Successful Recruitment Strategies: General Education, Accessibility, Awareness, and Outreach

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December, 2009

National Geospatial Technology Center of Excellence - Funded in part by the National Science Foundation DUE ATE #0801893

Table of Contents

EXECUTIVE SUMMARY

One of the biggest concerns of any newly established geospatial program (or, well established program for that matter) is student recruitment. We all understand the importance of and need for geospatial education, but translating that understanding to a successful recruitment plan is often very difficult.

The National GeoTech Center has found that there are a variety of proven techniques and strategies to recruit students into geospatial classes and programs. These strategies can be broken into two major categories: 1) outreach to K-12 students; and 2) outreach to College Students. For this paper, we will primarily focus on recruitment into geospatial coursework from the existing pool of college students taking general studies coursework. This document offers some effective recruitment strategies. These strategies (either in part or as a whole) have proven successful for National Center partners, and include: 1) creating a standalone introductory geospatial course that fulfills institution general education requirement(s) (for degree and/or transfer); 2) Offering courses that are the most accessible to the greatest number of students; and 3) Promoting geospatial technology awareness (including K-14 outreach activities). The paper also highlights effective techniques to recruit women and underserved populations into geospatial courses (and programs).

Part 1: General Education (GE) Course as a Major Recruitment Tool

In his 1988 book *The Meaning of General Education: The Emergence of a Curriculum Paradigm*, Gary Miller defines general education as "…the conscience of higher education, the part of a university that is concerned most directly with the individual student's responsibility to society at large." (Miller, 1988). Ultimately, general education coursework is an essential and necessary component of any undergraduate course load. General education requirements are generally divided into two parts: 1) a set of common courses required for all students regardless of major; and 2) a set of shared competencies and experiences to be embedded in existing coursework and curricula (http://newsinfo.iu.edu/news/page/normal/4154.html).

The core curriculum for most college students includes a large amount of general education coursework. At the community college level, most students will spend two years completing the majority of their general education coursework before transferring on to a 4-year institution. It therefore makes sense to offer a geospatial course that fulfills general education requirements. By doing so, geospatial curriculum will inevitably be taken by a large and diverse cohort of students seeking to fulfill their GE required course load. Once students are enrolled in the course, it is up to the faculty to create a dynamic, relevant, and interesting curriculum that will retain students and encourage them to continue with geospatial studies.

At the community college level there are generally two major types of General Education requirements: 1) GE courses that fulfill requirements for graduation with an Associate's degree; or 2) GE courses that transfer to a 4-year institution as part of a Baccalaureate degree. Faculty at the community college should always seek to create coursework that fulfills both the Associate and the Baccalaureate GE requirements (if possible).

At Southwestern College (SWC) the Geographic Information Science and Spatial Reasoning class fulfills GE requirements for both an Associate's degree at Southwestern College and a Baccalaureate degree at San Diego State University (SDSU). For an Associate's degree, the class fulfills the following graduation requirements: 1) Computer Literacy; and 2) Language and Analytical Thinking Group 2: Analytical Thinking. For transfer to SDSU, the course fulfills the graduation requirement in the "Mathematics and Quantitative Reasoning" category. SWC's introductory course has a class maximum of 30 students; the course has never been below that enrollment level (the section is offered each semester).

At Gainesville State College (GSC), the Introduction to Geographic Information Science course is an approved elective in the math/science/technology area of the University System of Georgia Core Curriculum. GSC's intro course is so popular that they offer numerous sections to over 90 students per semester.

At Atlantic Cape Community College in New Jersey, the Introduction to Geographic Information Systems course has been approved as a GE course in "Technology". Most Associate degrees in New Jersey require credits from the "Mathematics-Science-Technology" block.

At Penn State, the Mapping Our Changing World course is part of the University's Social Science GE curriculum.

At SDSU, the Geographic Information Science and Spatial Reasoning class fulfills the Baccalaureate graduation requirement in the category of "Mathematics and Quantitative Reasoning". SDSUs course traditional serves 30 students per semester.

At Bismarck State College in North Dakota, both the Fundamentals of GIS and GIS Applications courses are part on the math/technology general education course list of classes.

