How to Create Vibrant Diverse Student STEM Communities Through Teamwork and Leadership

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May 2007

Part Two: A Theoretical Perspective on Achieving Vibrant Student STEM Communities for First Generation and Underrepresented Students in Higher Education

Introduction:

A large gap tends to exist between those who run very successful student programs and the academics who theorize about student success, evaluate specific programs, and conduct program independent quantitative and qualitative studies of undergraduate science programs. While those running effective programs are the real agents of diversity, their work is rarely documented. Consequently programs come and go, new practitioners often painfully recreate programs developed and tested over time in other departments or institutions. They are often employed in a student affairs classification without respect to the number of advanced degrees they may hold, and are often themselves individuals of color. Faculty on large campuses tend not to be aware of these individuals and their work unless they are directly involved as P.I.s on the grants supporting particular programs, or are themselves deeply committed to promote diversity. Otherwise student affairs work is largely unnoticed and not particularly respected by faculty. Faculty who study diversity and student success may or may not be aware of effective programs on their own campus so the fruitful exchange of knowledge which could occur between these faculty and program directors usually does not occur. Each group operates in their own sphere, intensified by disciplinary boundaries and administrative structure.

This presentation is a brief and preliminary attempt to bridge this divide by discussing in the abstract what Diana Lizarraga achieves in practice. The rationale for doing so is that effective programs have characteristics the literature is not fully aware of and which are then under-emphasized in discussions of how programs are successful. This discussion is also motivated by the increasingly stringent requirements of the National Institutes of Health (NIH) and the National Science Foundation (NSF), to create new programs for increasing diversity in STEM which are theoretically informed and appropriately evaluated. Consequently the bibliography includes data sources on participation in postsecondary education and a few articles which survey the theoretical field of student diversity work.

Goals for Undergraduate Programs:

To create for the student -- Academic integration along with

Social integration, both creating a sense of belonging
Engagement with student peers, classes and own education
Self efficacy, academic and social competence
Definition of career goals further reinforcing sense of purpose and academic engagement

Achieving these Goals Requires:

Introduction to members of own ethnic group, induction into that group
A safe designated place to meet
Introduction into a learning community with individual responsibility to the community
A skilled facilitator, culturally sensitive, empathetic
Employing a positive achievement model to–
implement a positive program in order to develop and enhance existing or new skills and knowledge
Setting clear goals for the group, have students develop clear personal goals– both in relation to what the group wants to achieve and what each individual student wants to achieve

Beyond these factors addressed in the literature the chemistry of success rests on several other critical factors found much more in practice than theory. As was stated in the first part of this presentation, "it is all about the student." That means the emphasis is on positive individual student development, BUT within a particular community which has clearly defined borders and clearly defined responsibilities for its members. In the case of these four undergraduate science programs, the community is defined by being one of developing scientists, so that the disciplinary base plays an important role. Membership requires a willingness to work with and for other members, building the community through reciprocal service and mutual respect. For shaping future scientists, this altruistic team identity is particularly significant for changing the culture of science. It also resonates with students of color some of whom view their education as a way of eventually giving back to their community whether it be through teaching in minority serving institutions or working on health disparities.

Achieving a student community of this kind rests heavily on the individual program director who to be successful does much more than "run a program." Required is a vision of how particular program characteristics can be created to positively affirm the abilities of the student (remembering that socialization to the university and mastery of science are key), in a way which builds self-confidence and ease in the academic environment. Affirming student competence, building self-trust, while instilling discipline and fostering realistic individual goals is ultimately an art. Likewise reaffirming the need for honesty, ethical behavior, and fairness in both life and science requires a program director who has a clear sense of his or her own values and how they relate to supporting and developing the student in his/her programs. Transmitting these values also requires skill in institutions and a society in which honesty and ethical behavior is not always demonstrated.

The standard conceptual vehicle for the realization of these values is mentoring. The activity certainly is a highly significant part of the training within science programs, but the word is used as if the content of the activity is self-evident. It is not. The standard mentoring mentoring model outline:

Mentoring by Multiple Individuals:

By the facilitator (program director),
By peers as part of study group participation
Setting boundaries in these relationships, setting out what to get from mentor relationships
Requires direct involvement of faculty in first semester seminars/classes/discussion sections and occasional seminars
Requires a contract between student and mentors setting expectations and boundaries

The four programs discussed in part I make it clear that to attain program efficacy requires going beyond standard mentoring models.

Outcomes:

Increasing self confidence–in university setting,
-in own ability to succeed
-in self, growth of self trust
Reflected in–good grades
–general engagement with education
–focused goals
–participation in further academic programs: Research, research, research!
–Graduation!
Long term fortification of all aspects of identity: member of a particular ethnic group, member of the academic community, member of the successful

The research institutions which educate so many STEM undergraduates are based on atavistic values of white men who comprise 75% + of STEM ladder faculty. These are competitive institutions where faculty may not pay much attention to undergraduate students and where the general atmosphere may be less than nurturing. At the same time underrepresented students experience this kind of large institution, while participating in these programs they are often dealing with many other aspects of their life which produce:

Negative Influences:

Ongoing stereotype threat, occasional hostile/racist experiences
Health problems
Lack of money
Family issues/concerns weighing student down
Nagging psychological issues from background affecting self-confidence and sense of belonging.
Over-confidence! Students who did well in high school do not understand the extent to which college class are more demanding. They tend to enroll in too many courses, too advanced for their knowledge.

