Provost’s Learning Innovations Grant for Faculty
Request for Full Proposal
2005-2006

Please hand-deliver your completed grant proposal (4 pages, plus attachments),
the original plus 15 copies, to:
Susan DeWoody, 1530 Wallace (5)
by 4:30 p.m.
Monday, March 14, 2005.
No hand written proposals will be accepted.
Notification of awards will be made by Friday, April 8, 2005.

Project Title: Integrating Geographic Information Systems (GIS) into RIT’s Curriculum

Applicant(s):

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Integrating Geographic Information Systems (GIS) into RIT's Curriculum

Project Summary:

The US government estimates that over 85% of all data has a spatial component. Yet most of us have a limited understanding of how our environment, our activities, and our lives are influenced by the features of our surroundings. We lack spatial awareness. Our goal in this project is to cultivate and enhance spatial analysis capabilities throughout the institute through the use of Geographic Information Systems (GIS).

A GIS is a specialized collection of mapping, imaging, and database software; geospatial data; and computer hardware that allows the user to import, display, analyze, manage, and export spatial and temporal datasets, images, and maps for a wide variety of analyses. GIS is an integrative and interdisciplinary technology, in that it can help promote teaching and research collaborations between colleges and academic programs. Knowing how to use a GIS is becoming an increasingly important skill in a variety of disciplines and careers. By improving spatial and temporal analysis capabilities of faculty and students and promoting interdisciplinary collaboration between colleges, GIS can play an important role in problem-based learning strategies. This grant will allow GIS proficient faculty and student research assistants to teach interested faculty (we envision 6-12) about GIS technology and assist them in developing GIS projects and teaching modules for new and existing courses. These teaching modules and projects will in turn expose a greater number of students to the capabilities of a GIS and types of spatial analyses available to them through the technology.

This project is also viewed as a critical step in the development of a GIS minor and possibly a GIS certificate program. A GIS steering committee, chaired by CASCI director Guy Johnson and made up of representatives from COS, COLA, CAST, NTID, GCCIS, and RIT's FMS, is actively working on developing an interdisciplinary GIS minor, with five courses currently being taught or in development. This group has already succeeded in convincing the deans of the represented colleges to contribute to the purchase of a University site license for ESRI's ArcGIS, the industry standard GIS software. The GIS steering committee envisions that the projects and teaching modules developed by the interested faculty through this grant will eventually be developed into additional courses that could expand the breadth of this developing minor.

Who are the Targeted Learners:

GIS is interdisciplinary technology, with applications suitable for departments or research programs from every college on campus at all levels. Students and faculty currently using, exploring, or interested in learning about GIS include those from environmental science, environmental management, civil engineering technology, archeology, business, public policy, criminal justice, economics, history, sociology, chemistry, biology, statistics, imaging science, and computer science. Administrators and staff could similarly benefit, as demonstrated by FMS's interest in GIS. If maps or locations are useful or critical to a discipline, then GIS will be a valuable teaching and research tool.

Number of Students Who Will be Affected

We conservatively estimate the number of students affected by this project to range from 120-250, assuming 20 students per faculty project. This could easily go higher, however, if a
participating faculty member used the developed project or teaching module in multiple classes, labs, or over multiple quarters. This year, Korfmacher alone exposed over 50 students to GIS analyses through his courses, supervised lab exercises, and guest lectures.

**Anticipated Impact on Teaching and/or Learning**

GIS software can have a steep learning curve, which is often cited as a reason for not using the technology. Our intention is to work closely with the interested faculty to develop realistic and manageable, yet engaging, relevant, and challenging applications. Korfmacher, Younker, and the three student research assistants will 1) train interested faculty in the use of the software and work with them to develop projects and teaching modules, 2) help the faculty create application specific databases from existing GIS data and from data collected by the individual faculty members or their classes, and 3) assist the faculty in developing analyses, maps, and exercises that the faculty can then use in their existing (or new) courses. Expected output from these summer projects may range from basic mapping products for a particular area or event for use in an existing lecture (at a minimum) to the development of hands-on student or class lab exercises or research projects and the accompanying databases, map examples, and course handouts (ideal). The student research assistants will also serve as beta testers for the exercises, helping the faculty work out the logistics of the assignments and pointing out potential difficulties that students using the materials might encounter.