Multiple-Program Adoption of Geospatial Coursework

"Geospatial" is not limited to Earth Science coursework. Topics such as criminology, environmental science, business, economics, anthropology, political science, and biology (to name a few) all include geospatial components. Therefore, geospatial technologies are truly an enabling set of concepts and techniques that are used across a variety of spatial disciplines. In order to increase enrollment in introductory (and sometimes intermediate and advanced) geospatial coursework, a good strategy for recruitment is to seek adoption of geospatial courses as a requirement in a variety of programs. At Southwestern College, for example, the introductory course Geographic Information Science and Spatial Analysis is part of the core curriculum for an Associate's degree in Geography, as well as the core curriculum for a Certificate and/or Associates degree in the Community, Economic, and Urban Development program.

How to Attain GE Status

Each academic institution will have its own methods of course approval. What is generally universal, however, is that all proposed courses will go through a Curriculum Committee (generally comprised of both faculty and administrators), which will approve a course and its categorization. Each school's requirements in this area will vary.

At Southwestern College, the introductory GIS class was approved via our Curriculum Committee. The committee also approved our request for GE status as noted above for the Associates Degree. In order to have the course transfer to SDSU and fulfill their GE requirement in "Mathematics and Quantitative Reasoning" for a Baccalaureate degree, the necessary step was to have course-to-course articulation. This is standard procedure at community colleges in California; generally, GE transfer courses must have course-to-course articulation with the same course at the 4-year institution. Dr. Ming Tsou at SDSU wrote the GE course for SDSU. The Articulation Officer at Southwestern College then contacted the Articulation Officer at SDSU to certify the course-to-course articulation (verifying the same course prerequisites and core content).

In California, a major effort is presently underway between the community college and CSU (California State University) systems to create a state-wide general education geospatial course at the undergraduate level. If this happens, then your community college introductory geospatial course (if you are in California) will articulate to any CSU campus.

Part 2: Create Accessible and Timely Courses

Distance Education, Fast-Track, and Overlap

An introductory course in geospatial technology (such as a GIS class) serves multiple purposes for multiple student audiences. As a general education course, for example, the introductory course serves the traditional, continuing student population. As the first class in a geospatial program (certificate or degree) however, the introductory course serves not only traditional students seeking a certificate or degree, but also working professionals and returning students. In addition, for many working professionals, their goal will be to acquire the certificate, degree, or general training as efficiently and expeditiously as possible (i.e. fast-track, short session courses that are 8-weeks in length, for example, rather than 16-weeks in length). Therefore, in order to serve the varied student groups and attract as many students as possible, course accessibility is extraordinarily important.

Geospatial technology tools are prevalent, free, and easily accessible via the Internet (see Part 3 below). In addition, more robust GIS tools (such as ESRI ArcGIS) can be accessed in a computer lab at the institution (if the institution has an ESRI ArcGIS license). The software can also be installed on the students home computer for free; many ArcGIS textbooks, such as "GIS Tutorial" and "Getting to Know ArcGIS" come with fully functional 180-day ArcGIS licenses that can be installed on one's home computer. The software can also be accessed at home if the institution has set up 'virtual' (remote desktop) access through a campus server. Open source GIS products such as ESRI ArcExplorer, MyWorldGIS, UDIG, and GRASS can be easily obtained for low cost or even free. With this said, in addition to a traditional face-to-face setting, both online and hybrid (part online and part face-to-face) deliveries of an introductory GIS class can be done successfully without any loss of rigor or content.

Of the National GeoTech partners, Southwestern College, Lake Land College, Gainesville State College, Central Piedmont Community College, Kentucky Community Technical College, Central New Mexico Community College, Penn State, and San Diego State all offer successful online and/or hybrid coursework. In addition, all of the partners offer short-session, fast-track courses and/or Saturday classes. If you want to maximize your course numbers, remember, providing access to the most stakeholders is critically important.

