A Geologic Pathway to Success, Tania-Maria Anders, Professional Assistant Professor, Geology Program Coordinator, Texas A&M University Corpus Christi, Department of Physical and Environmental Sciences

Among the geoscience community, geology is increasingly referred to as "the science of the 21st century". The general public isn't as aware of the importance of geology and career options in the field. It is my goal to develop a "geologic path" that extends from elementary schools to a geoscience degree from a University. This will aid in increasing awareness for our science and its careers as well as preparing students for a career in the geosciences. My focus for this workshop will be on the transition from a two-year college to a four-year program. Both existing as well as new tools will be utilized overall.

Step 1: Develop or use existing resources to increase appreciation for the geosciences at grade-school level. Locally, several resources are available through the Corpus Christi Geological Society for elementary and middle schools (maps in schools, bones in schools, boulders in schools, South Texas Ice Age DVD) and the Jackson School of Geosciences Friends and Alumni Network for high schools ("Earth is Calling" DVD and brochures). This is where recruiting and education efforts begin. Benefit: these resources already exist and can be utilized easily (nationally).

Step 2: Collaboration between local Community College and University. Existing resource: Texas A&M University Corpus Christi and Del Mar College have a consortium agreement, which allows students to take courses at these institutions concurrently and transfer course credits easily. Future efforts need to focus on increased personal interaction (e.g. joint field trips) to break down barriers and encourage students to pursue a four-year degree. Faculty at both institutions need to jointly develop strategies for smoothing the transition from College to University. I hope to develop these with my colleague(s) from Del Mar college at the workshop.

Step 3: Develop strong ties with the industry. Ideally, every geology major should be offered an opportunity for an internship to experience the field first hand. Two important benefits to the students include gaining experience and helping them in the decision-making process regarding specialization for their future. I have instituted a geology advisory board for our geology program whose members include people from the local industry as well as other educational institutions. I hope to gain valuable input at the workshop as to how to move forward from here and how to best create valuable collaborations.

In summary, I see many effective tools in the geoscience community that have been developed to help increase awareness of our science and careers within. Our challenge is to use these resources more effectively and to establish successful and durable collaborations among institutions as well as the workforce.

The AGU, its Fall Meeting, and a niche for two-year colleges

Pranoti M. Asher, American Geophysical Union

The American Geophysical Union is a not-for-profit society of Earth and space scientists with more than 61,000 members in 148 countries. Established in 1919 and headquartered in Washington, D.C., AGU advances the Earth and space sciences through its scholarly publications, meetings, and outreach programs.

AGU's education programs capitalize on the intrinsic allure of the Earth and space sciences, and their fundamental relevance to daily life. Through education- and career-focused events at the annual AGU meeting (called Fall Meeting), professional development workshops for teachers, special programs for pre-college and post-secondary students, awards for science educators, and printed and electronic resources, AGU offers an array of opportunities that expose students, teachers, and life-long learners to the freshest, most accurate scientific knowledge and the excitement of discovery. We use a multi-staged approach designed to make Earth and space science fun and interesting for a variety of audiences and age ranges. We also work to provide awards, recognition, networking, and mentoring opportunities for college students and early career scientists, in addition to programming that works to strengthen the skills of instructors at all education levels. By reaching out to such broad groups, we are helping to ensure a robust geoscience talent pool that also reflects our nation's diverse population.

Outreach in the area of primary or secondary education area plays a significant role in developing and nurturing the next generation of Earth and space scientists. Several strategies will help AGU meet its overarching goal related to workforce or talent pool development (see AGU's strategic plan at: http://www.agu.org/about/strategic_plan.shtml). Particular emphasis is being placed on building partnerships and collaborations that will increase the effectiveness of AGU's outreach efforts related to education.

An example of AGU's innovative approach to STEM programming is our work to support two-year colleges, which play a vitally important role in the higher education system in the U.S.—including attracting a large population of students from underrepresented groups. Unfortunately, many STEM students from these institutions do not finish their degrees or succeed in transferring to and completing programs at four-year colleges. Our new effort, Unique Research Experiences for two-year College faculty And Students (URECAS), is intended to support and foster the educational careers of two-year college students in the Earth and space sciences, and ultimately create pathways for them to enter the workforce.

A planning workshop for this new initiative concerning two-year college student research was held at the AGU headquarters in Washington, DC from July 11-13, 2012. This workshop brought

together faculty from two-year colleges, four-year colleges and universities, and representatives from professional societies and federal organizations to learn more about how to support two-year college faculty and students engaged in Earth and space science research and to discuss the development of a program to strengthen the role of two-year college Earth and space science students in the future workforce. This work will help AGU identify barriers to participation for both students and faculty, which will then allow us to begin defining a path toward implementation of a full program in the near future.

The specific goals of this workshop were to:

- Identify and develop a community of two-year college Earth and space science faculty who are engaged in research experiences and programs with their students.
- Determine model programs and best practices within the community that make these research experiences and programs successful for faculty and students.
- Identify barriers to successful faculty and student research experiences and programs.
- Connect faculty who want to engage in research experiences with their students to national and local resources that can assist them in being successful in these endeavors.
- Highlight and develop collaborations that will allow two-year college students and faculty to attend and present their research at the AGU Fall Meeting.

Look for more information about URECAS and future programs at http://education.agu.org/

AGU galvanizes a community of Earth and space scientists that collaboratively advances and communicates science and its power to ensure a sustainable future. Fostering excellence in Earth and space science education plays a critical role in achieving that vision.

Working Towards a Geoscience Degree

Ivy Tech Community College, Indiana's only 2-year college, is still transitioning from a technical college to an all-encompassing fully accredited community college. Within the science department we have 4 full-time faculty members who cover the basic science disciplines (biology, chemistry, physics, and earth science) through introductory laboratory classes. Currently, Ivy Tech offers only 100-level science courses and does not offer a specific associate's degree in any science discipline (science is housed within general studies). Also, Ivy Tech does not offer a true geology course, but offers the broader earth science course as one of the science elective options available to students. However, Ivy Tech is rapidly expanding and the science program is at the forefront of course development. One of several goals I hope to achieve by attending this conference is to network with other two-year geoscience faculty members to determine what other classes are being offered, geoscience program objectives, and what improvements can be made to better serve future science and geoscience majors.

Earth Science is an introductory laboratory-based course offered at Ivy Tech. Within that course we cover a wide-range of topics including physical geology, historical geology, oceanography, and meteorology. The objectives of the course are pre-determined by our central office; however, I have attempted to incorporate place-based inquiry, hands-on experiences, community partnerships, and literature review into my curriculum to improve the geoscience experience of my students. Ivy Tech Community College is located in the urban center of Indianapolis, so many of my classroom discussions and laboratory activities center around urban living (such as soil and groundwater contamination), providing students with a place-based connection to earth science. Students learn about community issues (such as drought conditions within the local watershed) that have direct applicability to their own lives. I incorporate resources from the local professional organizations (such as the US Geological Survey – Indiana Water Science Center) and hope to collaborate with them on future projects. Students are also required to complete bi-semester literature reviews of current professional geoscience research.

Ivy Tech currently has two exciting geoscience initiatives in development. First, Ivy Tech recently started an honor's college, of which, earth science will be the first science course offered within their rigorous curriculum. As developer, I hope to incorporate semester-long geoscience research projects, data collection, and field trips into our earth science honor's curriculum. Ivy Tech's second initiative is to develop an entirely field-based earth science course where students spend the summer semester traveling across the American west experiencing earth science first-hand. I am eager to learn about and discuss other college's attempts to improve geoscience education and geoscience career preparation during this workshop.

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Hands-on Field Experience and Career Training in Oceanography

One of the biggest challenges we face as community college instructors is preparing our students for careers; this is especially true in geoscience fields because people are generally not familiar with the discipline and they do not typically know anyone who is a geoscientist. Further, community colleges do not typically have research programs where students can gain exposure to geoscience research and/or field applications.

Through collaborations with 4-year University and research faculty, I have found a way to provide some experiences to prepare my students for geoscience careers and to showcase some examples of people working in the geosciences. As an example, I have been working on a collaborative project with, Dr. Matthew Schwartz, a colleague at a regional 4-year university. This project is a unique education effort that links my community college students to oceanographic research through the development of a new course in Aquatic Environmental Science and has been funded by the National Science Foundation. The course is centered around several field trips to a local estuary, during which students learn to use field instruments to measure water quality variables (temperature, salinity, dissolved oxygen, and nutrients). The capstone of each field trip is a floating classroom during which students and instructors discuss summary results, test field hypotheses, and compare results with historical data collected during previous field trips. A unique aspect of the course is that Schwartz and one of his graduate students help me lead the field trips so that my students get to develop a relationship with them that builds throughout the semester. This connection of community college students with scientists working in the field promotes better understanding of research and provides a "snapshot" of a potential career path in the geosciences. Additionally, this program provides a very unique experience for my students to gain some hands-on experience and career training (i.e., field and analytical techniques, graphing and data interpretation, etc.) that is difficult to provide at a community college.

A hurdle specific to community colleges is the disconnect between faculty experience and student outlooks. More specifically, a geoscience faculty member at a two year college typically has a Masters or PhD degree from a research institution and has predominantly been exposed to geoscience careers that require advanced degrees. On the contrary, their students may not be able to see beyond a two-year degree program. Such a dichotomy makes it difficult for faculty to counsel their students and offer insight into possible geoscience careers. This problem may be especially true in my own field of Oceanography, where typically even Bachelor-level degree programs are scarce. I have been considering hosting a *Geoscience Career Day* to introduce students to potential careers in the geosciences. The keystone of this event would be a panel of people working in the geosciences with a range of education levels. Each panel member could discuss a typical day in his/her job, education background, typical salary range, etc. and students would have an opportunity to ask further questions.

Utilizing field experiences to create student interest in the geosciences.

Kelly Bringhurst, Dixie State College of Utah

Dixie State College of Utah is located in Southern Utah at the border of the Colorado Plateau and the Basin and Range. We utilize this setting to give geologic field experiences to approximately 600 students a year. Field trips are required in all geology courses and range from local 6-hour trips to 5-day trips to the National Parks. While most students do not major in the geosciences, it is our hope that a field experience will help them appreciate geoscience concepts and entice some students to consider the geosciences for a career. In order to expand upon the importance of these field experiences, we recently developed the Colorado Plateau Field Research Institute.

The Colorado Plateau Field Institute has a mission to facilitate practical field experiences and research opportunities on the Colorado Plateau and in the Basin and Range. The target audience includes: undergraduate science students, K-12 teachers, science education majors at DSC, graduate students from other institutions; and working professionals. Institute programs will also involve an international audience, both to provide broad access to the learning opportunities represented in the extraordinary outcrops and eco-zones of the region and to engage North American faculty and students in research with international peer groups.

The focus on K-12 teachers and Dixie College science education majors is of primary importance. Having teachers well versed and excited about the geosciences is the best recruiting tool for future majors in this field.

Dixie College has a dual mission both as a Community College and a State 4-year college. While we do not offer a degree in geology, we articulate with the Universities in Utah so that our students can have a seamless transfer to geology programs throughout the state. Annual meetings with geology faculty representing all state supported colleges in Utah are held to provide pathways for communication and articulation. These meeting build trust and we find that our students are always welcomed at the other institutions.

