

**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.

DIRECTIONS:

1. Complete cover sheet
2. Attach 2 page proposal summary
3. Attach 1 page budget
4. Submit your proposal electronically to your college office for approval. College offices will submit recommended college proposals to the Provost office **no later than June 23, 2006 for FY'07 funding.**

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Collaborators (other departments, if any):

Biology; other departments with Pre-Med majors

Title of Your Proposal Improving Retention and Success for Chemistry, Biology and Pre-Med Majors Entering Freshman Chemistry (Chem 1211K and 1212K) Sequence

Theme of Your Proposal (Support for students; Fostering connections; Enhancing advisement;

Other innovations): Use of placement exam, non-lab basic Chemistry course, tutorials to improve Retention and success; remove backlog of students who cannot register in Fall term

College rating (approved; not approved) APPROVED

Improving Retention and Success for Chemistry, Biology and Pre-Med Majors Entering Freshman Chemistry (Chem 1211K and 1212K) Sequence

Summary of Project: Students will be required to pass a chemistry high school equivalency placement exam before taking General Chemistry I (Chem 1211K, Science/Pre-med majors). The major goal is to improve the success rate in Chem 1211K to keep a large cohort of the best prepared students on track to graduate in a timely manner. Student background and preparation will be screened by use of a nationally accepted placement exam. Students who score at random or below (*vide infra*) on the placement exam will be given advisement before being placed in a preparation course, with peer-led tutorial support, that must be passed before advancing to Chem 1211K the next term. We expect the combination of a placement exam, advisement and a preparation course to have an immediate positive effect by opening up at least 20% of the Fall seats to prepared students (see below) and lead to an overall higher success rate for Pre-Meds.

Over the last several years, the increased quality of admitted Freshmen has resulted in large increases in science and pre-med majors in several departments including Chemistry and especially Biology. Many of these students want to take Chem 1211K in the Fall. Several years ago, the Provost generously provided funds to build desks for two additional sections of Chem 1211K for the Fall using all the available remaining space.. The capacity of the Fall 1211K course was increased from 384 to a maximum of 480 students. This improved the situation for a while, but continued growth has taken place such that the maximum capacity is still short of the current Fall demand. For example, the Biology major entering Freshman class alone has increased to approximately 500. Since an estimated 800 science and pre-med majors all need to start Chem 1211K (Freshman Chemistry) in the Fall, course capacity and success rate have become major issues leading to bottlenecks, student frustration, and lowered retention rates. Students who cannot register for Fall end up taking the course either in the Spring or Summer, essentially falling up to one year behind on the graduation date.

We have carried out an analysis of what is needed to improve the student outcome for this sequence. We have found that at least an above random score on the placement exam (California Diagnostic Exam used to measure H.S. level knowledge with nationally accepted norms) or an AP Advanced Chemistry score of 2 are necessary to pass. Thus, the student who enters 1211K would have at least the *minimum* background for success and retention. Students also lack knowledge of the difficulties and approaches required to be successful as Pre-Med focused majors. Specific early advisement and interactions with faculty Pre-Med advisors and successful peers are needed. With better prepared students, one would expect a substantial reduction in the current Fall DFW rate from ~33% to around 20%. Note: out of the last 1446 students over five semesters, 453 received DFW's (31% rate). Since Freshman chemistry is a prerequisite for Biology courses, a reduction of the DFW rate would directly aid the Biology success rate since more of the best students would be ready to take the Biology sequences in the next semester. Ultimately this would increase the four-year through six-year graduation rates. In addition use of this exam would allow most of the prepared students to take 1211K in the Fall, removing much of the backlog and frustration. It would also lead to greater efficiency in these courses, increasing the available seats because students would not need to repeat as often.

The Department had added a peer-led tutorial course (Chem 1201) to support Chem 1211K in an effort to reduce the DFW rate. This effort did greatly improve the DFW rate but

with increasing class size seems to have hit a limit of reducing the overall rate to around 33%. Individual sections have had rates as high as 42%. The Department gave the diagnostic placement exam (H.S. equivalency) the first day of Fall term several years ago and was shocked to find that at least 20% of that term's total 1211K enrolled students scored random (0%) or below. Interestingly, any student who scored on scale had a reasonable chance of passing 1211K. Some of the random score (0%) students that term were convinced to drop back to Chem 1050 (no lab) to make up the background problems. Of the remaining ill-prepared students who chose to remain in 1211K, almost all were part of the DFW outcome. Of the ~30 students who dropped back to Chem 1050, approximately 20 (67%) were able to pass that course and then take 1211K. This last Fall, we again gave the placement exam the first day. The random (0%) and below rate was still at least 20% of the class with some sections as high as ~25%! This time we could not convince any of these ill-prepared students to drop back. Advisement is needed at this point. Sadly, the course DFW rate remained ~33%.

