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Creating Pathways for STEM Transfer Student Success Plenary Session

National Institute for the Study of Transfer Students
September 12, 2011 * Asheville, NC

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Video Presentation



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

Special Issue

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SPECIAL ISSUE

**The role community colleges play
in broadening participation among
women and minorities in STEM fields**

Soko Starobin and Frankie Santos Laanan
Guest Editors

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IOWA STATE UNIVERSITY
Community College Leadership Program



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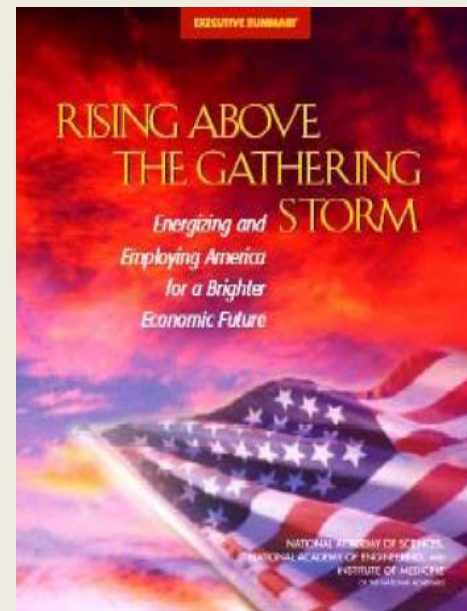
Changing World

- 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.

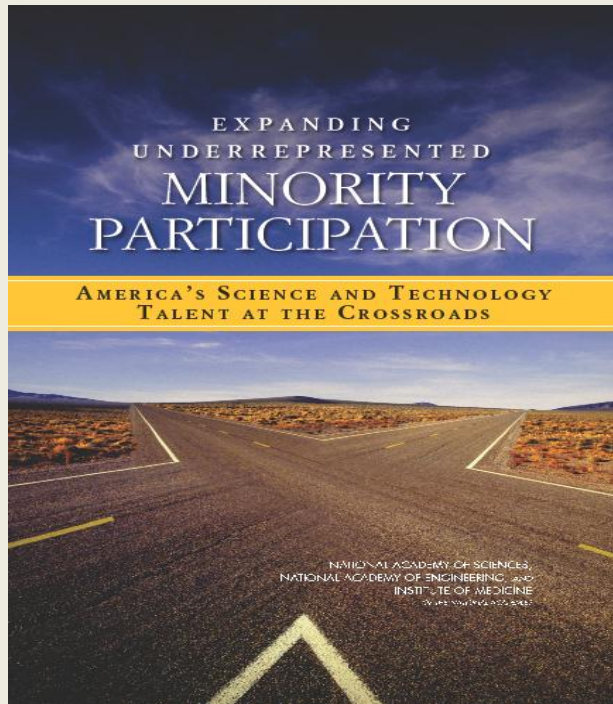


Rising Above the Gathering Storm

- *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



National Academy of Sciences (2010).

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.