By working closely with the interested faculty, the PIs and their student research assistants will also demonstrate how GIS can be used in problem-based learning and expose the participating faculty to the wealth of existing data and case studies currently available for use with a GIS. There are many sources of GIS data, most of them free. US Census maps and their extensive demographic and socioeconomic databases are available from the US Census website (free). Monroe County and the City of Rochester have compiled extensive local GIS databases, useful to many, if not all, departments and colleges (Monroe County is a GIS powerhouse in NY). The New York State GIS Clearinghouse (NYSGIS) and the Cornell University Geographic Information Repository (CUGIR) are also sources of a wide range of free GIS data for all of New York State. These data include high resolution aerial photography (up to 1 foot resolution), elevation data, and many cultural, political, and environmental variables. All these data sources are accessible over the web. The US Geological Survey serves as the primary GIS clearinghouse for the country. And ESRI, the industry leader in GIS software, provides extensive tutorial databases and case studies containing data from throughout the world. We suspect many RIT faculty are not aware of these mainly free and valuable resources and the potential they hold for enhancing problem solving curriculum.

**How Will Your Project Impact Student Success**

Knowing how to think spatially and knowing how to use a GIS are extremely marketable skills in many disciplines. Recent graduates from the environmental science program, for example, have cited GIS as a necessary requirement for their job requirement. Students from majors such as environmental management, public policy, criminal justice, philosophy, imaging science, and biology have recently taken Korfmacher’s GIS courses because of GIS’s applications to their fields.

We also believe that GIS will foster more interdisciplinary projects between faculty and students, which will help RIT develop more opportunities for problem based learning. Allowing students to work as “consultants” on a project provides them with valuable training in problem solving. Because of its integrative potential, GIS can play a leading role in this type of curriculum.
This project will also assist in the creation of an interdisciplinary GIS minor. Because we are already seeing faculty and student interest in learning about and using GIS from a variety of disciplines, we see the need for expanding the types of GIS courses offered from the various departments, some being discipline specific and others truly interdisciplinary. A minor would allow a student to develop a strong spatial analysis background and learn how to use a large number of GIS analysis tools.

**How Will You Measure the Impact, Report Your Findings, and Share Your Project**

The procedure will be evaluated in two ways. In the short term, we will collect comprehensive faculty feedback on the summer development component to ascertain whether or not the new course modules were developed successfully and were ready to be incorporated into existing courses. We will also collect a separate student evaluation form from the students who take the courses, following their experiences with the GIS module or application. Based on this feedback, we will work with the faculty to improve the existing courses if needed, or make changes in the approach we use in working with the faculty to develop GIS proficiency. In the long term, we will also evaluate the success of students who have had this training in obtaining co-ops and employment. We firmly believe that students who understand this technology and can apply it to solving real-world problems will be more competitive in the global marketplace. GIS proficiency was cited by two employers as one of the determining factors in their decision to hire two of our recent Environmental Science graduates. In this regard, we will work with RIT’s Office of Cooperative Education and Career Services to gather the data. Our data will also be used to write a major grant proposal to organizations, such as the National Science Foundation or the Mellon Foundation, that are dedicated to the development and dissemination of cutting-edge technology and multidisciplinary pedagogy. Our long-range goal is that RIT will one day be recognized internationally for its GIS programs.

We currently have a list of five faculty interested in working with us this summer. To recruit additional faculty, Korfmacher plans to present a GIS overview presentation at the 2005 RIT Faculty Institute on Teaching and Learning (FITL). Results of the project would be presented at the 2006 FITL. In addition, RIT hosts the annual GIS/SIG conference, which showcases GIS innovations in this region. There is usually an education session, and we would submit a paper to this conference. Korfmacher also presents regularly at the national ESRI Educators Users Conference and this would be an ideal topic for that forum. Closer to home, we would also consider hosting a faculty soapbox forum at the Idea Factory.

