Creating Pathways for STEM Transfer Student Success

Plenary Session

National Institute for the Study of Transfer Students

September 12, 2011 * Asheville, NC
Presenters

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Video Presentation

Pathway to a STEM Degree
The State of STEM Education

• What is STEM?
• Understanding STEM Education
• Why are we talking so much @ STEM?
• Changing student demographics
• Changing workforce needs
• STEM Human Capital Development
• Role of America’s community colleges
• Teaching and Learning
• The Future
Table of Contents:

Role of community colleges: broadening participation among women and minorities in STEM
Soko S. Starobin, Frankie Santos Laanan, Carol J. Burger

Changing STEM associate's degree production in public associate's colleges from 1985 to 2005: exploring institutional type, gender, and field of study
David E. Hardy, Stephen G. Katsinas

Math and science success and nonsuccess: journeys within the community college
Linda Serra Hagedorn, Daniel DuBray

Women in male-dominated career and technical education programs at community colleges: barriers to participation and success
Jaime Lester

From community college to PH.D.: educational pathways in science, technology, engineering, and mathematics
Soko S. Starobin, Frankie Santos Laanan

Role of community colleges in STEM education: thoughts on implications for policy, practice, and future research
Elizabeth Hoffman, Soko S. Starobin, Frankie Santos Laanan, Marisa Rivera

IOWA STATE UNIVERSITY
Community College Leadership Program

www.cclp.hs.iastate.edu
Changing World

• Our ability to meet the challenges and achieve the opportunities of our time depends in large measure on our science and engineering (S&E) enterprise.

• Yet, while our S&E capability is as strong as ever, the dominance of the U.S. in these fields has lessened as the rest of the world has invested in and grown their research and education capacities.
Rising Above the Gathering Storm

- *Gathering Storm (2007)* documented this global leveling and argued that the U.S. was at a **crossroads**: for the U.S. to maintain the global leadership and competitiveness in STEM, we must
  - Invest in research
  - Encourage innovation, and
  - Grow a strong, talented, and innovative science and technology workforce

- Resonated strongly in both the executive and legislative branches of government
- Led to:
  - America COMPETES Act
  - Substantial appropriations
Talent at the Crossroads

**Broadening Participation:**

- Our sources for the future S&E workforce are uncertain.
- The demographics of our domestic population are shifting dramatically.
- Diversity is an asset.

National Academy of Sciences (2010).
Institutional Roles

- **Community Colleges**: To facilitate and increase the successful transfer of underrepresented minorities in STEM to four-year institutions, an increased emphasis on and support for articulation agreements, summer bridge programs, mentoring, academic and career counseling, peer support, and undergraduate research at two-year institutions is recommended.

- **Minority-Serving Institutions**: MSIs have a legacy of recruiting, retaining, and graduating a disproportionate number of minorities, especially at the undergraduate level. With additional support, MSIs can expand their effectiveness in recruiting, retaining, and graduating an increased number of minorities, especially at the baccalaureate level.
Fixing the Problem

• Academic preparation (K-12 education, achievement gaps, etc.)

• Access and Motivation

• Affordability

• Academic and Social Support
Why Broad Participation Matters

1. Our sources for the S&E workforce are uncertain:
   • For many years, the nation relied on an S&E workforce that was predominantly male and white and Asian.
   • In the more recent past, we have seen gains for women in some fields and an increasing reliance on international students in others.
   • However, we are coming to understand that relying on non-U.S. citizens for our S&E workforce is an increasingly uncertain proposition.
2. The demographics of our domestic population are shifting dramatically:

- That we need to draw on all domestic sources for a strong and robust S&E workforce makes the future of our S&E workforce all the more urgent.

- **Those groups that are most underrepresented in S&E are also the fastest growing in the general population.**
3. Diversity is an asset and an opportunity:

- Increasing the participation and success of URMs in S&E contributes to the health of the nation by: **expanding the S&E talent pool, enhancing innovation, and improving the nation’s global economic leadership.**

- The S&E workforce is projected by the U.S. Bureau of Labor Statistics to grow faster than any other sector in coming years: *This growth rate provides an opportunity as well as an obligation to draw on new sources of talent to make the S&E workforce as robust and dynamic as possible.*

- However, we are starting from a challenging position; underrepresented minority groups comprised 28.5 percent of our national population in 2006, yet just 9.1 percent of college-educated Americans in science and engineering occupations.
Debunking Metaphors

From Pipeline to [Educational] Pathways to STEM Degrees

One way in and one way out.
Pathways to STEM Baccalaureate Degree

NEW WAYS OF THINKING:

• Multiple Pathway Options
• Multiple “entry points” or access points” to pursue STEM degree
• Move beyond “one size fits all” model
Why Transfer? Why Now?