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

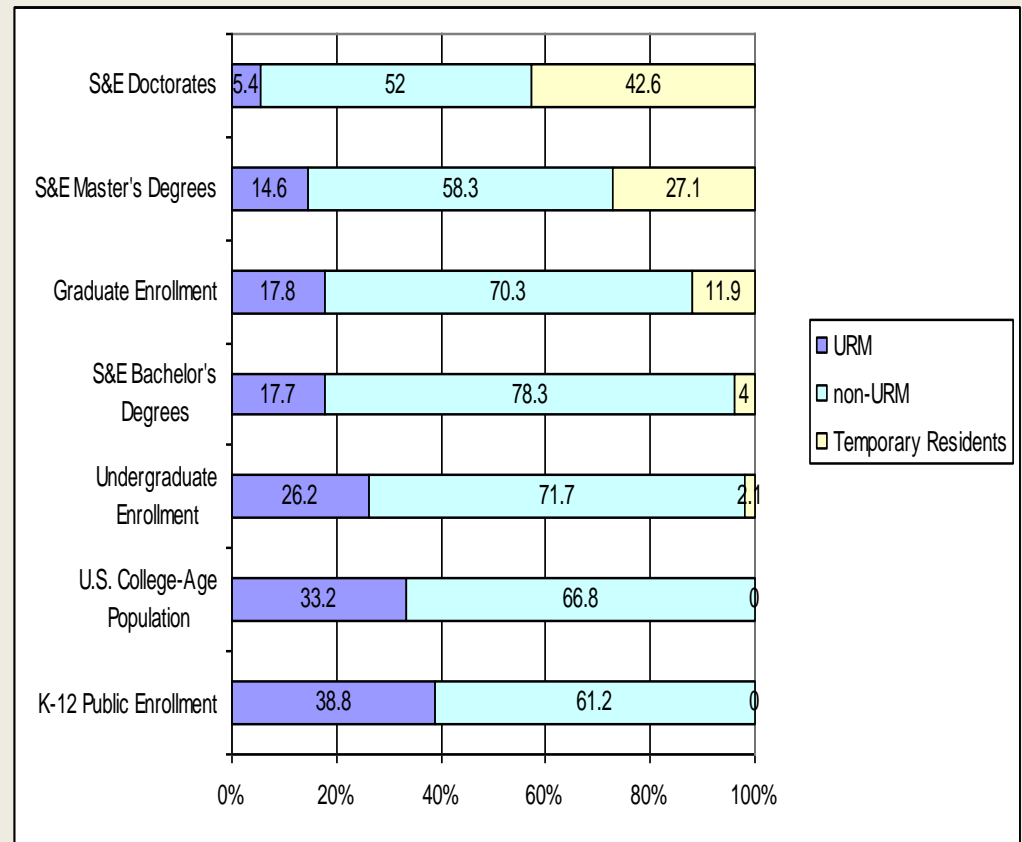
- Academic preparation (K-12 education, achievement gaps, etc.)
- Access and Motivation
- Affordability
- Academic and Social Support

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***

Enrollment and Degrees, by Educational Level and Race/Ethnicity/Citizenship, 2007

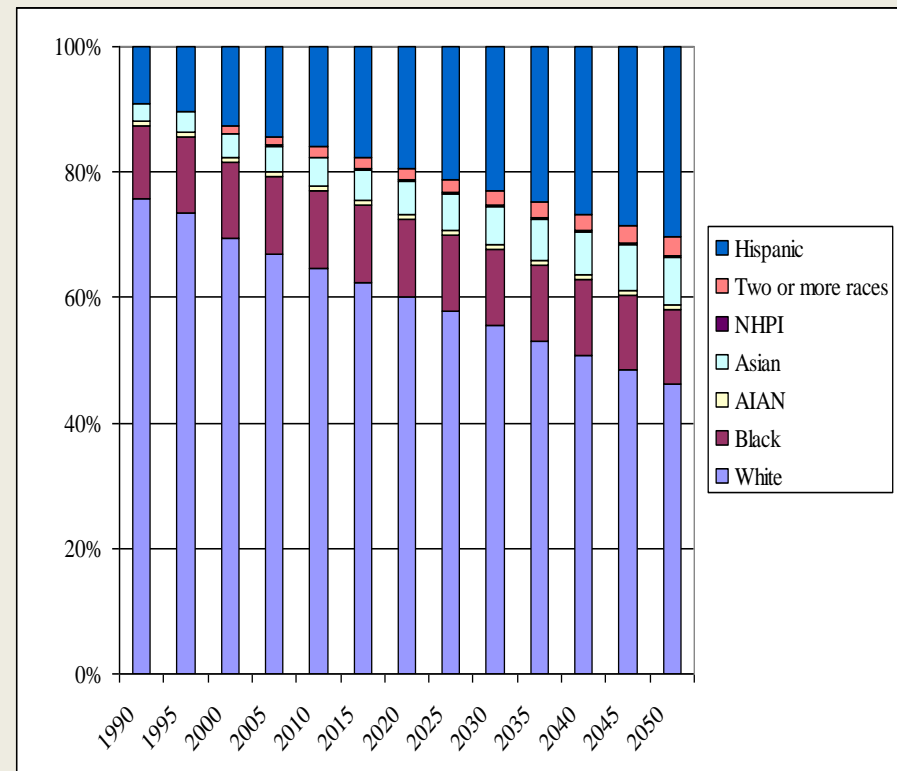


Why Broad Participation Matters

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.***

U.S. population by race/ethnicity, 1990-2050 (2010-2050 projected)