I am looking forward to discussion on career opportunities and placement potential to help advise students towards a career in the geosciences. We are also developing an Environmental Science B.S. degree program with an emphasis on geology and chemistry. Practical skills that students need for environmental monitoring and testing will be an important part of the degree proposal.

Working Toward a Statewide Transfer Agreement for Geology in Colorado

Eleanor Camann
Associate Professor of Geology
Red Rocks Community College

Preparing students for transfer to bachelor's degree programs in geology and related disciplines is one of my primary goals as discipline lead and the only full-time geology faculty member at Red Rocks Community College (RRCC). To that end, I have become heavily involved in curriculum development and revision at the state level in order to strengthen our courses, and have worked with faculty from other institutions to determine course requirements for an AS in Geology degree. I will focus on the latter efforts for this essay.

For the past 3 years, I have been the State Discipline Chair for Geology for the Colorado Community College System (CCCS), which includes 13 colleges and is the state's largest system of higher education. One of the things our group has worked on is reaching consensus on recommended coursework for an AS in Geology. However, the requirements for any specific major have been at the discretion of each institution, and degree transcripts have not designated majors, so the usefulness of this endeavor is debatable. That is changing.

A few years ago, state legislation resulted in the Colorado Commission on Higher Education (CCHE) being required to approve subject-specific statewide transfer articulation agreements. A few disciplines each year have met to work on these agreements, and 12 are already in-place with more in the works. This April, it was geology's turn. Representatives from 2-year and 4-year programs in geology met and were tasked to come up with a curriculum plan for 60 credits of coursework that will: meet CCCS requirements for an AS degree with designation; transfer to a 4-year program in that subject at a public school; put the transfer student at junior status if admitted; and allow the student to graduate with a BS degree with 60 credits or less of additional coursework (i.e. for a total of 120 credits).

I was the Chair of the meeting, and was pleased with how well our group worked together. We came to a fairly quick agreement about what coursework would be necessary to fulfill the above directives. The draft curriculum plan set the following requirements: 21 credits required by the system for Arts & Humanities, History, Social & Behavioral Sciences; Physical and Historical Geology; Calculus I and II; General College Chemistry I and II; Calculus-Based Physics I; and 6 credits of electives, for which we also included a recommendation to take Calculus-Based Physics II. This plan will next be reviewed by faculty and administrators at each public institution in the state before obtaining final approval.

On the downside, the fact that this curriculum plan includes only 2 geology courses and leaves little room for electives might mean that majors will be less-likely to take some of the many other courses we offer in our program. Also, one disadvantage of a blanket statewide transfer agreement as compared to agreements with individual universities is that the requirements for a bachelor's degree in geology vary a lot from school to school. It would have been nice to allow for more electives or include additional geology course requirements for the AS, and with most of the 4-year programs that would have worked. However, leaving out any of the courses we included would have made completion in 60 more hours impossible at a couple of schools that had a greater number of specific course and sequencing requirements.

The major benefits of having a statewide agreement in place are that it will help to insure that our majors are prepared for their 4-year degree and put our graduates on stronger footing at their transfer institution. It will also remove a lot of the uncertainty about what courses to take for both students and advisors, who have limited knowledge about geology BS degree requirements. It might also increase enrollment for some courses. For example, RRCC has more students transferring to the Colorado School of Mines (CSM) than any other school, and has had a transfer agreement with them for many years. Most of their programs either require or recommend Physical Geology, which certainly boosts numbers in that course. On the other hand, Historical Geology is not on that agreement (to my frustration), which has so far kept our enrollment in that course lower and made it necessary for each student who takes the course here to appeal for it to count for the equivalent course if they go to CSM (the credits are guaranteed to transfer, but not for a particular course).

Regardless of some of the potential issues, the advantages of a statewide transfer agreement are clear and I am looking forward to having it in place.

Strategic Advisement for Career and Transfer Success

Amanda Colosimo, Monroe Community College

While Monroe Community College (MCC), in Rochester, NY, has grown significantly in the past decade, it has also seen tremendous faculty turnover, as professors with 30 years tenure have been replaced by less experienced but enthusiastic new faculty. Administration has been largely supportive, frequently funding experimental projects and professional development opportunities for junior faculty members. Thanks to this support, we were able to design an introductory-level field course (varying from 9-12 days) that has been successfully run twice (to the Yellowstone vicinity and the Grand Canyon), as well as securing funding to create a third iteration to the national parks of southern Utah and northern Arizona. Co-teaching the Yellowstone field course was a tremendously successful project and is one my proudest achievements in my 8 years at MCC!

As junior faculty members have grown into their roles as emerging leaders and mentors, a very active co-curricular club has been created and new courses developed. The Geosciences Association has taken field excursions to Acadia, Cuyahoga, Mammoth Caves, Devils Tower, Yellowstone, Grand Teton, and Badlands National Parks and Monuments, as well as studying more local geologic points of interest. This club has led to at least 25-50 students enrolling in 4 YC geology programs throughout the country with great success and has been a way to create a sense of community on a sprawling campus with over 19,000 students!

However, we find ourselves at a point where we need to re-organize and package our offerings more effectively and move slightly away from our role as merely a “service department” to liberal arts and transfer students, as we re-design our own advisement track. We currently teach several 4-credit courses (Physical Geology, Historical Geology, Field Studies in the Geosciences, and Astronomy) and a wide variety of 3-credit courses, but without many geology majors, tracking alumni and their successes at transfer schools is more anecdotal than systematic.

MCC’s current advisement track for students pursuing an A.S. in Geology requires students to take courses that have not been successfully run at MCC since the 1980s (Mineralogy, Petrology, Invertebrate Paleontology, Geomorphology) based on both enrollment and resources. Furthermore, after a departmental review, it became evident that most A.S. programs in the country do not require these courses. We find ourselves in the timely position of needing to revise our advising sequence at a time when career opportunities for geoscientists are expanding.

My personal goals for this conference are three-fold: 1) to identify what strategies departments are employing to attract majors and increase visibility of the geosciences on campuses, 2) to identify what curriculum is most appropriate for students pursuing both A.S. and B.S. degrees (Are they the same? If not, how do they differ?), and 3) to learn how others are collaborating with local government agencies, consulting firms, and industry to establish internships and employment opportunities for 2YC students.

Early Advising and Successful Transfer to Four-Year Degree Programs

Michael L. Cummings
Professor of Geology
Department of Geology
Portland State University

The Department of Geology at Portland State University offers B.S./B.A. in Geology and B.S./B.A in Earth Science. The B.S./B.A. in Geology is the program for students intending to practice as professional geologists. The B.S./B.A. in Earth Science is a supporting degree for other professions such as law, K-12 teaching, urban and regional planning. We offer minor programs in geology, environmental geology, space and planetary science, and computer applications with an emphasis in geosciences. Our undergraduate majors are dominated by transfer students from area community colleges and post baccalaureate students. Post bacc students take prerequisite math and chemistry courses at community colleges to reduce cost.

I am the undergraduate advisor for all undergraduate programs offered by the Department of Geology. Students, in general, do not understand how to navigate through the higher education system, have limited sense of career pathways, and limited understanding of the relation between the curriculum and progress toward degree completion. During advising sessions, I emphasize three anchor points to guide our conversation. The first, largely my responsibility, is to protect the integrity of our degree programs so that the degree they receive is respected. The second is estimating the length of time to degree. The third is exploring ways to contain cost to degree. The last two are student factors and I advise to shortest time and lowest cost. The shortest time is controlled by course work completed before transfer and how this academic preparation aligns with the flow of our degree programs. The lowest cost to degree depends on our ability to effectively utilize education resources in the community. A complicating factor related to our location is developing programs of study that utilize the lower division resources available at Clark College in Vancouver, Washington and the upper division resources at PSU to minimize out of state tuition costs. Cost often outweighs time to degree.

Early advising is critical! One hallmark of the faculty relationships has been identification of geology majors at the community colleges and early advising at the university several quarters before the time of transfer. These often pre-admission advising sessions familiarize students with the degree programs offered by PSU and explore alignment of completed and anticipated course work with the PSU curriculum. We also explore career interests and how minors, curriculum modifications (substitution of up to 8 credits of upper division chemistry, math, physics, biology, or engineering courses for geology courses), senior thesis and/or articulation with the University Honors Program, involvement in faculty research, and getting a job work together. By the end of this session, students have an individually tailored degree map that projects the term of degree completion and have a plan to contain costs. Students are encouraged to take advantage of dual-enrollment agreements between PSU and community colleges. The agreements allow students to take courses concurrently at both institutions and to count the total number of credits toward financial aid requirements. Grades appear on the transcript at both institutions each term. Faculty and administrators from our community college partners and PSU geology faculty meet annually to examine the learning experiences of students and alignment of programs.

Providing Bridges from 2YC to 4YC in the El Paso Region

Diane Doser, Professor, University of Texas at El Paso

For the past ~3 years the University of Texas at El Paso (UTEP) has been working with El Paso Community College (EPCC) to help ease the transition of geoscience and environmental science students between our institutions. We have initiated a number of activities to accomplish this including: articulation of degree programs, review of introductory course content, cross-institution research projects with EPCC students and co-sponsored student research symposiums. One of the most successful activities has been our cross-institutional research projects that involve either individual students working with a UTEP undergraduate/UTEP faculty member team or EPCC classes that join UTEP classes for some aspect of field work or project. The EPCC students gain confidence in their ability to succeed by working with UTEP students and finding out that they are as capable of engaging in and completing research as their 4YC peers. They also have an opportunity to first meet UTEP professors as mentors and professional colleagues rather than in a classroom setting. The research symposium serves as an excellent venue for showcasing their research to the EPCC and UTEP community, as well as interacting with local and out of town professionals who serve as judges for the research presentation. Feedback provided by the judges assists students in refining their presentations for out of town meetings such as a regional GSA or SACNAS conference.

The first students participating in the research program will be graduating from UTEP within the next year. Many involved in the research activities have obtained summer internships in industry or at other academic institutions, some even prior to attending UTEP. Several have received competitive scholarships. The greatest challenges to the research program include finding UTEP faculty who are willing to work with EPCC students and the means to help support the students during their research activities.

More Questions than Answers: Identifying Geoscience Career Opportunities

Cheryl Emerson Resnick, Illinois Central College

Illinois Central College is located along the Illinois River in Peoria, Illinois. We currently serve approximately 12,000 FTE students. Our three full-time faculty teach sections of introductory Earth Science, Physical Geology, and Meteorology. We also teach a two week field course each summer that takes students out west for hands-on learning. The faculty who teach physical geology require multiple field trips to local and regional locations, teaching students basic field observation techniques. Our biggest success in marketing the geoscience program has been the field courses. Students who declare geology as a major often cite the field trips as the reason they're interested in a geoscience career. Those who transfer to four-year institutions enjoy a high success rate. These students often return to tell us they felt more competent in field courses and at field camp because of their exposure to our field-teaching methods. I feel we do a good job generating interest in a geoscience career but we need to widen our knowledge base to answer students' questions about career opportunities.