**Present a Rationale for Your Project, as it Ties to the Intent of the Grant (A&I)**

RIT already has GIS proficiency, but it is focused primarily within environmental science and a few other departments and programs. We feel it is an underutilized technology, limited by a steep learning curve, but with potential applications within most of the colleges, departments, and programs on campus. The strategy behind this proposal addresses the steepness of the technology’s learning curve. We believe our approach to be innovative, because it extends well beyond the more classical “teach-the-teacher” in a one-size-fits-all workshop approach. Instead, we propose to work with the faculty individually to incorporate GIS technology into their courses in a customized fashion, and to provide knowledgeable student research assistants who will assist them and beta test the exercises we develop jointly to ensure that the course objectives are met. Our ultimate goal is that these efforts spawn additional GIS courses across the university, which, eventually, will lead to the creation of an interdisciplinary GIS minor.
This goal is shared by the GIS steering committee, and this grant proposal is an outcome of the deliberations of this committee, which believes that GIS will become a powerful analysis tool for many RIT faculty and students, that incorporating GIS into a variety of courses will enhance student learning and success, and that the implementation of GIS pedagogy in a multidisciplinary fashion will add a distinctive feature to the RIT “brand.” GIS is currently being taught and used in ecological courses and research in COS and COLA and has been a key component of RIT’s Service Learning partnership with Sector 10. RIT’s Facilities Management is also interested in using GIS to help manage, store, and display spatial data related to the support systems of the college. Importantly, GIS capabilities will be a critical component of any RIT effort in the realm of homeland security.

Related to the steering committee’s efforts, RIT recently purchased a university site license for ArcGIS 9, the industry standard GIS software from ESRI, for $15,000, which we propose to count as matching funds for this project. This allows RIT to install ArcGIS on every computer on campus, providing ready access to this technology. The license and maintenance costs are currently being shared across five colleges (COS, CAST, COLA, NTID, and COE) and there is great interest in developing courses and projects that will use the software in these colleges to justify the license.

There is strong evidence to suggest that GIS could and should play a key role in RIT’s curriculum, based on the interests of the students who have taken Korfmacher’s GIS courses, the marketability of our students who understand technology, and the pedagogical, research, and project interests of administrators, faculty and staff who have already approached us about GIS. Faculty who already recognize the importance/potential of this technology and who have expressed a strong interest in adopting GIS into their current courses include Ann Howard from COLA (Sustainable Communities and Great Lakes), Elizabeth Hane from COS (Conservation Ecology), Maureen Valentine and Todd Dunn from CAST (CET Surveying), Josh Goldowitz from CAST (Environmental Geology and Introduction to Hydrology) and Robert Rothman from COS (Galapagos Seminar). In addition, we have had extensive conversations with members of the faculty of other colleges, including Jim Myers and Fritz Yambrach (CAST), and James Fugate (NTID). They are excited about the possibility of using GIS in their courses, assuming that expert training and advising is made available to them.

We currently offer GIS courses, taught by Korfmacher (Applications of GIS and Ecological and Environmental Applications of GIS), to a small number of students each year. He will be expanding his two courses into three (new course proposal submitted for Raster Applications of GIS). Korfmacher has used GIS for 15 years and over this time has worked with faculty and students from a variety of disciplines on research projects and developing course materials. Younker has used GIS in his archeology research and is a primary GIS contact for his Tribe’s GIS initiatives in Oregon. He is developing a new course that will incorporate GIS (GIS Applications in Urban and Community Studies).

**Timetable**
- Identify additional interested faculty, hire student research assistants, present at 2005 FITL conference (May-June)
- Work with faculty to develop individual GIS projects and teaching modules (June-August)
- Implement GIS projects and teaching modules and perform evaluations (Sept.-May)
- Present at 2006 GIS/SIG Meeting and faculty forum at the Idea Factory (April)
- Present project results at 2006 RIT FITL (June)
- Present at ESRI 2006 Educators Users Conference (July)