Another technique to maintain a program is called course overlap. At Southwestern College, traditionally our introductory geospatial course does quite well (the course is fast-track, online, and fulfills general education requirements). As is common at most institutions, the number of students continuing on to the higher level geospatial coursework drops off. At some institutions, this drop off is significant, leading to course cancellation of the higher level classes. At Southwestern College, courses are overlapped; that is, the three core courses of the GIS program are taught together. All three courses contribute to enrollment numbers, therefore, even if we only have five students continuing through the program, we will always be able to offer the high level classes (as the introductory course section will generally have 30 students). In addition, because all core courses are offered every semester, students are able to complete the GIS program in one academic year, making our program very appealing to working

professionals who are seeking GIS training for their present job (or seeking GIS training for a career transition).

Part 3: Geospatial Technology Awareness: Reaching Large Audiences

The majority of students entering the community college are either 'undeclared' in their major or are classified as 'general studies' majors. For example, at Southwestern College in San Diego, CA, more than 4000 students take our general education Earth Science coursework annually. Of these 4000 students, more than 90% of them are 'undeclared' majors. By embedding a geospatial technology component into all Earth Science courses (including geography, geology, and oceanography) we introduce geospatial technologies to a very large and captive audience. Of course, geospatial is not limited to Earth Science coursework (as noted earlier, spatially oriented topics such as criminology, environmental science, business, economics, anthropology, political science, and biology, to name a few, all include geospatial components. At Southwestern College, we have embedded geospatial curriculum into a majority of these general education courses and are therefore introducing geospatial technology to thousands and thousands of students annually, regardless of their major, educational history, or cultural background.

Geospatial Technology Awareness Tools, Modules, and Curriculum

In recent years, geospatial technologies have advanced significantly. Millions of people use popular web-based GIS applications, such as GoogleEarth, MapQuest, and Google Map application hybrids (known as mashups). Emergency response to natural disasters and concerns over homeland security has created a strong need for the general public to understand and use geospatial technology. With the expanded use of Internet- based geographic information science and the World Wide Web, people can access geospatial information and maps in near real-time. Many major satellite imagery companies (such as Digital Globe and GeoEye) and GIS vendors (such as ESRI and Google) offer free satellite images and low-cost to free GIS data and maps. The general public can vividly see the changes caused by natural disasters or other unique events via remotely sensed imagery and maps. Yet, ironically, even with geospatial technology being so prevalent, most users are unaware of what 'geospatial' is (and, we continue to see a lack of geospatial literacy within our graduating students). Raising the awareness of geospatial technologies by embedding learning modules into present curriculum increases the enrollment in community college geospatial programs (ultimately, by making students aware of the science) and encourages more students to choose geospatial technology careers. As an example of curriculum that has been successfully embedded into diverse courses at Southwestern College ranging from political science to political science to physical geography to economics, visit http://www.swccd.edu/~gis/page72.html. The curriculum in the modules uses free and easily accessible tools such as Google Earth and the National Atlas.

How to Spread the Modules Across the Campus

One of the best and proven methods (as determined by National GeoTech Center partners) to distribute learning modules across the campus is through summer workshops (generally one week in length) and mid-semester Staff Development workshops. At the summer workshops, faculty from a variety of disciplines can be trained to use geospatial learning modules (including higher-end products such as ESRI ArcGIS). These types of workshops often require stipend money to pay participating faculty for their time. For many of us, this might not be reasonable (especially those of us without grant money or large departmental budgets). Another method, therefore, and perhaps much more feasible, is to offer periodic Staff Development Workshops to be conducted during the course of the academic year. Most collegiate faculty are required to complete a certain number of "flex" or, Staff Development Hours, per year. Therefore, offering a one to two hour Staff Development Workshop that pays faculty flex time (or "hurdle") is generally very successful. These workshops can be conducted face-to-face, online, or in a hybrid format, making them accessible to most faculty members. The best thing for you to do is speak to your Staff Development Office and set up a series of workshops. Then, globally advertise your workshop(s) and/or directly contact faculty whom you think would be interested in attending. The new learning modules can then be incorporated into their curriculum either as project(s) or extra credit assignment(s).