My goal in attending this workshop is to update our program's ability to help students in three ways: 1) identify current areas for career opportunities in the geosciences, 2) develop alternative activities to give students more exposure to the skills they will need either in employment or as they transfer to four-year programs, and 3) identifying and developing partnerships with local employers to showcase geoscience careers in the community. I am eager to hear from other faculty and industry representatives what career opportunities exist and how best to engage our students' interests in the geosciences.

Education to dispel the misconception that Cape Cod is a big homogenous sandbox

Cape Cod Community College offers an A.A. with matriculation agreements for a seamless transfer to 4 year institutions, a technical A.S. in Environmental Technology, and a selection of environmental certificates. Our educational packages support a diverse group of learners from adult students (15 years and up) with no science background to professional scientists/engineers with years of education and work experience. Our students start with foundation classes that introduce the basics such as groundwater interaction, rock identification, particle size distribution, surface elevation determination, GPS usage, and mapping techniques. Students can complete a series of classes to prepare them for working with geologists, engineers, surveyors, and scientists. Students may elect to participate in honors projects, independent research, and internships. One of the program's objectives is to provide students with an opportunity to acquire the necessary skill set to be successful in a dynamic environmental workforce. A career support office assists with resumes and job opportunities while the transfer officer helps with continuing education.

A program goal is to provide the skill set specifically required by the local employers for these geoscience students. In order to achieve this goal, our program tries to meet with a diverse selection of employers annually at which time a collection of the comments regarding the type of training our students receive is conducted. Unfortunately, this process has not been done in years. Also our enrollment in the geoscience classes is currently low causing some classes to be canceled. Our program needs a review and revitalization to attract and retain new students.

The Cape provides diverse geological stratifications and due to construction plenty of disturbed sites. The campus sits high (100 feet above sea level) on the moraine but the area quickly transitions to sea level. Going South it is mostly a sandbox albeit offering unique challenges for septic, building, and drainage while in the other direction many different layers are found including dense silt and clay. The West Barnstable Brick Company used to procure their clay from this area. Cape Cod's unique and diverse local geology provides the students hands-on labs on the campus. This experiential learning helps dispel the typical misconception that the Cape is a big homogenous sandbox and hopefully prevents a common mistake made by a few contractors. The naive contractor has been surprised when a boulder interferes with the digging of a foundation or a newly installed septic system fails, due to a glacial deposited bolder or clay. The Cape's geological diversity also causes differences in the groundwater interactions that support the cranberry bogs yet challenge hazardous waste remediations.

In conclusion our program's goal is to update the current curriculum with industry standard technology, recruit more students, and provide these students with as many opportunities to meet their career goals as possible. Yet some of the challenges our program faces includes a high rate of staff/faculty turnover, old equipment, staff/faculty without commercial field experience, and student employment opportunities that require travel/relocation. In addition our program aspires to keeping staff/faculty trained in the best available technology so they can teach the future geoscience students.

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VioceThread for On-line Courses

Pre-Workshop Statement
Bob Ford
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I wish I could write a concise, but elaborate statement describing all the wonderful things we are doing to prepare our students to be successful in geoscience degree programs and careers, but I cannot. We are a small to moderate sized school. Most of the students taking our science courses are non-science majors satisfying general education requirements or students trying to get into one of our allied health programs. Given our typical clientele, we have done little or nothing to prepare students to be successful geoscientists. Probably the one area where we have done something is in K - 5 teacher preparation. Students seeking degrees to teach these grades in Maryland are required to take two courses in the geosciences, one in general physical science and the other in earth/space science. In order to maximize outreach to these students, we offer a hybrid version of each course, on-line lecture and face-to-face laboratory. Natasha Cleveland, the lead instructor for both courses, has incorporated *VoiceThread*, an interactive software application, into the on-line component of the courses. The biggest advantage of this software is that it allows the students to see and hear their instructor. It also provides a platform where the students are able to do the same. In many ways it is almost like being in a regular classroom environment. Initial student reaction to *VoiceThread* has been overwhelmingly positive (based on student evaluations). One of its strengths is adding the personal touch to the on-line experience. Students have a greater opportunity to engage the material by having being able to interact with both the instructor and fellow students. Natasha is currently in the process of conducting a formal assessment of *VoiceThread* as a learning tool so I am unable to provide further details as to its effectiveness. The biggest challenge thus far has been getting College support to implement *VoiceThread* in more courses. We currently have a workgroup of faculty from across campus training to incorporate it into their on-line courses.

That said, my main reasons for participating in this workshop is to see what others are doing and bring the best practices back to my campus to make a concerted effort to involve more students in geoscience programs and careers.

Geospatial-Geoscience Connections

Mark Guizlo, Lakeland Community College, Kirtland, Ohio

This is an exciting time for those involved in the geospatial field, with the rapid diffusion of technology and the growing awareness of the power of spatial problem solving across multiple sectors of government and business. Clearly, the geosciences have embraced the use of geospatial tools (Geographic Information Systems (GIS), Global Positioning Systems (GPS), remotely sensed imagery analysis, and the integration of these technologies through visualization and web/mobile platforms).

Having geospatial skills gives students an advantage in terms of career prospects, and students with geospatial and geosciences training should have a bright future. For students in the geosciences at many two year colleges, the lack of geospatial technology training limits their prospects. Two-year colleges face the challenge of providing courses in a field that is both rapidly changing, and is only recently maturing to the point where educators and industry are establishing common curriculum goals and expectations for what it means to integrate geospatial skills into a career in the geosciences.

Three trends are changing this picture and enhance the prospects for two-year colleges to overcome the gap in geospatial skills training: First, mapping and spatial problem solving are becoming more and more ubiquitous in society. This popularization of mapping through mobile apps and web resources helps with awareness of the power of geospatial technology to help people solve problems, and is driving demand for workers with appropriate skills. Second, the 2010 release of the US Department of Labor Geospatial Technology Competency Model (GTCM) represents a major achievement, since the GTCM identifies and categorizes specific competencies, ranging from personal effectiveness and academic competencies, to more specific technical competencies needed by geospatial workers. Third, National Model Curriculum and GTCM tools, which were developed by National GeoTech Center, offer critical resources for educators and students who want to integrate geospatial technology into curriculum and lifelong career development planning.

As an adopter of the GTCM approach, Lakeland Community College created a new Department of Geography and Geospatial Technology in the Fall of 2011, which includes both a geospatial technology program, and traditional general education geography courses (including a new lab course in Physical Geography, which is required in the geospatial major). The geospatial program hosts an Associate of Applied Science degree and a professional certificate in Geospatial Technology. The AAS degree is geared for students interested in pursuing a career as a geospatial professional or technician, while the certificate serves students in fields such as the geosciences, who want to add value to their current program or career trajectory. The majority of students in the certificate program already hold a Bachelor's degree, and half work in the geosciences in some way. Unlike more limited "technical" programs of the past, the GTCM approach results in a robust curriculum that places emphasis on thinking skills and the integration of critical workplace and career-building competencies. For example, students start building their career portfolio in their first semester. This approach is intended to bridge the gap between technical skills and general education, and to help give students options to transfer to a four-year institution in the geosciences or a related field, to pursue a job as a technician, or to use their new geospatial skills to enhance their existing career path.

PRIME - Promoting Research Investigations in the Marine Environment - A program for 2YC students

Jan Hodder, University of Oregon

I am a marine biologist at the University of Oregon's Institute of Marine Biology (OIMB) and the Director of the Center for Ocean Science Education Excellence -Pacific Partnerships (COSEE-PP). The COSEE-PP project has concentrated on providing 2YC faculty and students with professional opportunities to work with ocean scientists and learn about current ocean science research. Our research internship program, Promoting Research Investigations in the Marine Environment – PRIME –brings community college students to four Pacific marine labs for a mentored summer research experience. I am also one of the co-PIs on the SAGE 2YC project.

Providing Career Resources and Opportunities for 2-Year College Students to Bolster the Future Geoscience Workforce

Heather R. Houlton; Workforce Development, Education & Outreach Specialist
American Geosciences Institute (AGI) – Workforce Program

Two-year colleges play a very important role in preparing and recruiting students for programs at four-year institutions. From AGI's Status of the Geoscience Workforce Report (2011), data from 2008 indicate that nearly 50% of students who received a Bachelor's degree attended a community college, and 20% of those students received an Associate's degree. In addition, 36-46% of Master's degree recipients and 16-32% of Doctorates attended community college. The high percentage of students that received a Master's degree after starting their academic pathway at a two-year institution is particularly important for the geosciences because the Master's degree is considered the professional degree in the workforce. This implies that a large portion of our professional geoscientists in business sectors outside of academia attended community colleges. With a total of 1,690 two-year colleges in the U.S. and 285 institutions with geoscience faculty, there is an opportunity to vastly impact the future geoscience workforce.

The American Geosciences Institute has several efforts that support the student-to-professional transition into the geoscience workforce. The first is the development of the GeoConnection Recruitment Packets specifically tailored for the community college audience. These packets were previously designed and distributed to approximately 25 four-year institutions with information about geoscience careers and opportunities. Packets also included 5 free student memberships to participating geoscience professional societies to facilitate student involvement within the professional geoscience community. AGI is currently restructuring and updating the packets to cater toward community college students in order to foster their academic and professional development.

In an effort to help fill the geoscience workforce supply gap, AGI is piloting the Geoscience Careers Roadshow. We will be visiting several two- and four-year institutions to present information about geoscience careers to students. The presentations will demonstrate the breadth of workplaces and professions available to students with geoscience degrees, as well as guide them to the necessary resources in order to start their professional careers. To sustain these efforts, we will train select faculty at each institution to present this information and disseminate resources to subsequent geoscience student cohorts. These presentations will serve as a catalyst for discussion between faculty and students about career opportunities in the geosciences, thus aiding recruitment and retention efforts in our discipline.

Lastly, to further promote geoscience careers, AGI will continue to host multiple Geoscience Careers Student Networking Luncheons at different professional societies' annual meetings. Over the past few years, this event has been hugely successful at connecting and average of 50 professionals from different business sectors outside of academia with over 200 geoscience students from two- and four-year institutions. The Networking Luncheons have taken place at the American Geophysical Union's annual meetings from 2009-2011, as well as for the first time at the Geological Society of America's annual meeting in 2011. They provide great opportunities for geoscientists at all levels of their professional career to practice their networking skills and build their professional portfolio.

AGI is working to integrate two-year college students into these programs to enhance their academic and professional development. We hope to obtain valuable feedback from participants at this workshop in order to refine and improve our efforts to increase the impact we have on community college students.

2YC / 4YC Collaboration to Bring Geospatial Technology to a Rural Region

Tora Johnson, Director of GIS and Instructor of Environmental Studies
University of Maine at Machias/ Washington County Community College

I teach geospatial technology (GST) in two two-year programs shared between the University of Maine at Machias and Washington County Community College, both in beautiful and remote Downeast Maine. The Associate of Science program is administered by WCCC and the certificate program is administered by UMM; all courses are taught by UMM faculty.

Both schools--the two smallest public institutions in Maine--provide important education and workforce development services in the most rural and economically-challenged region of New England. Before we established the GST programs, neither school had the resources to maintain a geospatial technology laboratory or to offer courses consistently. The region's municipalities, agencies and organizations had almost no GST capacity with which to manage critical environmental resources and grapple with economic, public safety, and public health challenges. Several statewide studies had shown a need for more technical training in GST, but no Maine institution offered an associate's degree, and only one in southern Maine offered a certificate. We sought to fill that void with the new programs by building on prior collaborations among the state's public universities with help from a 2008 NSF Advanced Technological Education grant.

