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***Recognizing Opportunities:
Expanding Earth Science Literacy by
Understanding the Role of Community Colleges in U.S. Higher Education***

"Over the years, I've come to view community colleges and other two-year institutions as the Cinderella story of our education system--doing the hard work, quietly, without much fanfare. They provide a pathway to the American dream for millions of people, whether they enter the workforce immediately afterward or decide to continue their education."

William D. Greene, Chairman and CEO
Accenture (Forbes, 2008)

GEOSCIENCE COLLEAGUES CONTRIBUTING THEIR TALENTS AT COMMUNITY COLLEGES

Two-year colleges provide a skilled graduate-level educated faculty focused upon teaching. Natural or physical sciences faculty have graduate training in their subject areas. Many 2-year colleges require at least a Master's degree for any faculty science division hire or require a minimum of 18 graduate units in the discipline (depending upon the State and/or institution). A growing number of faculty have earned Doctoral degrees (upwards of 10%, with the greatest number achieved by adjunct faculty; AACC, 2009). Numerous faculty are "shared" by 2-year and 4-year institutions, working combinations of part time and full time at both types of institutions simultaneously (e.g. this author). Community college faculty professional development emphasizes pedagogy and androgogy techniques for diverse populations. These faculty play an important role in the training of students in introductory laboratory science courses by offering smaller class sizes (generally 30 or less students per faculty), and providing more personalized "active learning" instruction. Pre-service teachers, particularly primary-levels, can receive suitable strategies in instruction modeled during content classes (Fathe and Kasabian, 2009). It is interesting to note that participants of the American Geophysical Union workshop on Earth Systems Science (AGU, 1996) grasped that most students begin their college training at 2-year institutions, however many of the articulation agreements for transfer to 4-year programs granting baccalaureate degrees are controlled by 4-year institutions. This has the effect of restricting community college faculty in the use of their collective expertise and ingenuity in delivering contemporary Earth system science curriculum (AGU, 1996).

NATIONAL IMPORTANCE TO UNDERGRADUATE EDUCATION OF Diverse Populations

The National Science Board communicated six main priorities to the Transition Team for then President-Elect Barak Obama with regard to STEM education. Important to note is that 2-year institutions are included in the stakeholders mentioned for improving STEM-related communication, coordination and collaboration between K-12 teachers, students, parents, and administrators by better bridging with higher education institutions, informal science education organizations, business, and industry to promote 21st century-needed learning and development of STEM skills (NSB, 2009). In the United States, approximately 65% of all graduating high school seniors decide to attend college after graduating. Of those students, 30% matriculate to a community college setting (NCES, 2009a). The National Center for Education Statistics reports there are 15.6 million

undergraduate students enrolled in approximately 4100 degree-granting public and private institutions (NCES, 2009b) within the United States and its territories (American Samoa, Guam, Northern Mariana Islands, and Puerto Rico). From those institutions, about 1,800 (UT, 2008) are community colleges enrolling just shy of 12 million students with 6.7 million enrolled in academic credit courses (NCES, 2009b). Forty percent of these students enrolled for credit attend full time. Community colleges enroll 44% of all undergraduate students nationally and up to 39% of the country's international students (AACC, 2009).

The American Association of Community Colleges (AACC, 2009) reports the average student age is 29 years old, with almost 50% of this population being 21 years or younger. Women are the majority at 58% and ethnic/racial minority populations are approximately 40% of the 6.7 million enrolled. Thirty-nine percent are first generation college students. Students that begin their coursework at community colleges have diverse goals: to obtain some college coursework credit only, to obtain an Associate's degree, and/or to transfer units (with or without completing an Associate's degree) to a bachelor's degree-granting institution. U.S. Department of Education studies indicate that 75% of the high school seniors beginning at community college intend to transfer (NCES, 2008). Further, many with initial goals of just earning an Associate's degree become more prone to continue their education after experiencing successful semesters, gaining confidence or realizing the potential a bachelor's degree offers. "Students who transfer from community colleges to four-year institutions graduate at the same rate and succeed in their jobs on par with students at four-year colleges and universities who did not transfer" (NACCTEP, 2009).

STRATEGIES TO INCREASE STUDENT NUMBERS IN GEOSCIENCE AND/OR TEACHER CANDIDATE TRAINING

Community colleges are particularly important due to their often dual-roll of being part of a "formal" higher education system as well as part of the workforce development system (EOPCEA, 2009). It is very important that our geosciences community recognizes the opportunity for improved outreach to potential majors and non majors through our community colleges. Since nationally 44% of all undergraduates attend community college, then potentially 6.7 million students will enroll in their introductory science and mathematics courses during that time. Awad and Mattox (2009) discuss the merits of recruiting students to undergraduate programs by attracting well-qualified high school students into college credit courses while they are still juniors and seniors. A number of community colleges and an increasing number of 4-year institutions have such dual-credit and/or dual-enrollment agreements in place for a variety of disciplines. The GSA Education Committee is aware of such programs, including the Illinois College of Lake County example discussed in their article, and sees these "bridges" as a way to recruit high school students into undergraduate geosciences programs since there are no Advanced Placement courses in Geology to attract this population.