Negative Influences from Faculty:

From those who do not differentiate among members of ethnic groups and treat all pejoratively as “minorities.”

May hold negative stereotypes about students leading them to doubt student competence, and to not be as demanding of students of color as of other students.

Often too busy to really pay undergraduate students any attention

Maximizing Impact of Diversity Programs:

Fully document program activities and how they are conducted

Evaluate participating students from their entrance into program through program completion and learn what really works and why.

Coordinate with other programs

Track program participants to learn educational and career path

The Next Step:

Create a campus science education center/diversity center in order to

Enable intra-program coordination,

Set standards for documentation and evaluation

Provide a library/website of good studies/evaluations, sample surveys, survey methodology

Share good ideas and practices

Work with faculty on grant applications for student support grants

Support professional development of program coordinators

Provide training for those new to the field of science diversity education

Coda:

These activities should not end with first year students, but be employed for students through- out their undergraduate years. Students at every level require mentoring, a safe place to interact with students like them, working in study groups or learning communities, learning leadership skills along with how to work with one another or in teams.

RESOURCES IN SUPPORT OF INTERVENTIONS/PROGRAMS/INITIATIVES PROMOTING ACCESS, RETENTION AND GRADUATION OF STUDENTS UNDERREPRESENTED IN POST-SECONDARY EDUCATION.

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DATA Sources

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National Science Foundation Website: www.nsf.gov/ where is found among many others: Division of Science Resources Statistics, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2007,* NSF 07-315. Arlington, VA.: February 2007. Available: http://www.nsf.gov/statistics/wmpd

Division of Science Resources Statistics (SRS), Science and Engineering Statistics: Publications, data, and analyses about the nation's science and engineering resources, http://www.nsf.gov/statistics such as: *Science and Engineering Degrees: 1966-2004* Detailed Statistical Tables. Maurya M. Green, Project Officer, NSF 07-307. Arlington, VA.: January 2007

The Urban Institute, Program for Evaluation and Equity Research (PEER). Beatrice Chu Clewell, et.al., *Evaluation of the National Science Foundation Louis Stokes Alliances for Minority Participation Program: Final Report*. Prepared under Contract REC 9912176. Washington, D.C.: The Urban Institute, November 2005.

See Appendix A for an analysis of literature on effective strategies to increase diversity in STEM fields and a long bibliography.

The National Center for Education Statistics (NCES), U.S. Department of Education. http://nces.ed.gov/ for a wealth of reports and statistics. An example: Chen, X. *First Generation Students in Postsecondary Education: A look at their College Transcripts.* (NCES 2005-171). Washington, D.C.: U.S. Department of Education, July 2005

Educational Testing Service (ETS), http://www.ets.org/research/pic [Policy Information Center]. A large number of reports available. An example: Bridgeman, B. and Cathy Wendler, *Characteristics of Minority Students Who Excel on the SAT and in the Classroom.* Princeton, N.J.: Policy Evaluation and Research Center, Educational Testing Service, January 2005

The National Center for Public Policy and Higher Education. *Measuring Up, The National Report Card on Higher Education.* http://measuringup.highereducation.org/ Can access individual states in categories ranked among all 50 states.

National Center for Higher Education Management Systems (NCHEMS). http://www.higheredinfo.org/raceethnicity/ Also state by state comparisons under several headings, this references race ethnicity. *As America Becomes More Diverse: The Impact of State Higher Education Inequality*. 2002

American Council on Education(ACE), *Minorities in Higher Education, Twenty Second Annual Status Report.* Washington, D.C.: ACE, 2006 The definitive summary of educational and employment progress of people of color. Available: http://www.acenet.edu/AM

Useful Books or Articles:

U.S. Department of Energy, Office of Science. *Building Toward a Better Future, A College Planning Guide for Students and Their Families.* Washington, D.C.: DOE, n.d. This is an excellent guide to planning for college from an early age in all aspects. Also available as *Formación para un Futuro Mejor: Guía de Planificación Universitaria para Estudiantes y Sus Familias*. Can be ordered through http://www.science.doe.gov/Program_Offices/Workforce_Development.htm pdf available: http://www.science.doe.gov/Program_Offices/WFD/CollegePlanGuide_WEB1.pdf

Cushman, Kathleen. *First in the Family, Advice About College From First-Generation Students: Vol. 1 Your High School Years. Vol. 2 Your College Years.* Providence, RI.:Next Generation Press, 2005, 2006. These are simply terrific books which deal with all the issues of life in a low income, first generation family based on interviews, so that much of the text is advice given by first-generation students. More information: http://www.nextgenerationpress.org/

Seidman, Alan, "Minority Student Retention: Resources for Practitioners." *New Directions for Institutional Research,* 125, Spring 2005.

Carter, Deborah Faye, "Key Issues in the Persistence of Underrepresented Minority Students." *New Directions for Institutional Research*, 130, Summer 2006. Online: Wiley InterScience: www.interscience.wiley.com Together both of these articles petty much cover the standard literature on issues related to minority undergraduates at predominantly white institutions.

Reason, Robert D., Patrick T. Ternzini, and Robert J. Domingo, "Developing Social and Personal Competence in The First Year of College." *The Review of Higher Education.* Spring 2007, 30 3