We designed the programs specifically to serve Maine's largely rural and suburban workforce. Unlike in more urban areas, Maine's economy is comprised of a large number of small businesses, organizations and municipalities. Consequently, there are very few jobs in Maine for workers who specialize in GST. Instead, the vast majority of workers in Maine are "jacks-of-all-trades" who use GST use it in the context of another career. This was a critical insight for us: it didn't make sense to educate large numbers of specialized workers for non-existent jobs. Therefore, we needed to design a system that would produce a small number of specialist technicians with associate's degrees and a large number of ancillary users with significant GST expertise from courses, certificates or minors.

The content of our courses is shaped by workforce research in Maine and elsewhere, and we offer all courses in either blended, online or short-term intensive formats to provide access to incumbent workers. Through the university's Geographic Information Systems (GIS) Service Center, students engage in real-world class projects, and they are linked with employers via internships. This has the added plus of providing low-cost and no-cost GIS services to area clients, generating demand. Many of these projects and internships lead to work for graduates. Our graduates have been getting hired, even through the economic downturn and often before they are done with the program.

By creating courses that serve multiple audiences, each contributing a small number to the total enrollment, we've been able to create a sustainable model that serves the growing needs of the region without creating competing programs at the two institutions. In fact, the first year the programs were offered in 2009, enrollment in our introductory course was three times that of the previous year when only UMM four-year students were enrolled. We've run the second course in the sequence fully enrolled each year since. Even so, enrollment remains a challenge in our programs, especially in our advanced courses. In spite of the fact that employers are calling for more skilled workers, we struggle to put "butts in seats." We have been able to use funding from service clients to support under-enrolled courses, which is a win-win for the students and the clients, but this may not be a sustainable solution.

Looking to the future, we are collaborating with the state's school laptop program and Esri, Inc., to get more geospatial technology into K12 classrooms and raise awareness. We're also working to better align our curriculum with the National GeoTech Center's Geospatial Technology Competency Model. Finally, we hope to support similar collaboration among the community colleges and universities in the state, but close relationships like the one between WCCC and UMM are apparently pretty rare and tough to build.

I. **Potentiometric Data Collection**
(Water Resources Management)

This project is a Water Resources Technology field work at the Suwannee River Water Management District monitoring stations in the Ichetucknee basin in North Florida.

Objectives:

1. To train and prepare students for water resources monitoring careers for the Ichetucknee basin in North Central Florida.
2. Designed to bring educators and professionals (Engineers) together.

Need and Effectiveness

1. Lack of trained and qualified water resources technicians in North Florida.
2. Importance of water resources in Florida's economy.
3. Challenges facing Florida's Water Resources Management Districts in monitoring water resources with lengthy drought seasons and increasing pollution.

Challenges

1. Bringing professionals and educators to work together in a project.
2. Finding financial and human resources motivated and trained well enough and available to support the project.
3. Incorporating the project within a general education geoscience course of the college curriculum.
4. Finding students interested in geoscience enough to make the project feasible

II. **Septic Tank Installation** (Soil and Environmental Science)

This is another project in association with the Columbia County Health department.

Objectives:

Teach students career skill in septic tank installation, monitoring, and remediation.

Challenges:

This project faces the same challenges as the water resources project.

Author: Mustapha Kane, Ph.D., Professor, Florida Gateway College, Lake City, FL, 32025.

Interview with a scientist

Amber Kumpf, Muskegon Community College

‘Interview with a scientist’

Overarching goal of the activity: help students be more informed about (1) their possible career options and about (2) specific skills they can develop to best prepare themselves for the workforce.

Activity design.

The student will complete three main sections to receive full credit for the activity.

Part 1: design a web page outlining the path to a career they are interested in, citing and summarizing several resources

Part 2: interview a person who works in that field, specifically asking about skills that helped them succeed in their current position

Part 3: supplement their web page with resources/a plan that would help them gain the particular skills mentioned by their interviewee, and/or list of ways the student has already gained some of these skills

How does it support or prepare students for their future degrees or careers?

This activity would help the student focus on the big picture of their career path and making sure their course of action is bringing them closer to their goals. It would also be available to future students to be able to use as a resource.

What are the strengths of its design and the most valuable aspect?

Having a contact in the field that you plan to enter is the most valuable aspect of this activity. This person could become a potential mentor for the student. The contact might be able to provide contacts for internship or other similar opportunities. This may help non-science majors identify where science is important and related to their career path.

What are the challenges of implementation?

Challenges might include: (1) finding a person in the field who is willing/able to respond quickly to the student interview, (2) many students are non-science majors, so implementation as a geology assignment may require investigation into earth science related careers that are not actually within the student’s field of interest.

Some ideas that may help overcome these challenges: (1) provide a structured outline of procedures for the student to follow, pre-approve of concise student interview questions, suggest a 10 minute skype interview or phone calls instead of email only contact, (2) pre-approve or help find earth science related fields/contacts within that field (i.e., if the student wants to be a history teacher – have them interview a geology teacher instead, if the student studies criminal justice – suggest a forensics expert interview, lawyer – an environmental law specialist, etc.).

What is the evidence of its effectiveness?

Untested, I have not yet implemented this activity.

A "Jobs in Geosciences" Speaker Series: Addressing What Geologists Really Do

Lynsey LeMay
Adjunct Geology Instructor
Thomas Nelson Community College

The geology department at Thomas Nelson Community College (TNCC) recently initiated a program to bring geologists employed in a variety of fields to campus. Noted both anecdotally and through survey data collected about perceptions and careers in geosciences, students often have misconceptions about what geologists actually do in their various job functions. To address these misconceptions, the "jobs in geosciences" speaker series was started. This was funded by a small grant from the TNCC Educational Foundation.

To date, the department has hosted four speakers. Each speaker has shared with students their daily responsibilities and the types of research they conduct, but also a bit of their educational background. The first speaker, Dr. Susan Barbour, presented a talk about her work as a mudlogger for Diversified Well Logging, Inc, drilling for natural gas in the Appalachians. Dr. John Galler, an environmental consultant from Tetratech shared many intriguing fieldwork stories. Virginia's state geologist, Dr. David Spears, shared the economic and political impacts involved with accessing wind energy off the Virginia coast. Carroll Ellis, III, a consultant with Dominion Due Diligence Group, shared with students his educational background primarily, including what he learned as he searched for geology related jobs immediately following graduation. Prior to the speakers' lecture, students were invited to meet with the speaker informally where pizza and drinks were provided. The invited speaker then gives a talk followed by a question and answer period. Interested students may stay later to chat further with the speaker.

Students who have participated in these talks have given positive feedback. Many are introduced to non-academic geologists for the first time, and are fascinated by their research stories. Some students have been inspired to research geology job opportunities further, and to look for internships in the immediate future. More formally, students who have attended talks were asked to participate in a post-talk survey about their perceptions of geology careers. These post-talk surveys indicate that it is possible to see a positive shift in students' perceptions, with data showing an increase in perceived prestige of geoscience related career fields.

Exposing students to geologists in the workforce gives students a true sense of what geologists really do, and students seem to really like it! The speaker series is also an easy way to encourage partnerships between the two-year college and local workforce communities. As such, this is truly a positive experience for both the students and the presenters.

Collaboration Between Wake Tech and NC State to Increase the Number and Diversity of Geoscience Students

Gretchen Miller
Geology Instructor - Natural Sciences, Health, and PE Department
Wake Technical Community College (Wake Tech)

I have been successful in recruiting several students into geoscience majors in recent years simply through enthusiastic teaching and identifying students who are asking the right kinds of questions. I keep an email list of interested students, and forward any relevant information regarding educational opportunities. However, I have felt that most of this work has been somewhat haphazard, so when North Carolina State University (NC State) approached our faculty regarding a collaboration to recruit and train students in geoscience fields, I was on board immediately. We are in the first year of this collaboration, whose purpose is to increase the number and diversity of students pursuing a geoscience degree through a National Science Foundation grant named Diversity in the Geosciences, Making a Pathway to Success.

How does it support or prepare students for their future degrees or careers?
Wake Tech students are provided with an opportunity for paid summer research internships at NC State. Wake Tech instructors identify students who have an aptitude for science and a possible interest in a geoscience career. We match the interests of these students with professors at NC State, where the students complete a research project under that professor's direction. The students present their projects at a poster session at the end of the summer. If these students choose to continue their studies at NC State, they will be given additional opportunities for research and mentoring. Other aspects of the program include inviting private sector and government geoscience employers to visit Wake Tech and present information on careers and research, and enhancing lab experiences with both computer- and field-based activities to increase student excitement for the geosciences.

What are the strengths of its design and the most valuable aspect?
The strongest aspect of the program is giving the students a chance to try their hands at research, which gets them excited about other opportunities in geoscience fields. In addition, Wake Tech has a highly diverse student body, our geology program teaches over 1200 students per year, and our students generally plan to transfer to a four-year school to earn a Bachelor's degree. Therefore, we can reach out to a large number of potential future geoscientists.

What are the challenges of implementation?
The biggest challenge we have encountered is effectively reaching minority students, as these students usually do not see themselves in geoscience careers no matter how much you discuss the opportunities in class. I have found that talking to minority students individually, rather than in a large group, is the best way to encourage them. Another challenge has been communication between the two schools, as sometimes our goals have not been completely aligned. However, the first year has run relatively smoothly and we look forward to continuing the collaboration.

What is the evidence of its effectiveness?
The 2011-2012 academic year is the first year that we are implementing this program and results are not final, but initial results are encouraging. Nine Wake Tech students are currently participating in the summer research program at NC State. Anecdotally, the students have been very excited about and appreciative of this opportunity. Plans are in place to continue the collaboration next year, with the expectation of recruiting more students as we go forward.

Not a Teacher, But Want to Play a Really Good One in the Classroom

Ian Miller
Coastal Hazards Specialist
Washington Sea Grant
Olympic Peninsula Field Office at Peninsula College
Port Angeles, WA

I am a specialist with Washington Sea Grant and my paycheck comes from the University of Washington, but my work site is at Peninsula College, a small 2-year college on the Olympic Peninsula of Washington State. In return for office space I am responsible for teaching at least one class a year, and because I am also developing a research program I recruit and work with students as interns. I have significant teaching experience, but most of it is with elementary and middle school students, and most is in non-traditional, non-classroom settings. As a result, I consider myself very new at college-level instruction, and want to develop myself as a top-notch instructor. I am scheduled to teach my first course, General Oceanography, this fall quarter.

My academic background is in Ocean Sciences in general and coastal geomorphology in particular. My role at Sea Grant is as a "Coastal Hazards Specialist", and my day-to-day is filled with a mix of research, outreach activities, and consulting with local governments on coastal issues of concern. Of late, that mix has included studying chronic erosion on the Strait of Juan de Fuca, understanding the restoration benefit of a large dam removal on the Olympic Peninsula, coordinating a working group on the impacts of climate change on the coast of Washington State, and providing science-based information products to the public and government on the risks posed by debris from the 2011 Tohoku tsunami. I feel that my background and current project slate will provide a lot of fodder for interesting class projects, but I also know that there is a lot that I need to learn to teach effectively. The title of this essay is meant to convey what I view as my challenge: I am not hired as a teacher, and have many other responsibilities, but I want to do the absolute best that I can do by the students that are in my classes or that I work with as a mentor.

