Increasing Participation in the Geosciences at El Paso Community College

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Community Colleges currently serve 44% of all undergraduate students and 45% of all of all first time freshmen in the US[1]. The combined low cost and flexibility of community colleges has also meant that they accommodate a large percentage of minorities entering higher education. Hispanics now constitute 15% of the general population and 19% of college population in the US[1]. This increase has led to more Institutions being designated HSI (Hispanic Serving Institutions) by the federal government, where at least 25 percent of the full-time-equivalent students are Latino.

These facts illustrate the potential community colleges hold to encourage STEM (Science Technology Engineering and Math) majors to minorities as well as non-minorities. But the reality is the number of STEM degrees awarded at CC has not followed the same trends in enrollment[1]. Student research is the key to having students participate in STEM fields. This, unfortunately, is a simple task with a complex solution.

Having students involved in hands on research is fundamental in having them understand the potential of what a particular STEM field can provide. Regrettably, unlike our university counterparts, community colleges do not have the financial, administrative, or infrastructure support needed for research.

Like many community colleges, El Paso Community College (EPCC) is experiencing a stage of rapid and exciting growth. EPCC currently enrolls 27,000 students with 85% of the student body being Hispanic. More than 130 programs of study are offered including an Associate of Science degree in Geological Sciences. In our effort to increase majors in Geology at EPCC, we have taken several small steps over the past three years.

Attrition rate-

El Paso Community College is often used as a "stepping stone" for students to prepare for a four-year college (primarily the University of Texas at El Paso or New Mexico State University), gain credit, or to test the waters of higher education. Many times, our students leave EPCC and start a four-year institution without ever receiving their Associates. Many of these students do not realize they have either earned enough credit to receive their Associates, earned enough to get multiple Associates, or are simply lacking one or two classes to complete their Associates.

State funding in Texas, as in most states, is based on graduation rates, not class enrollment. Therefore, once a student leaves EPCC without receiving their Associates and transfers to a four-year institution, EPCC receives no credit for federal aid from the State of Texas for that student. Therefore, the four-year institution will receive state recognition once the student receives their Bachelor Degree, even though EPCC is responsible for up to half of the college credit the student earned.

In order to increase the number of students receiving their A.S. in Geological Sciences at EPCC, we implemented a "2+2" program. Working closely with the Curriculum Offices at EPCC and UTEP and the Geology Department at UTEP, we developed a Degree plan that would:

-Allow a student to complete their basics (up to 65 credit hours) and therefore complete the first two years of a four-year degree while getting their AS degree at EPCC.

-Allow the student to then spend the last two years of their BS taking upper level courses at UTEP and only pay the higher tuition rates for these last two years.

-Ensure all courses taken in the AS degree plan for Geological Sciences at EPCC would count for credit in the BS Geological Sciences Degree plan for UTEP.

- The format and style of both the EPCC and UTEP degree plans were identical to minimize confusion, redundancy, and anxiety of transferring students.

The simplicity of the degree plans allows EPCC geology instructors to easily mentor students interested in becoming geology majors at EPCC and illustrates a path for a BS degree at UTEP. In the past 2 years since the introduction of the 2+2 program, we have gained 10 geology majors at EPCC two of which have continued at UTEP under the Geological Sciences BS degree program. Some of the students who developed an interest in Geology late in the time spent attending EPCC wound up having accumulated enough credit, under the new degree plan, for not only an AS in Geological Sciences but for other Associate degrees as well (in one case 3!).

Student Research-

Undergraduate student research is an essential component of an institution's ability to grow the number of STEM majors. Unfortunately, unlike our university counter parts, many community colleges lack the required components needed for faculty to apply for funding or faculty are not encouraged to do research. The administrative mentality of "Community colleges are for learning not research!" within our institutions is often engrained but fortunately can be changed.

Applying for funding for our projects was not easy. Several administrative reasons on why student research might not be a good idea were given but we came up with solutions for each of them:

- **Time** - CC faculty class-loads do not permit time to conduct major research.
  Solution: Development of **Geology 2389: Investigations in Physical Science**- This course allows students to explore geology while working closely with an instructor. They may study GIS, soil pollution, mineral exploration, or a topic chosen by the student and instructor. This course allows the student to investigate and learn geology using research.

- **Cost**- CC do not want financial obligation for laboratory equipment up-keep or maintenance.
  Solution: The total amount received for equipment and supplies has been less than $1,000 and require no up-keep or maintenance. Often, government agencies and universities store still useable research equipment as surplus that can either be given to community colleges or sold at a discounted rate.

- **Facilities**- Most CC were never planned to incorporate research labs or facilities.
  Solution: All research is conducted in the field and requires little to no classroom time.

- **Funding sources**- Research money in not in a CC budget.
  Solution: Projects were developed in conjunction with UTEP and participating research institutions in order to use or rent more expensive research equipment. Projects were designed to be cost effective and use as little money as possible. Two grants were submitted to NSF through the Western Alliance to Expand Student Opportunities (WAESO). Both grants included student stipends, supplies, rental fees, and equipment and each came under $3,000 for the total funding amounts.
  A key step that helped in funding of the projects was serving on a NSF grant review panel. Serving on a panel allowed for a greater understanding on how to write, prepare, and find grants. Reviewers are not limited to university PhD's and often have several CC faculty involved in the process.

The key to overcoming these obstacles was to understand the aversion or lack of understanding of student research at certain administrative levels. Not all research projects require vast amounts of time, resources, or funding. But all students should have the opportunity to experience quality research at a 2yr. institution to foster the curiosity of majoring in a STEM field. The ability for a Hispanic Serving Institution (HSI) or Community College to allow undergraduates to conduct hands-on outside research is a key factor in increasing their awareness and participation in STEM fields. Even with a modest amount of funding, huge strides can be made for minority and non-minority students attending community colleges to become interested in and majoring in STEM fields. Below is a brief description of what the EPCC Geological Sciences Department recently did to increase the number of Geology majors using student research.

In Fall 2009, a Physical Geology class project was undertaken by El Paso Community College to investigate the hydrology of a mitigated wetland in El Paso County, Texas. Students made simple field observations and came up with hypotheses of possible sources of water for the wetlands. As a result of this preliminary class project several students became geology majors and wished to continue their investigations.
Further investigations of the site required a small amount of funding in order for two individuals, Marc Lucero and Raul Gonzalez, to continue their research. With the money provided by WAESO, these two students have been able to:
- Conduct detailed weekly investigations of the water quality in the wetlands at 14 selected sites.
-Collaborate with two major universities (Texas A&M and UTEP) in their research.
-Be the first community college students to present their findings at the University of Texas at El Paso's Department of Geological Science 24th Annual Research Colloquium.

As a result of their presentation UTEP's Department of Geological Science has offered to help further their investigation this summer. With the continued support by WAESO, they will be using geophysical equipment provided by UTEP as well as receive training and mentoring by a faculty member.

Currently there is a waiting list for other students to participate in field research at EPCC. We are hoping that we can continue with our success and our collaboration with UTEP and continue to learn new ways to improve the rates of STEM majors at two and 4 yr. institutions.

[1] Quality Education for Minority (QEM) Network Follow-up Workshop to HSI-STEM Outreach Forum Overview of NSF Programs and Proposal Opportunities. Las Vegas, NV. 2009.