The students who score random or less on the placement exam must be given a path toward success. Normally, they could register for Chem 1151K, which does not require a high school chemistry background, but space is also a problem in that course. After advisement by a faculty Pre-Med advisor, these students will be placed in Chem 1050 (no lab and therefore no space limitations) with small added peer-led tutorial classes (Chem 1202) for additional support. A faculty Pre-Med advisor and successful peers (recruited from the GSU American Medical Students Association) will meet regularly with this group of students as well as those in Chem 1211K to help the students understand the approaches needed to be successful in a Pre-Med focused major. In Chem 1050, we can and will instill the skills necessary to be successful in Chem 1211K. For each term, we propose adding special sections of Chem 1050 with added peer-led tutorials to prepare (salvage) these students. Students who successfully complete Chem 1050 will then be able to register for 1211K the next (following) term. Thus, we should be able to get many of these students back on track after only one semester. Based on our limited trial, up to two-thirds of these students may be saved but we suspect that we may only be able to salvage half of this group. This is still a substantial improvement over the current situation in which essentially none of these students continue!

Evaluation of Process: If properly instituted, the DFW rate in Chem 1211K will be used as a measure of the success rate of the first part of the program. We expect an immediate impact of a decrease of the DFW rate from ~33% to around 20-24%. This is a reasonable expectation since only an above random score on the placement exam is required. Thus, many of the students will still have weaker backgrounds than would be ideal. If higher cutoffs were to be used (~10%tile or higher), more students would be dropped back to Chem 1050 and lower DFW rates in Chem 1211K could be achieved. This type of adjustment could be made after one or two cycles in the process. Interactions with successful peer mentors will be monitored by examination of the grade distribution. An increase in honor grades vs. C's will be judged as successful.

A second evaluation will be carried out on the number of ill-prepared/poor background students who pass Chem 1050 and then subsequently pass Chem 1211K. It is expected that roughly 75-80% of the total will pass Chem 1050. Furthermore, we expect a roughly 70% pass rate on these students in Chem 1211K vs. the current rate of ~0%.

Budget Tied to Goals

A. Costs Associated with Giving the Placement Exam

Estimated Number of Students Who Need to Take Placement Exam	Proctors Needed
Fall 600-800	5 x 5 sessions 20 = \$1,000
Spring 150-250	4 x 2 sessions 8 = 160
Summer 50-120	3 x 2 sessions 6 = 100
Total 800-1170	Total Proctor Costs Estimated \$1,260
Grading of exams/student notification	SA Costs \$ 500
	Subtotal \$1,760

Exam sessions will be given in 576 Kell (48 max.) and/or 218 NSC (75 max.); at least 5 times for Fall and twice other terms

Note: Department will support by providing supplies (Scantrons, pencils and exam copies) to administer the placement exams.

B. Costs Associated with Preparation Courses and Supporting Tutorials

Estimated Number of Students Who Fail* Placement Exam	Min. Required GTA and SA Support	
	Chem 1050	Tutorials
Fall 100-120	3 @ \$2900 = \$8,700	4 @ \$500 = \$2,000
Spring 45-55	2 @ \$2900 = 5,800	2 @ \$500 = 1,000
Summer 25-35	1 @ \$2900 = 2,900	1 @ \$500 = 500
Total	GTA = \$17,400	SA = \$3,500
	Subtotal \$20,900	

* random or below score

C. Costs Associated with Advisement for Chem 1211K and Chem 1050

GTA support for a Pre-Med faculty advisor (Fall, Spring)	2 @ \$2900 = \$ 5,800
SA support for Pre-Med upper level peer mentors (various majors; Biology, etc.; recruited from GSU American Medical Students Association)	Fall 12 @ \$500 = \$ 6,000
	Spring 6 @ \$500 = 3,000
	Summer 3 @ \$500 = 1,500
	Subtotal = \$16,300

Total estimated cost	\$38,960
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