The "gaps" that I need to fill are many, but I see four clear questions that I am hoping to address to improve my position as an instructor in the geosciences. They are:

1. What sorts of geoscience careers do we need to prepare students for?
2. What sorts of skills do they need to compete for those positions?
3. Of that list of skills, which can I help them with?
4. Of the skills that I can teach, what are the best teaching methods to apply?

I also realize that there are questions that I probably don't even know that I need to be asking. It is this group of questions that addresses the request of the workshop conveners, "What would I like to be doing to improve the preparation of students in two-year colleges for geoscience careers?" I am hoping to use this workshop as a foundation as I construct a teaching philosophy for myself and build the courses that I will teach over the coming years.

Sadredin Moosavi

The Grand Isle Project – The Strength of Lower Division Student Research

Over the past few years my research agenda has been challenged by the hurdles facing most faculty in non-tenure track appointments; high teaching loads involving mostly lower division non-major students, lack of access to research equipment, job instability and appointment in departments that devalue teaching and those who teach general education populations by favoring research-oriented upper division faculty with policies that restrict permission to submit grant proposals to tenure track faculty. Without access to funding, graduate students or majors, my areas of research have been limited to low cost activities in geoscience education or field research that can serve a dual teaching and research role. The students I have served in both 4 and 2-year colleges mimic the geoscience student population in 2 year colleges in that they were lower division students not on the path to a geoscience major or graduate program and who most likely would not be available to the project after a relatively short period. I designed research projects suitable for freshman/sophomores with limited geoscience background that build data sets through teamwork and cumulative effort over time. Such projects build student expertise quickly allowing "experts" with 1-2 years experience to mentor and support initiates to the project. To be successful for students, the research must lend itself to individual students' completing the research process of developing a question, taking part in experiments to test the question, collection, analysis and presentation of data on at least a part of the larger question in the time in which they will be involved with the project. To be meaningful to faculty, the research gains made by individual students over 1-2 year time frames need to support a larger effort that contributes to a meaningful research question, leading to long term financial support and professional development via publication for the faculty member.

In my case working out of Tulane University on a fixed term contract, a beach-monitoring project on Grand Isle Louisiana was such a project. Grand Isle is a rapidly subsiding and eroding barrier island accessible by road about 2.5 hours from campus. Erosion on Grand Isle is rapid enough that significant changes in the beach can be seen and measured on the time scale of semesters, with fundamental changes occurring from year to year. Further, the fate of the island holds significance as a popular and valued resource for the tourism and fishing industries and the island's residents. More importantly, the island provides critical support to the nation's oil industry and vital storm surge protection to metropolitan New Orleans. Grand Isle matters! Monitoring the beach sufficiently to make recommendations to local officials requires a research effort richer in eager hands and minds than in expensive equipment. Using seed funding from a service learning course grant, approximately 60 general education students each semester traveled to Grand Isle in teams to collect beach profile data. Students were able to measure the shape and depth of the beach from the dune line out to knee depth on a monthly basis during the academic year, allowing for the rapid movement of sand along the Grand Isle shore to be documented in near real time. New groups of students each semester lead by a dedicated crew of motivated student researchers from prior terms were able to see how their data could measure the shape of the beach and contributed to capturing the seasonal cycle, effects of hurricanes, response to beach nourishment projects by the Army Corps of Engineers and eventually the effects of the BP oil spill and its clean up when integrated over time. The student researchers involved over multiple semesters were able to produce results worthy of presentation at the national GSA meeting. Of greater importance, the students' field data was actually used by Grand Isle State Park officials, BP contractors and the National Guard to guide aspects of the clean up in real time. The model has been so successful that other park units in Louisiana have inquired how they might become involved with geoscience service learning courses!

It should be noted that the research conducted by the lower division students did NOT replace larger scale and more precise beach profile measurements conducted by well-funded research teams of graduate students and run by post docs from other universities. What the Grand Isle students had to offer was longer-term data with high spatial and temporal density in a critical location and the day-to-day experience knowing how the beach behaved, compared to very precise but widely spaced and rarely sampled transects by the outside researchers. The error bars on the lower division student data are certainly higher than that of the R1 researchers, but they were able to correctly identify the direction of the long shore current, the likely location of boom failure during oil clean up due to chronic localized erosion and the role of BP wind fencing and traffic in inhibiting growth of the dunes by aeolian forces. The better-funded researchers were not sufficiently present on site to recognize these issues and thus had little credibility to the stakeholders on the ground needing to make important decisions in real time. This identifies a key niche for 2-year college student research. Freshmen and sophomores working with equipment purchased with a $5000 service learning grant and $10,000 REU grant, guided by a faculty member with a 4:4 course load cannot compete in terms of expertise, equipment and field support with a team from a research I university operating on a $500,000 grant. They will not quantify the transport of sediment across the entire Louisiana Gulf Coast. But they were there to inform decisions that saved a salt water marsh, restored steam cleaned sand to a segment of a spit from whence it would not be immediately eroded and gave park officials the data needed to guide placement of future breakwater rocks and a donation of BP wind fencing to capture and expand the park dunes, allowing return of endangered piping plovers to nesting sites covered by thick tar mats only months earlier. The R1 researchers produced fine data for their archives but nothing of immediate value to Grand Isle.

Research of this local importance can be done effectively by 2 year college students, but only if the faculty member is given adequate security and support to sustain the project over multiple years. Faculty in adjunct or contingent appointments forced to cobble together an income teaching at multiple institutions are seriously undermined by this unethical model for staffing academic institutions, particularly as they are ineligible to get even minimal grants for their work because their institutions will not sponsor a proposal from a faculty member that they are unwilling to commit to for the duration of the grant. With courage this problem can be circumvented. As Chair of the Geoscience Education Division of GSA, I have brought forward a proposal that would have a scientific society such as GSA serve as the institution of record for faculty to use to submit and administrate grants. In such a system, the society would be the institutional home for the researcher and project regardless of the vagaries of contingent employment…allowing for long-term sustainable projects to be supported even if the students ultimately come from multiple institutions. GSA is studying the proposal at present. If this approach is successful, faculty and lower division students from 2 and 4 year colleges across the nation will have greater access to the support needed to make projects like that on Grand Isle possible.

Rochester Community Technical College Adjunct

InTeGrate Liaison and SAGE2YC Advisory Board Member from Pasadena City College

Elizabeth Nagy-Shadman, Pasadena City College

In addition to being an advisory board member for SAGE2YC, I am a co-PI on the NSF-funded, five-year InTeGrate project that aims to improve geoscience literacy and build a workforce that can make use of geoscience to solve societal issues. My role is to oversee the involvement of 2-year colleges (2YCs) and to be certain that issues unique to 2YCs are identified and considered during the program development, testing, and dissemination. As such I am a liaison between the InTeGrate and SAGE2YC groups, and am very excited to be involved in both programs.

I am very fortunate to be an associate professor in a 2YC geology department that churns out a significant number of students who plan to transfer to four-year institutions and major in geology. Pasadena City College offers a fantastic geology program that focuses on field experiences and includes advanced courses such as mineralogy and field mapping. We have a very popular student geology club that raises funds with activities such as on-campus rock and mineral sales and uses the funds to take 2-4 day "fun" field trips to places like the Grand Canyon, Death Valley, Joshua Tree (CA), and the Channel Islands (CA).

My greatest interest related to this workshop is in the area of career awareness. Many of our students, like me so many decades ago, are so fascinated by geology that they decide to major in it without really knowing what might come next. I believe I speak for many of my colleagues as well as myself when I say that I really do not have up-to-date information on current geoscience career options and societal needs which geoscientists can fulfill.

Engaging Rural Alaskan Students in Geoscience

Todd Radenbaugh, Assistant Professor of Environmental Science, UAF Bristol Bay Campus

In rural Alaska, the teaching of university level geosciences at University of Alaska Fairbanks (UAF) has been limited to a few 100 and 200 level courses offered through the UAF's Collage of Rural and Community Development (CRCD). CRCD has 5 rural campuses across the state that traditionally has focused on English and math instruction, tribal management, and courses to meet community needs. Recently, there has been a growing interest in science to better understand the rapid pace of change due to a warming climate and globilazation, both of which influence the health of social and environmental systems. Further, there has been much controversy and conflict generated as a result of new resource extraction activities in remote regions where culture is still based on subsistence. This sets the stage to engage rural Alaskan students and teach more science. Since 2008, 4 new CRCD science programs have been designed to promote place based learning. These programs hope to expand local knowledge and continue the local management and conservation of resources. However, since ability to approach and resolve global problems at a local level is problematic because of size of external drivers the main goal is to allow rural communities to better adapt to change and help keep ecosystems resilient and healthy.

The growing global demand for energy and minerals is increasing the rate of resource development. For example, Bristol Bay in southwest Alaska has much mineral wealth and the Pebble Partnership LTD hopes to mine copper, gold, and other metals for world markets. However, local reaction to the proposed mine has generated controversy and conflict over legitimate concerns that the mine would negatively influence cultural and ecosystem health. Local view the abundant ecosystem services of pristine nature as having value beyond mineral wealth. Fisheries, account for nearly 75% of local jobs and a subsistence lifestyle is practiced by 90% of the residents. The region has been able to maintain its high ecosystem value due to the low human population, remote geography, and limited accessibility. The influences of a large mine(s) and its infrastructure sets the stage for investigations into the value of the region beyond economic measures. Given the pace of broad scale anthropogenic change, the region could become a laboratory for the way nature and society responds to external drivers.

The needed discussion of the issues through stakeholder collaborations and industrial ecology depends on an educated local populace. To help in this endeavor, the UAF Bristol Bay Campus has designed an Environmental Science Program to support and prepare students for future degrees or careers. Its main goal is to encourage students to investigate local environmental issues while participate in data collection. The hope is to allow graduates to become better informed of the science behind an issue and help improve decision making. These are increasing needed skills in rural Alaska as oil/gas and minerals exploration expands into remote regions. Geoscience plays an important role in decision making as it brings the data needed to help solve resource use issues. Although most agree to the value of such a program there have been many challenges. The largest is sustained enrollment. Even though the program offers both a Certificate and AAS degree, many students don't finish. Reason for the low graduation rate are in part based on issues similar to other two-year institutions (time demands of work, family, and leisure) but there unique reasons as well that stem from cultural differences in how rural Alaskan communities and a university system work. Engaging students in controversial local issues has been a successful way to demonstration the importance of geoscience education.