Advertising and Curriculum: Serving Women and Underserved Populations

Especially for women and minority students, contextual learning is paramount (see, for example http://www.iwitts.com/html/016armstrong.pdf). In general, academic studies (such as the Armstrong study) indicate that women and minority students are more interested in science if the total context of the problem is considered. The total context includes technical, social, environmental and political aspects to the problem (not just isolated technical tasks). So then, if women and minority students are to be enthused about a geospatial class, any learning module and any primary coursework must include curriculum that addresses not just the technical side of "geospatial" but also how geospatial technologies can contribute to solving 'big picture' problems; such as questions of sustainability, or international economic development, or disease pandemics, or global climate change (for example). Penn State has developed a wonderful short recruitment video, highlighting the contextual relevance of geospatial technologies. Please visit the Geospatial Revolution Project at: http://geospatialrevolution.psu.edu/index.html.

The National Institute for Women in Trades, Technology, and Science

The following five recruitment strategies for the recruitment of women and underserved populations into science fields are taken direction from the National Institute for Women in Trades, Technology, and Science website (see http://www.iwitts.com/html/recruiting_strategies.html). (NOTE: Most academic institutions have a Women's Resource Center. The Center will be complete with ready-

made strategies to help you successfully recruit women into your program. Be sure to seek all available resources):

Step One: Send a Strong Message that You Want Women and Minority Students in Your Classes

You may not know it, but you are already sending a message to underserved groups of students if your class is not diverse in gender and demographic. Any student walking past a class where no one looks like them will think to themselves "I don't belong here." So, what kinds of alternative messages can you send? When advertising your class or program, remember to include the following information: 1) We want all students in our class; 2) You can do this, other students just like you have; 3) Our classes can lead to high wage careers; 4) Employers want smart and able people in these jobs: period;5) Geospatial Technology is a field that helps to solve big problems that are critical and relevant.

Step Two: Proactively Recruit Women/Girls and Minority Students to Your Classes

To overcome the negative messages many women, girls, and underserved students receive about pursuing a technology career, you will need to proactively recruit them to your classes. Here are some strategies that have been successful for others. See which ones will work best for you.

- Develop a publicity flyer for your class that features role models whom are diverse (past students if you have them) and put it up around the school in the computer lab, drivers education class, locker rooms, cafeteria, etc. Give a bunch to counselors and to instructors in pipeline courses. For free clip art and photos of women in technology and trade occupations, see the IWITTS website at http://www.iwitts.com/html/clipart.htm.
- Issue personal invitations to women, girls, and minority students to attend. Let them know that you think they'd be a good candidate for your class. If they are in high school, suggest that they bring a friend. If you don't personally know of any students to invite, ask the business education instructor if you can present to their class or ask to present for a few minutes in classes such as introduction to computers or in homerooms. Also, reach out to the counselors and admissions staff in your school that can identify candidates for your classes.

Step Three: Hold a Technology Career Orientation

An effective way to connect women and girls with female role models in technology occupations and give them an opportunity to participate in hands-on labs is by hosting one large event, such as a career orientation, fair or expo. These events accomplish a lot in a short period of time, and save resources by limiting setup of speakers and hands-on labs to a single event. Your role models (who can be difficult to

locate since they still comprise a small percentage of the workforce), can convey their insights to large numbers of students at one time.

The WomenTech Project features career expos to increase the enrollment of women in technology programs and to raise career awareness for female participants. Evaluations of the WomenTech Expos indicate that participants considered enrolling in technology programs after attending a single event. An ancillary benefit of the expos was that instructors were excited by the enthusiasm of participants and requested that the expo be continued annually.

Step Four: Use the Web to Recruit Women and Underserved Students to your Classes

Creating a Women in Technology section of your school's Web site and an Underserved Students in Technology section is a 24/7 recruitment tool to both showcase successful students from technology programs in your school and provide role models in occupational areas in where women and minority students are underrepresented. These also provide a place where your students use technology while connecting with each other.

Successful underserved students emerging from your technology programs are the key to selling them to the next generation of students. Featuring successful graduates as role models on your Website sends a message that you support women and minority students in pursuing these fields of study and that others can also succeed. And, it gives your role models recognition for trailblazing in a field where they may not otherwise receive much encouragement.