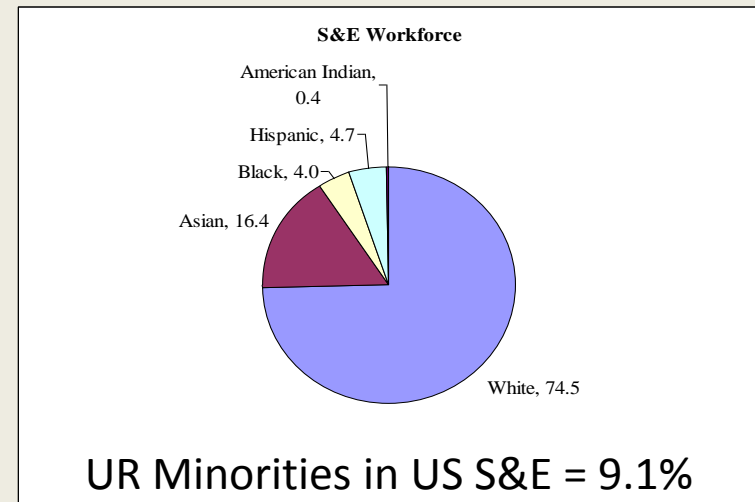
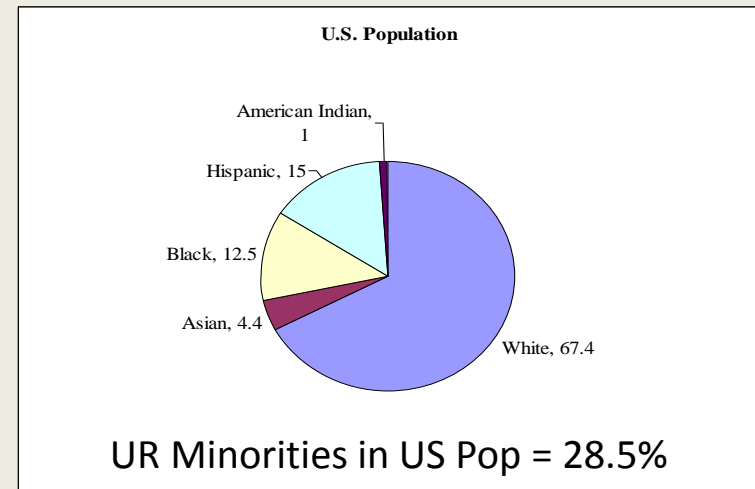


Why Broad Participation Matters

3. Diversity is an asset and an opportunity:

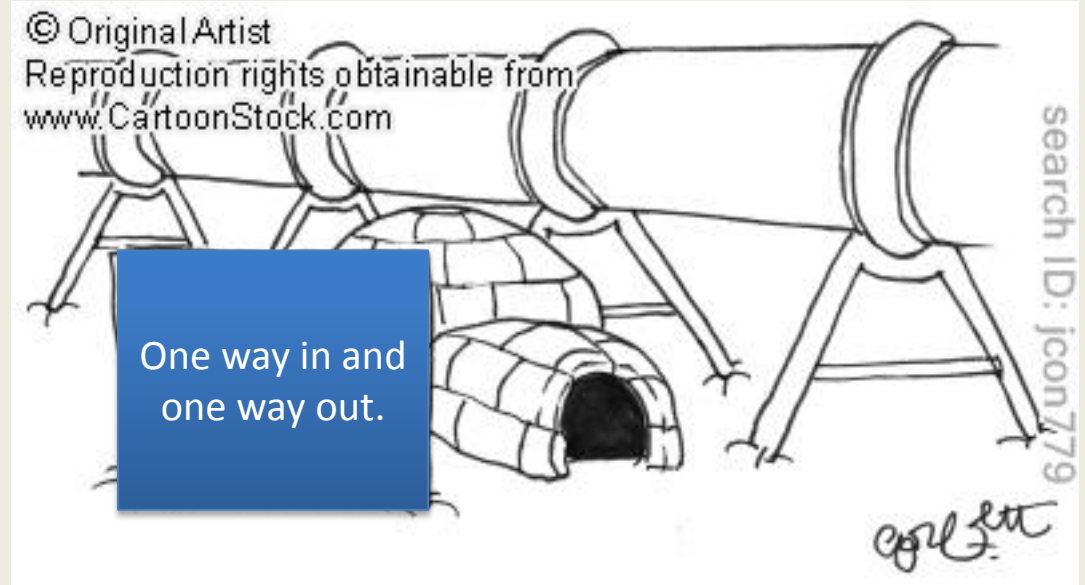
- Increasing the participation and success of URM in S&E contributes to the health of the nation by: **expanding the S&E talent pool, enhancing innovation, and improving the nation's global economic leadership.**
- The S&E workforce is projected by the U.S. Bureau of Labor Statistics to grow faster than 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.