Texas A&M Geosciences and the increasing role of transfer students

Eric Riggs, Texas A & M University

Texas A&M University at College Station is the flagship university for the Texas A&M System, and as such is a major destination for transfer students, both from inside and outside the A&M system. The College of Geosciences consists of four academic departments and many organized research centers spanning the core geoscience disciplines of Geology & Geophysics, Geography, Oceanography and Atmospheric Sciences. Two additional stand-alone interdisciplinary degree programs round out the College academically, offering undergraduate degrees in Environmental Geosciences and Environmental Studies and graduate degrees in Water and Hydrological Sciences. The College has increased its undergraduate enrollment and graduation numbers substantially in recent years, growing from 105 Baccalaureate graduates in 2006-07 College-wide to 187 in 2010-11. This 80% growth over this time period has greatly outpaced the undergraduate degree completion growth rate of 10% for the University as a whole. While the College of Geosciences is still the smallest at A&M in terms of overall Baccalaureate graduation rate, it is by far the fastest growing of our nine undergraduate degree-granting colleges over the last five years.

A significant number of our incoming and graduating undergraduate students are transfers from primarily 2-year colleges, mostly concentrated in the southeastern portion of Texas. University-wide between 2006 and 2010, 23-25% of degree recipients entered as transfer students. In the College of Geosciences transfer students are an even more significant portion of our graduating students, making up 34-35% of graduates during the same period. Most of the undergraduate enrollment growth in the College, however, has come from an increase in first-time freshmen and not from an increase in transfer admissions. Transfer admits as a percentage of the new undergraduate admissions had been relatively flat to a slight decline at near 30%, but recent efforts to reinvigorate transfer admissions has sharply reversed this trend. Current enrollment data shows that our incoming transfer students this year once again more closely mirror our historic graduation rates with 34% of our new students entering by transferring in primarily from community colleges.

Beyond the numbers, there are other observations, concerns, and opportunities for partnerships between Texas A&M Geosciences and our surrounding community college students and programs. Through careful tracking of admitted transfer students, we have seen a consistent drop in their GPAs after transferring to Texas A&M, pointing to gaps in preparation, mismatches in expectations, or curricular stumbling blocks. In any case we have a problem and an opportunity to help this incoming third of our student body reach their highest potential. Community college populations in our region also tend to be more diverse than first-time freshmen in general, and we are actively working to build stronger formal ties to community college feeder programs within the Houston metro area and other regions within southeast Texas as part of our broader strategy to enhance diversity across our College. Seeing after the proper preparation and “onboarding” of this increasingly diverse and varied group of students will be important for ensuring their success and the vitality of our undergraduate programs. Texas A&M as an entity is moving toward an increased emphasis on community college transfers, and we look forward to learning from geosciences colleagues around the nation so that we can lead by example locally.

2YC students from a 4YC chair's perspective

Matthew Schwartz, University of West Florida

As chairperson of a four year college department of Environmental Studies, I have two main types of interaction with 2YC students: 1) I have worked directly with 2YC students via a course designed as part of a collaborative ATE research grant and 2) we accept many 2YC students as transfers into University of West Florida. In the aforementioned Aquatic Environmental sciences course, we worked to provide field instruction supplementing my co-PI's classroom lectures related to sampling and analytical methods related to coastal and estuarine systems, while also introducing students to the application of Geographic Information Science (GIS). That project funding has been completed; however, we intend to expand the project to continue its goals in coming years.

As the chairperson of the Department of Environmental studies at University of West Florida, I see transfers from a number of 2YC programs in the region. We have established articulation agreements with one of these 2YC programs with a goal to highlighting academic requirements of the 4YC degree before the students arrive at University of West Florida. I am exploring the idea of conducting dedicated outreach and advising sessions with 2YC programs to explicitly address the requirements for their intended BS in Environmental Studies (particularly those quantitative prerequisites such as Chemistry and Mathematics courses), to recruit students to the BS in Environmental Studies, and to discuss career options related to such a degree.

How do we prepare the next generation of geoscientists in this technology-driven world? We need to attract them in the first place.

Suki Smaglik, Central Wyoming College

First of all, we need to have geoscience students in our classrooms in order to start to prepare them. Therefore, we need to start young. Kids love rocks; some collect rocks from the time they can crawl. The question we might ask is: Why does this interest stop rather than expand? Only a few of us who discovered our connection to Earth at a young age become geologists. We need to make it known that being a geoscientist is a good career. Geoscientists with an emphasis on environmental issues will always be employable, from field technicians to industry consultants. We have spent nearly two centuries despoiling North American resources. Problems related to resource extraction will take at least another century to set right. It is geoscientists who will be leading the way.

Geoscience programs at 2YCs serve three functions: 1) General studies science courses (w/ or w/o a lab); 2) AAS for direct employment and 3) AS for transfer to higher degree(s). A quick Google search reveals no comprehensive career advice sites for aspiring environmental technicians, geoscientists or related career paths. What are we doing in our programs to advise students on their career path. Do we need help? Yes, indeed. It may be that one of the results of this workshop will be the development of a career advice site for 2YC degree students of geoscience. Do you think anyone actually uses the term “geoscientist” besides us? Unlikely. I fear they are still using the terms “geologist” and “environmental scientists (or engineer).”

In the past 12 years at Central Wyoming College (CWC) I have offered geology courses, developed or helped develop three new programs, and made articulation agreements with our sole University (UWyo). We hired an Environmental Science and Technology instructor. None of these efforts has been rewarded with a huge increase in geoscience majors. How is that so, in a state rich in, and dependent upon, geologic resources? The University certainly has plenty of geology majors. However, only 3 of our 7 community colleges (CCs) even offer a geology course, although a couple of others offer some “geo-related” course (Earth Science, Astronomy or Oceanography). Only one of our CCs has more than one sophomore-level course. There is a perception in this state that choosing a career in geosciences requires direct enrollment at our 4-year institution, or going out-of-state (not necessarily a bad thing).

We have had a few students successfully continue with their 4-year degrees at UWyo. A few more have found a better fit at other state’s universities (CO, ID, MT, SD, UT). Perhaps, that is all the success that I can count, but I am not satisfied. What I need is a plan that correlates well with attracting students to the geosciences. I am hoping to get some good ideas from this workshop.

Besides general education geoscience-related courses, what we have at CWC are two transfer programs and a technical degree:

1) Earth & Environmental Science (AS): Includes one introductory-level geology course (physical, environmental or historical), two semesters each of college-level math and chemistry, one Earth System Science course and a few other options in science, plus 34 credits of general education. There is no room for more, although we are trying to find a way to "plug into" energy resources.
2) Environmental Science and Leadership (AS): Combines most if the above (only one semester of math and one other science, but a full year of chemistry) plus a semester in outdoor leadership with the National Outdoor Leadership School (NOLS).
3) Environment, Health & Safety – Environmental Technician (AAS): Requires a few safety courses, some lower-level non-majors science courses, including Environmental Science, and some technical courses designed to introduce the students to the real equipment and procedures that they will use in their work (GIS, Law, Toxicology, Soils, Water). In addition, they take a smaller selection of general education courses.

We have also had a strong undergraduate research program for the past six years. All students are allowed/encouraged to join this program. It is competitive and selective but it has yet to produce a true geoscience transfer student, although several have transferred into biology, chemistry and education programs.

Given all of this, we look good on paper, but how are we going to move beyond that to have students who go on to geoscience careers and be prepared for them? That is our dilemma.

Using a 2+2 Agreement and a Simulated Geological Investigation to Improve Student Preparation

Mr. Andrew Smith
Assistant Professor
Vincennes University

At Vincennes University we have found a number of techniques to be effective in preparing students for the geoscience workforce and/or transitioning to four-year programs. I would like to highlight two of the methods we use to improve student preparation.

First, we have excellent working relationships with institutions where our students commonly transfer. We have what we call a 2 + 2 agreement with several of the major state universities in Indiana. What this means is they have evaluated our program requirements and found them to be compatible with their similar programs. In turn, we have modified our program requirements to make them compatible with those of other schools. This allows for students to complete their first two years at Vincennes University and then transfer to a four-year program without the obstacle of classes that don't transfer. In addition to establishing the 2 + 2 programs, we have organized field trips with students and faculty from the nearby four-year schools and taken students to visit the campus and department at some of the schools. This allows students to get a feel for what they can expect when they transfer to that school. It also allows for faculty at VU to better understand what the expectations are of students at the nearby four-year programs.

Another technique we have tried involves a simulated geologic / environmental investigation which I have used in my physical geology lab class. This exercise aims to give students a sample of one type of work completed by consulting geologists. Students visited several stations on campus where they collected information that was supplied by "drilling" a borehole at each station. At each station, students were supplied with bags marked with different depth intervals and asked to record the depth, type of rock/material, depth to water and any other information supplied by the "driller". After visiting each station, students then came back to the lab and were asked to construct various geologic maps and cross-sections depicting the fictional geology of our campus. Because water table information was also supplied, they were charged with interpreting groundwater flow beneath campus and how certain environmental factors (i.e. leaking underground storage tank) would affect the quality of groundwater. I tried to give this activity an authentic feel making it a rain or shine activity and providing them with "minor" setbacks such as arriving at a station and finding that the "drill rig" was not working properly. This exercise is an effective way for students to collect, interpret and present data that has real-world implications. One challenge associated with the exercise (or strength depending on your viewpoint) is the fact that the students are spread out all around campus and the instructor is not always available if they have questions. Students generally enjoy the exercise and come away with some "real-world" experience.

A Moveable Museum

Roger Steinberg, Associate Professor of Geology, Del Mar College

Del Mar College (DMC) is a two-year college in Corpus Christi, Texas. We have a lot of the pieces in place needed to create a strong program in support and preparation of students for transfer to four-year colleges, the geotechnical workforce, or geoscience careers—but we could use some new strategies for putting the pieces together.

Del Mar College is a Hispanic-Serving Institution with an enrollment of about 12,000 students per semester. Although there are only three Geology faculty at Del Mar College, we enroll more than 1000 students each academic year in our Geology classes. (Presently we teach only Physical and Historical Geology, but will be adding Oceanography soon.)

My current focus is recruitment rather than preparation. Almost all of our Geology majors are recruited from students who are initially intent on simply fulfilling their core science requirements. Since I've been primarily teaching Historical Geology the past few years, I've been getting students excited about Geology as a career using fossils and other unique teaching specimens. Most of my students have never been to a museum, so I bring the museum to them. I used to prowl gem and mineral shows—now I prowl online. I invest much time cultivating relationships with fossil dealers and have acquired many excellent teaching specimens from various Internet sources and auctions. (I only buy legally obtained specimens from reputable sellers.) I have an extensive collection to show to students, which includes specimens from famous fossil locales including the White Sea (Ediacaran), Burgess Shale, Chengjiang, Solnhofen, Bundenbach, Messel, Bear Gulch, Mazon Creek, Hell Creek, and La Brea. Students can examine and hold dinosaur footprints, dinosaur coprolites, dinosaur gastroliths, dinosaur eggs, dinosaur bones and teeth, and even fossil dinosaur skin, as well as sediment from several K/T Boundary sites representing the asteroid that may have wiped them out. I also have samples of the Cape York, Allende, Canyon Diablo, and Odessa meteorites, as well as Lunar and Martian meteorites. Pictures alone don't do these types of specimens justice. This approach may be helpful--the number of our declared Geology majors has almost tripled in the last five years!

On the preparation side, these are some of the pieces:
1. Our best asset is our relationship with two nearby four-year universities that are part of the Texas A&M System, including Texas A&M Corpus Christi (TAMUCC), to which the majority of our Geology majors transfer. I am very fortunate that Dr. Tania Anders from TAMUCC will also be attending this workshop. We are always exploring new ways to create a better relationship, and we hope to learn a few new tricks at this workshop.