Step Five: Get Press Coverage for all your Recruitment Activities

Almost every school has its own internal communication vehicles, so whether it's your school's daily newspaper, monthly magazine, or a third-class mailing to students, don't overlook these opportunities as a way to recruit students to your technology programs.

Reporters like to write stories about women working in traditionally male occupations. IWITTS has done many projects around the country, and without fail educational institutions, job training programs and employers have all been able to get free press coverage about their projects to recruit and retain women in these fields. If you follow this strategy, there's no need to waste limited dollars on an expensive ad with only a few lines of content.

For more information and examples of recruitment best practices, please see the Best Practices CD (http://www.womentechstore.com/edpedcd35.html) which features over 100 pages of strategies for increasing and retaining females in your technology programs and actual examples of how the WomenTech Project implemented these strategies in the community college demonstration sites.

Proven Practices for Recruiting Women to STEM Careers in ATE Programs

Proven Practices for Recruiting Women to STEM Careers in ATE Programs was a three year special project funded by the National Science Foundation (NSF Grant DUE # 0501971). The purpose of this study, which began September 1, 2005 and continued through August 31, 2008, was to investigate the ways in which educational institutions (that were awarded ATE grants), recruit women into their science, technology, engineering and mathematics (STEM) programs. Ultimately, the intended outcome of the project is to develop a comprehensive package of proven practices that others can use in their program design to improve STEM recruiting strategies for women and girls.

The project has three overarching goals.

1. To advance knowledge on career theories, gender and ethnicity as they apply to understanding women's academic and STEM career choices.

2. To describe and document practices in use by centers and projects funded by NSF's Advanced Technology Education (ATE) Program for recruiting female students (representing various ethnicities and racial groups).

3. To combine information from literature reviews and other gender research projects with collected data, and pull together a constellation of pragmatic practices for recruitment of females into educational programs that would prepare women to enter STEM careers. Results from the project's data collection activities will be compared with published findings on the effectiveness of recruitment strategies in attracting women into STEM fields. These results will then be reviewed in relationship to existing theoretical literature on career development and on the effects of gender and ethnicity on career choice. The final outcome of the project will be a set of pragmatic practices that educational institutions can use to enhance their enrollment of women in STEM programs, and suggestions on ways to tailor existing recruitment strategies and/or develop new ones that appeal to women.

The full project report is scheduled to be released sometime in early 2010 (see http://www.stemrecruiting.org). Preliminary results of the study indicate the most effective recruitment activities include: flyers, newsletters, career fairs, campus tours, visits to high schools, brochures, videos, activities for parents, tutoring, financial aid, mentoring, socially oriented activities (e.g. workshops, camps, & clubs). Of these recruitment activities, the ones with the most impact tend to be mentoring, socially oriented activities (including hands-on summer camps or workshops, cohort/group activities), and provision of resources (financial aid). Other fairly effective activities include marketing activities (visits to high schools, science fairs), public awareness (competitions, videos), institutional integration of programs/courses, and dual enrollment programs.

Model Institutions for Excellence (MIE) Program

The Model Institutions for Excellence (MIE) Program funded by the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) has developed a body of work over the past 11 years demonstrating successful strategies for recruiting underrepresented minority students to science and engineering fields and supporting their successful completion of science degrees (see http://www.nsf.gov/news/news_summ.jsp?cntn_id=110124). In addition to the five steps noted above, among the keys to the MIE program's success include bridging the transition from high school to college through training of elementary, middle school and high school teachers and offering summer orientation programs. Then, once students are in college, mentoring programs, tutoring, opportunities for group study, career counseling, and advice on financial aid options help students stay engaged in science and engineering studies. What cannot be minimized is the role of faculty (or alumni) in the mentoring and tutoring of students. Proactive mentoring and tutoring may lead to higher retention rates (for students across the board). In addition, in successful MIE programs, students receive information on trends in Science Technology Engineering and Mathematics (STEM) fields, and job placement services. Meanwhile, faculty themselves receive staff development (to keep appraised of industry changes), curricula are aligned with accepted content standards, and courses are developed that are relevant (i.e., contextual) both to the marketplace and to the students in general. To download the complete "Model Institutions for Excellence 2007 National Report", please visit: http://www.ihep.org/assets/files/publications/m-r/ModelSuccessMIE.pdf.