We must remember that the majority of U.S. students are not exposed to geological content after 8th grade. The early "core" college science requirements for post-secondary students should be tapped as a way to provide "early" exposure to geosciences as a viable vocational track. Also within the current pre-college system in the United States, we need to understand that an estimated 2 of every 5 teachers complete some math and science courses at community colleges (NACCTEP, 2009) during their degree programs. The Trends in International Mathematics and Science study (TIMSS) provides an important measure of K-12 student achievement comparing students globally on key indicators. According to the 2008 TIMSS, poorer students continue to lag behind affluent in 4th and 8th grade mathematics and science achievement in the United States. The data provided from TIMSS over the past number of years is an indicator that the U.S. is falling behind in the competitive global market. We need improvement in K-12 teachers skilled in STEM instruction at both the primary and secondary grades (Fathe and Kasabian, 2009).

"Greater than 20% of all teachers begin their college careers at two-year institutions and nearly half of all teachers complete some of their science or mathematics courses there."

Fathe and Kasabian (2009)

This presents an astounding number of teachers we need to teach earth science literacy. The U.S. Department of Education data indicates there are over 5 million K-12 instructional staff in both public and private schools nationwide. According to transcript studies, community colleges played a role in more than 50% of the nation's current classroom teachers, often providing the only technology training and general

content courses they received in their undergraduate careers (NACCTEP, 2009). Community college experiences provide a foundation for pre-service teacher upper level instruction, as well as provide pathways for post-baccalaureate workforce to switch careers to become certified teachers (NACCTEP, 2009). At least one type of alternate teacher certification path is present in all 50 states and the District of Columbia, with approximately one third of new teachers hired coming through these routes. The simple fact is, train the elementary, middle childhood and secondary level teacher candidates to recognize the far-reaching relevance of earth science literacy, as that expressed through the “Big Ideas” and create a more “topic comfortable”, competent set of advocates in our pre-college students’ experiences. More teachers trained in the geosciences/earth sciences within the pipeline will increase the probability that geosciences will be used as a vehicle for the required teaching of integrated content and technology skills across course disciplines. Perhaps more teachers would then request to teach specific courses in geology--thus creating a synergistic effect in our school system structures. Increase the number of messengers to promote the vocation.

REFERENCES

American Association of Community Colleges (2009) Various Statistics...Fast Facts, graphics of Faculty Degree Attainment, CC Enrollment, <http://www2.aacc.nche.edu/research/index.htm>

American Geophysical Union (1996) Shaping the Future of Undergraduate Earth Science Education: Innovation and Change Using an Earth System Approach http://www.agu.org/sci_soc/spheres/

Awad, Aida and Stephen Mattox (April 2009) Recruiting students to undergraduate geoscience programs through dual-credit and dual-enrollment classes, GSA Today, Vol 19, Issue 4, p. 58 . See also <http://www.geosociety.org/gsatoday/archive/19/4/pdf/i1052-5173-19-4-58.pdf>

Executive Office of the President Council of Economic Advisors (2009) Preparing the Workers of Today for the Jobs of Tomorrow http://www.whitehouse.gov/assets/documents/Jobs_of_the_Future.pdf

Fathe, Laurie A. & Kasabian, Judy (2009) *The State of Affairs - Impact and Implications of STEM Teacher Education at Two-Year Colleges*. Torrance, CA: El Camino Community College District. National Association of Community Colleges Teacher Education Programs and NSF Workshop <http://www.nacctep.org/PDF/TheStateOfAffairs.pdf>

Forbes (13 August 2008) Why Not Community College? http://www.forbes.com/2008/08/13/community-college-success-oped-college08-cx_wg_0813green.html

National Association of Community Colleges Teacher Education Programs (2009) 10 Myths & Realities about Community College Teacher Education Programs http://www.nacctep.org/PDF/Myths_Individual.pdf

National Center for Education Statistics (NCES) (2008) Community Colleges Special Supplement to The Condition of Education 2008 <http://nces.ed.gov/programs/coe/2008/analysis/2008033.pdf>

National Center for Education Statistics (NCES) (2009a) Stats in Brief - Students Who Study Science, Technology, Engineering, and Mathematics (STEM) in Postsecondary Education <http://nces.ed.gov/Pubsearch/pubsinfo.asp?pubid=2009161>

National Center for Education Statistics (NCES) (2009b) Digest of Educational Statistics 2008 <http://nces.ed.gov/Pubsearch/pubsinfo.asp?pubid=2009020>

National Science Board (2009) National Science Board STEM Education Recommendations for the President-Elect Obama Administration http://www.nsf.gov/nsb/publications/2009/01_10_stem_rec_obama.pdf

University of Texas at Austin World Web U.S. Higher Education (UT) (2008) U.S. Community Colleges (Regionally-Accredited Institutions) <http://www.utexas.edu/world/univ/>