2. I have more than a dozen years experience as a professional geologist in mineral exploration and oil and gas exploration and production, and was employed by companies ranging from the very large (Exxon) to the very small (myself, as an independent consultant). Because of this varied professional background, I can realistically advise students about life as a professional geologist.

3. South Texas has a thriving professional geological community, and the boom is on, concentrated presently in horizontal drilling and fracking of the Eagle Ford Shale. This community presently offers our students both scholarships and internships.

4. We started a Geology Club at Del Mar College for our students this past semester. We are investigating various ways that this can help with recruitment and preparation.

5. I am the coordinator of the Del Mar College Department of Natural Sciences Friday Science Seminar Series. 3-5 times per semester, I schedule presentations by local/regional professionals for DMC faculty and students. Not too surprisingly, many of these are geological in content. We upload presentations as streaming video to our website (http://www.delmar.edu/ns_lectures.aspx). Talks are also shown repeatedly on Del Mar College's educational cable-TV channel, and in this way reach a much wider audience.

I hope to learn or steal as many ideas as possible at this workshop that can help with taking these pieces and developing new strategies in support and preparation of our students for transfer to the local (or other) four-year colleges, entering the geotechnical workforce, or the pursuit of geoscience degrees.

Pairing 2YCS with research-focused universities

John Taber, IRIS Consortium

Given the value that has been shown for early research experiences for undergraduates, including for students who have yet to decide on a major, IRIS would like to partner with other organizations to develop, or help build on a student research program that integrates research opportunities at two-year and four-year schools. We have experience running a national distributed REU program for upper-level students with math, physics and/or geoscience background, but need to learn more about the needs and interests of first and second year students, as our current program has evolved into one where most participants have completed their junior year. One of the challenges that I anticipate is to identify research mentors who are prepared and motivated to provide the level of support that will be needed for the younger students. This would be in contrast to our current REU, where the research mentors have come to expect students with significant physics and math backgrounds.

As with our existing program, we envision students working at an IRIS member institution, with multiple students at an institution, and with more support (mentoring, writing, science training, etc) than our current REU. We would like to learn from other effective programs so that we could effectively connect students at our Educational Affiliate member institutions, which currently include several 2YCs, to nearby more research-focused universities.

Engaging Students Through Research at a 2-YC

Joshua Villalobos
Associate Professor
Department of Geological Sciences
El Paso Community College

I can honestly say that for the past six years of teaching full-time I have been excited about going to work everyday. The prospect of having the opportunity to introduce something new to a group of students, or explain something that they take for “granite” everyday gives me as much excitement and contentment as my regular morning tall Starbuck House Blend coffee! I like to think that all college professors had that one instructor, professor, or advisor that made them want to go down the path of education and forgo the path of fame or fortune in the geosciences.

As a 2YC professor I have this rare privilege to be that same professor I had and inspire my students to learn our language of Geology. But as 2YC professors we face more unique challenges than our 4YR counterparts. Many of students are non-traditional students and are not typically encountered at 4YC. But it’s these types of students that make teaching at a 2YC, in my opinion, a more rewarding and challenging experience. Our non-traditional students are enthusiastic and determined individuals who are; single parents, returning for a second career, have disabilities, are at an economically or social disadvantage, or are in a family were culturally a college education is not encouraged, and this is just to name a few.

A challenge we face in STEM education is not in inspiring our students to be passionate about geology, (our passion and knowledge on our subject should make it infectious and incurable!) but making our students see themselves as scientist. The teaching of science as an inquiry, and the incorporation of science activities as part of the learning process has been successful in getting students learning and envisioning science. But to be truly successful we must continue this process. By having our students do the science they learn to envision themselves as scientists. When student can envision themselves themselves as scientist, they learn the capability to make themselves scientists. It's easy to get students to think about science, but it's difficult to get them to think of themselves as scientist.

At El Paso Community College (EPCC) I've tried to facility my students envisioning process by offering research to our geology majors. Through a grant from the NSF's Opportunity in Enhancing Diversity in Geosciences I've been able to create a research program Student Opportunities in Learning Advanced Research in the geoSciences (SOLARIS) at EPCC.

The SOLARIS program funds 10 EPCC geology majors to conduct research with either EPCC faculty or participating faculty at University of Texas at El Paso. Students learn by taking ownership of their research projects and learn the process of research (data collection, use of equipment, data processing, writing abstracts, oral presentations, etc.) to help facilitate their vision of becoming a scientist.

David H Voorhees
Associate Professor Earth Science / Geology
Waubonsee Community College
Sugar Grove, IL
June 2012

WAUBONSEE COMMUNITY COLLEGE
Where futures take shape

Preparing Students in Two-year Colleges for Geoscience Degrees and Careers

I have been teaching Earth Science, Geology, Astronomy and Geography full time at Waubonsee Community College for 10 years. As most of my teaching is the General Education *Survey of Earth Science* class, a 3-credit lecture course covering physical geology, oceanography, meteorology and astronomy, I don't have many, or know of many, geoscience majors in my classes, although I have identified several over the years using various techniques, four of which are described below.

In order to try to systematically identify future geoscience majors in my classes, I have recently added a required 'syllabus quiz' on the class Blackboard site that all students have to complete at the beginning of the semester. The primary goal of the syllabus quiz is to make sure the syllabus is read and understood. In addition, I have two open-ended questions that ask the student what they plan to major in and what their career goals are. It obviously begins to form a bond with the student by showing interest in their career goals, but it also helps me to identify early in the semester potential geoscience 'majors' (since we do not have a formal Associate's degree in geology in Illinois) and can mentor them during the semester and beyond. I also make some kind of comment on each student's submission to demonstrate my interest in them, even if they are not potential geoscience 'majors'.

I am the campus representative for the Geological Society of America, which provides me with appropriate and visually attractive posters that I display in the Earth Science / Geology hallway. I initially thought that it would only be a nice wall display, but I was able to identify a future geoscience major with that poster a couple of years ago. She approached me after class (she was in my Physical Geology class at the time) about wanting to attend the GSA meeting in Seattle, and what it would involve. She ultimately attended the convention, met with representatives from many schools she was considering transferring to, and ultimately chose the University of Hawaii to study volcanology. She has since changed her major to Social work, but it was the GSA posters that identified her geoscience interests to me. I have also used the free advertising materials provided to me to entice future majors.

There is an Honors Program at Waubonsee Community College, in which high performing and motivated students can take any class as an Honors class, and complete an Honors project, in return for a financial compensation and a notation on their diploma if they complete more than 5 classes as Honors classes. I always encourage honors projects that have a true research component, as opposed to the typical research paper. Examples of some of these honors research projects include analyzing a year of data from our AS1 seismometer (for a Physical Geology class), analyses of water table fluctuations of monitoring wells that we have in the wetlands on our campus (for an Environmental Geology class), and a project from the Spring 2012 semester studying the screenwash from the 2004 Aurora Mastodont Project (for a Survey of Earth Science class). The project that analyzed the data from the AS1 seismometer was entered into a regional STEM poster competition, and won 2nd place in the Technology Division. The Aurora Mastodont Project screenwash analyses Honors Project was entered into this year's STEM Poster competition, and she won first place in the Earth Science/Physical Science/Chemistry Category. I typically get 1 honors student per academic year, probably

because of the requirement of 3.75 GPA to participate in the Honors program. There are typically 75 honors students per semester, college wide**.**

I have participated in a weeklong program sponsored by our Counseling Department 'Major Decisions Week' in which faculty volunteer to discuss job opportunities and careers in their disciplines. The first year, the Earth Sciences presentation was not included in the printed advertising because of its late addition, and there were only 4 attendees. I would like to add that one of those attendees is now planning to transfer to study Environmental Geology at Southern Illinois University, and another attendee is now our Earth Science Laboratory Assistant and is planning on continuing her studies in physical geography.

Developing meaningful and manageable research opportunities for community college students: lessons learned from semester #1

Becca Walker. Professor of Earth Sciences, Mt. San Antonio College, Walnut, CA

Each semester, there are a handful of students in the science building every day working at the tables outside of the classrooms, dropping by office hours with hand samples, and asking questions after class related to, but beyond the scope of, the topic covered that day. They are the "repeat offenders" who have taken several courses in the department and are hungry for more. But when I say "more", I don't mean yet another rock identification lab or plate tectonics lecture. I mean an opportunity that is challenging, self-directed, and above all, allows community college students to experience what it really means to be a practicing geoscientist and reflect on their career goals. To provide students with this opportunity, colleague Mark Boryta and I created a section of GEOL 99—special topics in geology—for 8 interested students this spring.

A 2-unit independent study course, students began an assessment of the San Juan Creek watershed, including stream and beach profiling, bedrock geology, and sediment sampling and analysis. The goals related to geoscience career preparation included exposing students to some of the techniques, tools, and ways of thinking used by professional geoscientists; giving students the responsibility of defining their own procedures and project scope and justifying these decisions; and introducing students to collaborative research. I also hoped that this project would help maintain students' excitement about geoscience in preparation for transfer to 4-year institutions, hence the importance of designing a level-appropriate, rigorous project.

As expected, the course's first iteration was fraught with challenges. From an implementation perspective, the main challenge is that a special projects course is not recognized as part of our teaching load. This meant that carving out dedicated time to spend with students in the field, in the lab, and working with the data was extremely difficult. Second, Mark and I lacked a clear vision about how much latitude to give students concerning the study design. Our original idea was to divide students into teams with specific field and/or lab tasks. However, most participants wanted to try a bit of everything, which resulted in ineffective scenarios like 8 people trying to sieve a sediment sample at the same time. There was also the "unrealistic expectations" challenge—as they had never participated in scientific research, students assumed that they would complete the entire watershed assessment in one semester and were disappointed when this didn't happen. Despite these barriers, I believe that engaging community college students in early undergraduate research experiences has tremendous potential with respect to career reflection and preparation. I observed students during fieldwork and team meetings and saw increases in the frequency and duration of collaboration, establishment of a division of labor based on individual strengths, and acquisition of field, lab, and communication skills. Finally, I've included a few representative quotes from students' reflective writing indicating that their experiences aligned with our overarching goals. We are excited to use what we learned this spring and continue offering research experiences in future semesters for community college students.

"It wasn't like a normal field trip where we had specified guidelines and papers that we had to fill out. We had to determine what we wanted to do and how in depth we wanted to do it."

"This is really the first chance I've had to use knowledge from the classroom to solve problems in the field… There were mistakes made, but this was all part of the process of learning….I gained a lot of experience working with procedures similar to those used by professional geologists."

"For me it was more than a lab class. I got to perceive geology in the real world…I could see mountains, the dry stream bed, vegetation, human activities, all interacting…I was 'getting what geology is all about'."

One-page essay describing what I do, or what I would like to be doing, to improve the preparation of students in two-year colleges for geoscience careers.

Katryn Wiese – City College of San Francisco – Earth Sciences

After transferring to a 4YC, my 2YC students should feel competitive, confident, and supported. To achieve that goal means setting up a support network of faculty and fellow students and giving them strong foundational skills, knowledge, and experiences. It also means building career and workforce skills. Since I cannot supply all of this myself, I rely on colleagues at 4YCs and research labs and industry and consultants. And I strive to bring part-time faculty into my department who can help us stay fresh in what the workforce wants.