Southwestern College and Del Mar College are Hispanic Serving Institutions. Gainesville State College and Central Piedmont College serve the HBCU (Historically Black Colleges and Universities). All four partners have used the techniques noted above for the recruitment and retention of women and minority students into geospatial fields; all with high levels of success.

School Website and Academic/Career Counselors

Often the school website is the first introduction students have to your institution. In addition, many (if not all) institutions are starting to go paperless, with all registration and course selection done online. Leveraging this form of recruitment can be successful. Contact your institution’s web-team. See what steps are needed to place an ad for a course/program on the institution’s webpage and on the Class Schedule front page. Of students polled from Southwestern Colleges Fall 2008 introductory GIS class, about 60% of them first became aware of the course offering via the advertisement on the college webpage.

In addition to the college webpage, be sure that your program has a website of its own. This website should be advertised as much as possible within your Division (as well as on the campus website). All National GeoTech Center partners have geospatial program websites which serve as a major recruitment tool. Beyond a program website, San Diego State University sends emails to every incoming freshman advertising their class.

In addition to websites, you must not forget your academic/career counselors. Unfortunately, there is often a disconnect between academic programs and Student Services. National Center partners have found that the most successful geospatial programs are the ones that have the best relationships with Student Services. Academic and career counselors are often the first representative of the college to speak to a student. Counselors need to know about your classes and your program. Contact the counselors via email to describe your class and program, or, better still, ask to attend a counselor staff meeting in order to give a quick workshop and demonstration of geospatial tools and technologies. When offering a staff development workshop, be sure to invite both academic and career counselors to attend. It is important that they are in the 'know'.

Additional Methods of Outreach

In an effort to promote geospatial awareness, members of the National GeoTech Center have used national events, such as GIS Day and Geography Awareness Week, to raise GST awareness and reach diverse audiences. For example, the Department of Geography at SDSU, during the 2005 GIS Day, created a series of GIS-related lectures and a career forum to introduce geospatial technology to *non*-geography majored students (http://geoinfo.sdsu.edu/hightech/Kim/Page1c.htm). Del Mar College hosts a large annual GIS Day in which 400 to 500 K-12 students participate. Del Mar also participates in multiple Career Days at area high schools. Central Piedmont Community College works with home schools, 4H, and Boy Scouts. They also have a free College Day on campus that attracts large crowds. Southwestern College advertises its geospatial program (and geospatial careers) every year at the on-campus Careers Day, Science Opportunity Day, Major's Day events, and Women's Technical Career Conference. Southwestern also presents its geospatial program at the colleges' annual conference with faculty from the local high school district.

Here is a list of additional methods of outreach that have proven to be successful for National Center partners:

- Post a job board and highlight student success stories (this should also be placed on your program website).
- Give short presentations on GST careers and courses in classes such as geography, geology, biology, environmental science, engineering, computer science, political science, social science, and business.
- Perform class visits to regional secondary schools.
- Sponsor GIS day events for secondary schools.
- Conduct Open House activities during orientation or registration.
- Align courses and curriculum with 4-year programs to foster articulation.
- Develop dual enrollment and dual credit initiatives with high schools.

Summary

So, what are the keys to recruitment success? First and foremost, make your introductory geospatial course a general education class. The more general education categories the course fulfills, the greater the likelihood the class will fill itself. Next, the course must be accessible. Geospatial and online (or hybrid) go well together. An online, general education introductory geospatial course tends to do extremely well. Also, be sure that you are being as proactive as possible with your geospatial awareness efforts. Take the learning module link within this document and distribute them freely to your colleagues. The more students who are aware of the power, potential, and prowess of geospatial technologies across a variety of disciplines, the more likely they will want to take geospatial coursework. Finally, use the tips noted herein to proactively recruit women and traditionally underserved students into your programs.

For further information and resources, please visit http://www.geotechcenter.org.

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