studies of students in both SI and the SCS courses to determine their preparation for upper division work, their graduation rates, and their success in post-graduate education and/or employment. Students will also be surveyed to determine whether their perception of biology, and of themselves as biologists, is affected by their participation in the SI-assisted or the SCS courses.

Administration and Time Line

The SI program will be jointly administered by the PI (Baumstark), Dr. Therese Poole (Biology's Undergraduate Director), and Dr. Peggy Ogden (Coordinator, Cooperative Learning Lab). Dr. Baumstark will coordinate SCS sections.

Su 07. Four SI tutors will be assigned to high enrollment courses. One SCS Biotechnology section (with a projected enrollment of 25 students) will be offered.

Fa 07 and Sp 08. In each semester, seven SI tutors will be assigned to high enrollment biology courses. Two SCS sections/semester will be offered, giving a potential enrollment of up to 125 students during FY08 (100 per academic year + 25 per summer session).

BUDGET

Supplemental Instruction

1. GLA/GTA/SAs for Biol 2107K (five @ \$2000 each)	\$10,000
2. GLA/GTA/SAs for Biol 2108K (five @ \$2000 each)	\$10,000
3. GLA/GTA/SAs for Biol 3800 (five @ \$2000 each)	\$10,000
4. GLA/GTA/SAs for Biol 1110 (three @ \$2000 each)	<u>\$ 6,000</u>
	\$36,000

Justification: 1-3. SI leaders (either graduate students or advanced undergraduate Student Assistants) will be assigned to two sections of each course in the academic year, and one section during the summer, giving a total of five SI leader positions per year for each course. 4. One SI leader will be paired each semester with an instructor from Biol 1110, a high-enrollment anatomy/physiology course taken by pre-medical students and others interested in the health science, for a total of three SI leader positions over the three-semester period.

Sophomore Connections

GLA/GTAs (five appointments @ \$2500 each)	\$12,500
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Justification: Two GLA/GTAs are requested for each academic semester and one for the summer semester

Evaluation

GLA/GTA (\$500/semester x 3 semesters)	\$ 1,500
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Justification: The GLA/GTA will collect and process data for assessment purposes.

Budget Summary

Supplemental Instruction	\$36,000
Sophomore Connections	\$12,500
Assessment	<u>\$ 1,500</u>

TOTAL: \$50,000

All funding is requested for FY08; salaries of graduate students are to be paid monthly; student assistants will be paid bi-weekly. Each appointment will be for a single semester, with the possibility of renewal.

- Su07: Four SI leaders; one SC instructor.
- Fa07: Seven SI leaders; two SC instructors.
- Sp08: Seven SI leaders; two SC instructors.

Subsequent years: Allotment of funds in subsequent years will depend on the results of the assessment process. With the SI-assisted courses, funds will be redirected as necessary to those courses where the improvement of retention rates is most pronounced. The ultimate goal is to provide SI tutors for students in all sections of courses where they are found to be effective. If the SC course in biotechnology has a significant impact on retention, faculty in other 2000-level courses will be encouraged to redesign their classes around the SCS model.

BIRPG

Interim Progress-Toward-Goals Report

RPG Proposal Title: Improving Retention Rates of Sophomore Biology Majors

Department: Biology

Principal Investigator: Barbara Baumstark

Date: March 1, 2007

The Department of Biology is constantly seeking new ways to enrich the educational environment for its undergraduates in ways that enhance learning and improve retention rates. The RPG grant awarded to the Department of Biology (2006-2007) was used to support two initiatives, both of which are designed to provide sophomores with the skills and resources to matriculate to the upper division level.

1. Supplemental Instruction (SI).

Six graduate students/semester were supported with RPG funds as “SI leaders.” Each SI leader is paired with a professor teaching a biology course with a high enrollment and/or a high WDF rate. At the beginning of the semester, SI leaders receive training in techniques designed to enhance student learning. During the rest of the semester, they attend their designated course, and make themselves available at biweekly help sessions to assist students who are having difficulty with the course material.

In the 2005-2006 academic year, the Department of Biology was part of a small pilot project utilizing SI for high enrollment courses. Funding through the RPG allowed the Department to expand the SI program significantly, and to include courses offered specifically for biology majors. During the Fall semester of 2006, biology courses taking part in the SI program served 991 undergraduates, 446 of whom were taking courses funded directly through the RPG*. During the current (Sp07) semester, an additional 1050 students are enrolled in courses assisted by an SI leader.

Assessment. In each of the courses paired with an SI leader, participation by the undergraduates in SI help sessions is voluntary. For purposes of assessment, students who attended at least two SI sessions were scored as SI attendees while those who attended one or no sessions were scored as non-attendees. Comparison of final grades for Fa06 reveals that SI attendees performed significantly better than non-attendees in the SI courses. The average SI biology course gpa for SI attendees (N = 297) was 2.95, while that of the non-attendees (N = 608) was 2.60 (significant at $p < .001$). The DFW rate of the SI attendees (11.7%) was also significantly lower ($p < .001$) than that of non-attendees (24.3%).

*An additional 64 students were enrolled in a course assigned to an SI graduate student who withdrew from the program about midway through the semester. This course was not included in the assessment analysis.

2. New Curriculum Development.

Biol 2430, a new Sophomore Connections at State (SCS) course focused on biotechnology, was developed during the Fa06 semester. Two sections of this course are currently being offered in the Sp07 semester. Students participating in the course learn of the many exciting opportunities in the biological sciences that have been brought about through advances in biotechnology, and the concurrent ethical problems and controversies that have accompanied these advances. They also receive academic and career advisement, and learn about biotechnology-related research projects at GSU that are available to undergraduates.

Assessment. Enrollment in the Sp07 semester currently totals 9-10 students per section. Although this is less than the maximum that could have been accommodated by the two sections (24/section), it has facilitated interactions between students and instructor, providing us with continual feedback on the course's effectiveness in portraying the excitement and opportunities available in biotechnology. Additional sections are scheduled for the summer semester, with the long-term goal of offering three 24-student sections per term. Biol 2430 complements our newly developed "Biotechnology and Society" program, a GSU initiative funded by the Howard Hughes Medical Institute Division of Undergraduate Education (HHMI #52005875; \$1.5M; 2006-2010). Based on informal responses from students currently enrolled in Biol 2430, we predict that this course will ultimately serve as an important recruitment tool for attracting new undergraduates to our HHMI biotechnology program.