Right now I am working towards these goals with the following programs/resources:

- **Mentoring program** – A students, especially those identified as majors, are encouraged to act as tutors and lab aides to the same classes they have completed – they develop personal relationships with the instructors – ie, they get mentored – and they develop tutoring skills and expertise in the subject matter – ie., they mentor.)
- **Transfer website** – We provideh sections for each surrounding 4YC, including links to websites, and ideally blurbs written by their departments and how to get involved. We also include job/career/internship info; and we develop majors around basic transfer skills and foundations (physics, calculus, etc.).
- **Reciprocal relationships with local 4YCs** –having our students attend Club meetings and department seminars while they have their graduate students shadow our instructors and get experience teaching (this is a fledgling program, and would benefit from expansion and continuity – it helps if there's one instructor who can fan/support each 4YC relationship, as there are many in our area).
- **Earth Sciences Club** – to foster shared experiences, networking, and long-lasting connections
- **Internships** – This program is also something that exists in a fledgling offering now – with the USGS Benthic Lab and the National Park Service, but which would benefit from deeper, more consistent and varied research/lab relationships.

Website: www.ccsf.edu/Earth (choose Students and follow through to learn more about our Club, Mentoring Program, Internships, Transfer information, etc.)

The program listed above that has great potentential, but that is the weakest at the moment is INTERNSHIPS. And the challenge there is finding a greater diversity of labs and colleagues to make those experiences available to students. I can give students work experience college credit, and in some cases they can earn a small stipend. But making the connections required to create a pipeline that the researchers value and that I can value for my students is limited by time and connections. The value for my students comes from hands-on research experience and field work – networking with professionals, improving their resume, learning what aspects of their field most interest them, and developing support networks and mentoring from other scientists. Evidence of the positive value comes from the future career options and potential of the students who have had these experiences. They either decide science is not their bag, and focus their energies in other directions, where they're more happy, or they end up top of their class at the 4YC (though they do start out that way at the 2YC as well), and they end up actively engaged in research prior to graduation with a BS and continue onward for a PhD. That being said, I don't have a statistically large enough group yet to say that I have a guaranteed model.

Big Changes and New Directions for a Small Program

Christine Witkowski - Middlesex Community College, Middletown, CT

Middlesex Community College is one of the smallest of the twelve community colleges in Connecticut, with about 3000 credit students per semester (1700 FTE). The Science, Allied Health & Engineering Division offers many 3- and 4-credit science courses in support of the General Studies and Liberal Arts A.S. degrees. One of the few A.S. degrees specifically in science offered at Middlesex is the Environmental Science degree. This program dates back to the 1980s, with a focus on pollution control and cleanup. Many of the courses required for the degree (such as Industrial Toxicology, Organic Chemistry, and OSHA HAZWOPER training) are no longer offered at Middlesex due to lack of demand. The occasional student graduating in the program in recent years has done so with many "substitutions" for required courses. I joined the faculty in Fall of 2010 as the new program coordinator, with a mandate to revise and revive the program to meet the requirements of new job and career opportunities.

Existing geoscience courses include Introduction to Environmental Science, Natural Disasters, Earth Science, Astronomy, and Introduction to Physical Geology. Most of the students who enroll in these courses do so to meet the science requirement for a non-science degree. Students enrolled in the Environmental Science program complete the Introduction to Environmental Science (non-lab) course, as well courses in Chemistry and Biology, and an internship. Geology is not a required course, and none of the existing courses have a field component or technology integration. My overarching goal in revising the program is to create a much more hands-on, field-oriented, place-based curriculum. We are located on a beautiful 38 acre campus with many potential study areas, and we are well situated within a geologically diverse landscape. However, changes to the program will require significant investments, and I am currently seeking grant funding in order to obtain some of the needed equipment and resources for field-based investigations.

Complicating the effort to implement changes to the existing program is the fact that Middlesex is in the midst of tremendous changes, both at an institutional level and within the state system of colleges and universities. In the past year, the state of Connecticut created a new Board of Regents for Higher Education to govern the 4 state universities and 12 community colleges in Connecticut, which were once governed separately. One goal of the reorganization was to create seamless articulation between the community colleges and the state universities. This process is expected to bring changes to all degree requirements, and has put individual program changes on hold, but ultimately will create better opportunities for transfer students. On an institutional level, Middlesex has also welcomed a new president and a new academic dean in the past year. Both of these hires bode well for the future of the environmental science degree program because they have embraced the concept of sustainability for the campus and are supportive of new curricula in these areas.

The new program will aim to meet the needs of students who desire immediate technician positions, as well as the students who wish to transfer and pursue higher degrees and careers in the geosciences. However, transfer pathways for the Environmental Science A.S. degree are complicated by the fact that the possible 4YC programs are so diverse. We will also face the challenge of successfully recruiting students for the program because we are in a densely populated region where many students have chosen to pursue degrees at larger community colleges nearby. We will need to start creating excitement among high school students in the region through new partnerships and programs, exposing students early to diverse geoscience career options. We will also need to establish stronger ties to potential employers to better understand how our program can meet their needs. There are many challenges ahead, but it is exciting to be a part of creating a program that can uniquely address the needs of the future.

Strategies for raising awareness of geoscience related careers at 2-year colleges

Ben Wolfe
Metropolitan Community College – Kansas City

I am single faculty discipline at my campus, part of a large urban multi-campus district in Kansas City, Missouri with a total of three district full-time geology faculty. The overwhelming majority of students at my institution take geoscience courses (e.g. physical geology or physical geography) to fulfill part of the general education requirements of the Associates in Arts degree or General Education certificate for transfer to a 4-year school. As with many other community college earth science programs, I face a relatively small number of students continuing on to major in geoscience programs at their transfer 4-year institution. Additionally, students have very few opportunities to take upper level (200-level) geology courses which often transfer as just elective credit. Nor are there strong established pipelines for students interested in geoscience to matriculate to the several surrounding 4-year institution geology programs. Typically I average two to three students that make their interests in geology known to me per year. This is difficult to track however as my institution does not have a geology "major" as part of the Associates in Science or Associates in Arts degrees. To increase interest and retention in geosciences courses, I have developed a two prong approach – one aimed at students looking to transfer to a 4-year institution and the other aimed at students in the often overlooked career and technical programs.

In the case of transfer students I take on a "high touch" approach in my introductory Physical Geology course. To make students aware of geoscience related careers (many of whom have not had an earth science course since ninth grade) I work examples of such careers into lecture topics in class. For example, when lecturing on groundwater, I emphasize what types of jobs in geosciences exists for that particular field of study (such as hydrologists, specifically what they do and what they study). I also am active as a faculty mentor and advisor for students who express interest in science on their admission forms or in discussions of potential careers in science in our first-year experience courses and GUID classes. Serving as a faculty mentor has been very effective, not only in recruiting students to consider careers in geology, but also in advising a curriculum for students necessary to be successful upon transfer to a 4-year institution (such as completing college level chemistry, physics, and calculus).

The second approach focuses on students pursuing certificates and degrees in career and technical (CTE) energy related programs (such as HVAC, industrial engineering technology, electrician, and linemen). To increase awareness of vocational related geoscience careers, many of which require a good foundation in the vocational training they are currently pursing, I developed a foundation energy course - Energy and the environment - which fulfills both the science general education component of the AA degree for students looking to transfer as well as CTE students. The curriculum focuses on fundamental concepts of energy generation and environmental impact including analysis of energy fundamentals, fossil fuel exploration and use, atmospheric pollution, global climate change, nuclear energy, alternative energy sources, and energy conservation all of which are directly related to geologic processes. These new course is part of newly created certificate programs in Photovoltaics, energy efficiency, and solar thermal – with the intention of expanding to AAS degrees in each.

Lastly, to raise awareness of the active outdoor aspects of geology careers that may draw students with interests in similar activities, such as hiking, backpacking, camping, etc., I incorporate field trips into my introductory geology course as well as a much longer field study course. I have found field experiences to be very effective in recruiting interest in geosciences. Typically several of the trip participants express increased interest in careers in geology on post-trip student experience surveys. However, since such

field experiences only transfer as elective credit, I struggle with recruiting large numbers of students to take such courses. Typically those already interested in geology are more prone to enroll than someone who is still undecided in their long term career plans.

Woodall_essay Creating and Promoting 2-Year Geoscience Degrees

I joined the faculty at Daytona State College (DSC) in 2008 as the first and only geoscience professor—which continues to be true. My initial responsibilities included teaching introductory courses in Oceanography and Geology—predominately to non-science majors. While teaching these courses, I quickly became aware of the immense opportunities to grow the geosciences; Daytona Beach is not only located on the shores of the Atlantic Ocean, but also lays at the front door of the most diverse ecosystem in North America—the Indian River Lagoon Estuary. So I established goals to grow the geosciences which included creating new 2-year Associate Degrees, increasing transfer opportunities to 4-year universities and creating/expanding the number of geoscience courses, labs and internship opportunities for students at DSC.

After meeting with the DSC Administrators in 2010 and presenting my ideas, they encouraged me to move forward with my goals and allowed me to establish a new name—the Institute of Marine and Environmental Studies (IMES). We also created new major codes to identify students interested in working on their A.A. Degree in either Marine Science (#7922), Marine Biology (#7921), Environmental Science (#7935) or Ocean Engineering (#7951). We have since added a major code for an A.S. Degree in Environmental Science Technology (#2230). And—more importantly and fun for me—they bought me a boat!!!—small but mighty.

I began meeting my goals by identifying 4-year universities offering B.S. Degrees in Marine Science, Marine Biology, Environmental Science and Ocean Engineering and then setting out to meet with program advisors at each university to establish articulation agreements—recognizing that doing this would ease student transfer to their programs and serve to inform our students of the appropriate courses to take while enrolled at DSC. Articulation agreements have now been established with numerous public and private universities around the state. To make our students more attractive to these universities and competitive with other 4-year students, we have also created new courses that expand field and lab experiences for students in the marine and environmental fields.

For the A.S. Environmental Science Technology Program, we have established strong ties with some very supportive public/private industries that serve as our Advisory Board members. These highly enthusiastic folks have also created free field training opportunities for our students and are anxiously waiting to mentor their first interns during the Spring, 2013 semester.

I also set out to promote and advertise these new 2-year degrees. First, I worked with our IT Department to create a website www.DaytonaState.edu/IMES . Here, students can review the goals of IMES and the courses recommended by our articulating partners. We also have a Facebook page https://www.facebook.com/DaytonaStateIMES where we post opportunities for and activities completed by our students. Other supporting efforts include a mass-mailing system created for me by our IT Department so that I can identify students by their major code and then send information via email about upcoming activities or scholarship opportunities.

There have been challenges! First and foremost—much of what was needed to create a successful geoscience program was a bit of a surprise to the administrators. Field courses required financial support (e.g., field equipment) and efforts (e.g., liability insurance) ***not*** previously required by classroom-only degrees. But—in the 2 years since first starting IMES, we now have almost 400 students enrolled in our majors. The interest is there---and now administrative support is growing!