- Community colleges are the largest postsecondary education segment and its share of the undergraduate population is likely to increase.
- Community college students want to transfer.
- Community colleges will prepare more students for transfer in the future, especially students from middle-class backgrounds.
- Community colleges attract students from underserved groups in greater numbers than four-year colleges and universities.
- Community colleges cost less to attend than four-year institutions.
- Community colleges are more accessible than four-year institutions.

Pathway to STEM Degree: 101

- Inputs (student background characteristics, etc.)
- Pre-STEM academic preparation (e.g., socialization and STEM Student Success Literacy)
- Transfer and articulation policies (formalized vs. not formalized)
- Teaching and Learning
- Career and Technical Education [CTE] Pathway to Advanced Technology Education (ATE)
- “Community College Effect”
- Transfer Student Success at 4-year
Using Community Colleges to Build a STEM-Skilled Workforce

Highlights

• Education and skills in STEM are important in a global economy increasingly focused on high-growth, technology-driven occupations.
• Community colleges play an critical role in statewide STEM initiatives.
• Policy Gaps:
  • Lack of alignment between CC degree production and employer skill needs
  • Lack of real-world application in CC courses and programs
  • Low degree completion rates
  • Ineffective mathematics remediation
  • Lack of articulation agreements that ensure credits
Assets of Community Colleges

• *Uniquely positioned* to grow the pipeline of STEM professionals and produce more STEM-skilled workers to meet the demand for middle- and high-skill jobs.

• *Convenience of CCs* is a crucial asset: 90% of the U.S. population lives within 25 miles of a CC, which makes these institutions highly accessible to many people.

• By 2030, *people of color will make up 45% of the working-age population* – up from just 18% in 1980.

• *Inexpensive option* for many low-income, low-skilled adults who want to boost their education and training ($2,544 CC mean annual cost vs. $7,020 at 4-year public college).
Figure 1. Conceptual Framework of Educational Trajectories via Community College

Source: Laanan, 2009
Figure 2. Conceptual Framework of Understanding Transfer Students’ College Experiences and Transition to 4-Year University
Inputs

Background Characteristics

- Age
- Race/Ethnicity
- First-Generation Status
- Low-income
- Socio-economic status
- Parental Education
- Parental Income
- High school achievement/preparation
- English Language Learners
- Placement Test Scores
- Other variables
- Employment
- Hours spent on CC campus
- Developmental Courses
- General Courses
- Academic Advising / Counseling Services
- Transfer Process
- Course Learning
- Experiences with Faculty
- Participation in 2 YR-4 YR partnerships (transfer and articulation)
- Bridge Programs
- CC GPA
- Learning and Study Skills
• Employment
• Academic Major
• Learning Community
• Course Learning
• Experience with Faculty
• General Perceptions of University (e.g., accessibility of faculty, friendly “Transfer Culture”)
• Adjustment Process (e.g., social and academic, transfer shock, transition issues)
• College Satisfaction
• University GPA
• Retention in STEM major
• Leave STEM major
• Retained at University (non-STEM)
• Leave University
• Graduate with STEM degree
• Job Placement
• Self-Concept / Self-Confidence
• Graduate degree in STEM discipline
Bert E. Holmes
Carson Distinguished Chair of Science at UNC-Asheville
and formerly
Program Officer in Division of Undergraduate Education at NSF

Grove Park Inn – Asheville, NC
12 September, 2011
Courageous Conversation with Panel

• What are the critical issues facing STEM education in community colleges?

• What is the role of community college faculty in mentoring future scientists?

• How do we increase more women and URMs in the Pathway to STEM Degree?

• How do community colleges and 4-year institutions work effectively to increase a seamless transition for pre-STEM majors?

• How do we ensure student academic preparedness?
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