Provost's Learning Innovations Grant for Faculty
Request for Full Proposal
2007-2008

Please hand-deliver your completed grant proposal (4 pages, plus attachments),
the original plus 12 copies, to:
Susan DeWoody, 1530 Wallace (5)
by 4:30 p.m.
No hand written proposals will be accepted.
Notification of awards will be made by Friday, April 13, 2007.

Project Title: Implementing a Workshop Format for Introduction to Biology I, II and III

Applicant(s):

<table>
<thead>
<tr>
<th>Name</th>
<th>Telephone</th>
<th>Dept.</th>
<th>College</th>
<th>COS</th>
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<tbody>
<tr>
<td>Harvey Pough</td>
<td>5-2070</td>
<td>Biological Sciences</td>
<td>COS</td>
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<tr>
<td>Dina Newman</td>
<td>5-4482</td>
<td>Biological Sciences</td>
<td>COS</td>
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<tr>
<td>Kate Wright</td>
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<td>Biological Sciences</td>
<td>COS</td>
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Request for Full Proposal Requirements

1. Title and summary of proposed project.
Implementing a Workshop Format for Introduction to Biology I, II, and III.
We will change the introductory course for biology majors from its current didactic lecture/laboratory format to an active-learning workshop/assembly format beginning in 2007-2008.
We request funds for two purposes:
   a) Partial summer salaries for two faculty members who will develop the active-learning components on which the workshop presentation is based.
   b) Compensation for students who will test the active-learning components to be sure they work as planned.

2. Targeted learners or population (include cluster, departments, year level, number of learners impacted).
The targeted learners are the 140+ first year students who take the Introduction to Biology sequence (1001-251/252/253) each year. These students all major in biology or biology-related disciplines (biotechnology, bioinformatics, or environmental science). Five to ten deaf and HOH students take the course each year.

3. Is this for a current course or new course?
This proposal will support the conversion of a course that is currently taught in the traditional lecture-lab format to an innovative workshop format.

4. Anticipated impact on teaching and/or learning. 5. How will your project impact student success (i.e., retention)? 6a. How you will measure the impact?
Because the anticipated impacts on teaching, learning and retention and the evaluation of our success in achieving those impacts are closely integrated, we are presenting the information requested in items 4, 5, and 6a in the following table.

<table>
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<tr>
<th>1. Expected impact</th>
<th>2. Evaluation strategy</th>
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<tr>
<td>Increase learning and retention of course content</td>
<td>Document number of students receiving grades of D, W and F.</td>
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<td>Increase class attendance</td>
<td>Attendance will be recorded at each workshop session by use of the “clicker” (Personal Response System).</td>
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<td>Increase success of deaf and HOH students.</td>
<td>Compare grades, retention, and proportion of deaf and HOH students who become involved in undergraduate research before and after implementation of workshop format.</td>
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<tr>
<td>Increase participation of biology students in undergraduate research opportunities</td>
<td>Document involvement of biology students in research projects at RIT and research-oriented co-ops/internships at other institutions.</td>
</tr>
<tr>
<td>Increase participation of first year biology students in the undergraduate research community at RIT (i.e. RIT-sponsored seminars and poster sessions)</td>
<td>Document the number of first year students attending weekly department and college-wide seminars, poster sessions and independent study opportunities.</td>
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<td>Motivation of students to be self-directed learners and to acquire more knowledge than could be expected by a “traditional” lecture-based approach to the subject of biology</td>
<td>Gather information, in the form of written surveys, from biology department faculty, commenting on the preparedness and knowledge base of students as they participate in advanced biology courses at RIT.</td>
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Increase enthusiasm for first year students for their major and their department as a whole. The students will complete periodic survey and evaluation form.

6. b) How you will report your findings?
We are planning the following methods of making the results of this project available to an audience beyond the RIT campus:
1. National meetings and conferences.
   • Our initial plans have already been presented at a conference on *Improving Biology Education: Theory and Practice* held in Chicago in March, 2007, and the organizers of the conference have asked us to present a progress report at next year’s conference.
   • HP is a member of the National Association of Biology Teachers and of the Association for Biology Laboratory Education. Both organizations have annual meetings and publications featuring presentations of innovative approaches to teaching biology, and we plan to present progress reports in both venues.
2. Internet.
   • We are planning to create a webpage where our materials will be posted. It will include a description of the course and our philosophy, modules available for download, and a feedback section for others to send us comments and exchange ideas. This method will allow our work to be disseminated to other college-level biology instructors for use in their courses.
3. Publication
   • Prentice Hall has expressed interest in providing assistance in developing materials for biology lecture-tutorials with the ultimate intention of publication in their lecture-tutorial series (Adams et al. 2005). (See Appendix 2.)

6. c) What you will share about your project in a faculty forum?
We are developing active learning modules that will present most of the course content that is currently covered in lectures. Our modules are, of course, based on biology but the pedagogic basis for changing students from passive recipients of information to active participants in the process of learning transcends disciplinary boundaries. We are developing and using modules that span the range of educational goals, from conceptual learning through critical inquiry to quantitative skills. The philosophy and mechanics of developing and using active learning modules can be demonstrated in presentations such as those featured each year in FITL.

7. Present a rationale for your project, as it ties to the intent of the grant:
Scope of the project
We are converting a large (>140 students) biology course for majors from its current lecture/lab format to a workshop/assembly format that will use active learning modules (hands-on activities) to present biological concepts, methods, and details.

• At present, students attend three 50-minute lectures and one 3-hour lab section each week. The entire class is present for the lecture, and each lab section has 24 students.
  o In the new format, students will have two 2-hour workshop meetings each week in groups of 24-30 students. These sessions meet in a room that is suitable for both active learning and wet-lab activities or for a combination of both methods in the same class meeting.
  o The new format will have one 2-hour assembly weekly in which all the students participate. This session meets in a lecture room, and will focus on learning activities that work better with large groups, such as analyses of population-level genetic characteristics.

• At present, one faculty member gives nearly all the lectures and the other two faculty members share in teaching the labs.
  o In the new format, all three faculty members will conduct both active learning and wet-lab activities, rotating among the five sections of the course so that no section is identified with a specific instructor.
  • We are alternating instructors to prevent the course from diverging into slightly different versions that
reflect the different biological specialties of the three faculty members.

Novelty of this project and its application to other courses

- An extensive review that included both web-based search engines and personal networking with colleagues through professional organizations and via textbook publishers revealed only one workshop-format course in biology, a non-majors course at the University of Oregon (Stokstad 2001, Udovic et al. 2002). Because that is a non-majors course, its primary goal is general education (“science as inquiry”). Like the Oregon instructors, we must correct the misconceptions about biology that students bring with them and demonstrate that biology is something to do, not just something to learn. However, in addition, our students go on to upper-level lab courses in biology, so we must provide students with the conceptual understanding, factual knowledge base, and laboratory skills that these advanced courses require.

- The faculty members who teach our own non-majors course, General Biology, have proposed changing that course to a workshop format following the model of active learning that we have established in Introduction to Biology.

- Keith Whittington, from the Department of Information Technology (GCCIS College) has implemented an “Active learning” format in his programming course at RIT. In a one-quarter study, 75% of programming students enrolled in his section (“Active learners”) achieved a final grade of A/B compared to 59% of the “Traditional learners”. More importantly, only 8% of “Active learners” received a grade of D/F or W compared to the 28% of the “Traditional learners” (Whittington 2005). Our goal is to achieve similar results and to bring this successful educational tool to another course at RIT.

- Physics courses at RIT have been presented in a workshop format for several years, and we have been consulting with faculty colleagues from Physics about elements of pedagogy that transcend differences in disciplines.

Major tasks for this project

The new format presents both logistic and pedagogic challenges.

- Because the faculty members will rotate among the sections, we must coordinate their presentations to assure that each individual covers the same information using the same terminology and the same examples to ensure that the learning experience is the same for the students in every section.

- We must develop active-learning modules that present information that is currently presented in didactic lectures. We have made a substantial start in this direction in the past three years—we have about 20 active learning modules completed and we have implemented an effective peer learning element using clickers—but for the workshop format we will need about 40 more active-learning modules!

- The magnitude of these tasks far exceeds what can be done during the academic year; indeed, we anticipate that at least two (probably three) summers of preparation will be needed to complete the transition to the new format. Our goal is to use this summer in preparation to launch the workshop format during spring quarter of 2008 with the intention of converting the fall and winter quarters of the course in the next two years. The faculty members will prepare drafts of modules, the students will test them, and the faculty and students together will make changes to address difficulties that become apparent.

Credentials of the participating faculty

Harvey Pough has been teaching since 1969 and has developed new courses and new degree programs at Cornell University and Arizona State University. He has been teaching Introduction to Biology at RIT since 2004-2005 and, in collaboration with Dina Newman and Kate Wright, has implemented a new approach to laboratory projects, about 20 active-learning modules, and an effective application of clickers to peer learning.
Dina Newman has been teaching at RIT since the fall quarter of 2003, and Introduction to Biology laboratory sections since winter 2004. She is a Research Assistant Professor who currently holds an NIH grant that supports 80% FTE for research activities; with her remaining time she chooses to assist in the development of Introduction to Biology. She primarily designed one of the five laboratory projects and one of the lecture-based active learning modules, plus has contributed to continuing development of the course for the past two years.

Kate Wright has been teaching at RIT since winter quarter of 2003. She began her career at RIT as an adjunct faculty and was hired as a faculty lecturer this past September (2006). She has taught and been involved in the following courses since 2003: General Biology, Molecular Biology, Cell Physiology, Tissue Culture and Introduction to Biology.

8. Provide a timetable of the development of the project.
Overview: We will change to the workshop in steps, beginning with the spring quarter of the 2007-2008 AY. Depending on the success of that transition, we will change the winter quarter or both the fall and winter quarters to the workshop format in 2008-2009.

This project
• Summer 2007
  o Develop all of the active learning modules that will be needed to teach the course in a workshop format in spring 2008.
  o Devise a method of coordinating workshop presentations by the three faculty members to ensure that they all present the same information using the same terminology and the same examples.
  o Develop initial active learning modules that can be inserted into the lab portion of the fall and winter quarters (to enrich and extend the current content and test methods of working with active learning modules in class periods longer than 50 minutes).
  o Develop additional active learning modules for the lecture portion of the fall and winter quarter courses.
  o Develop the periodic surveys and evaluations that students will complete to help us assess our success with the workshop format.
• Spring 2008
  o Implement new workshop format and new modules. Drs. Pough, Newman and Wright will teach the course, rotating through sections as described above.
  o Evaluate success and make changes as needed.
A renewal application planned for 2008.
• Summer 2008
  o Develop all of the active learning modules that will be needed to teach the course in a workshop format in winter (or fall and winter) of 2008-2009.
  o If the fall quarter is not converted to workshop format in 2008-2009, develop additional active learning modules for this part of the course.
A potential renewal application planned for 2009 if the conversion has not been completed.
• Summer 2009
  o Develop all of the active learning modules that will be needed to teach the entire course in a workshop format in 2009-2010.

Literature Cited