U.S Population and U.S. Science and Engineering Workforce, by Race/Ethnicity, 2006



Debunking Metaphors

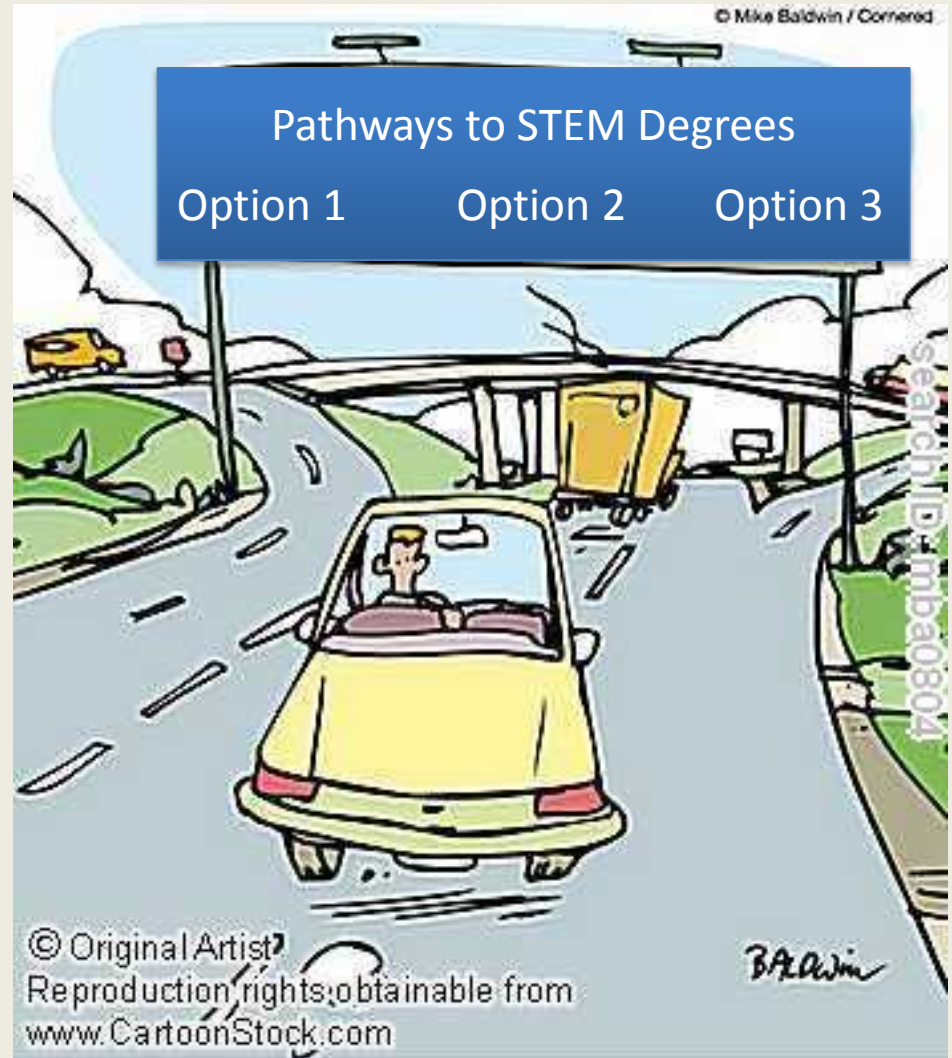
From Pipeline to [Educational] Pathways to STEM Degrees



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.

Source: Handel, S. J. (2011). Improving student transfer from community college to four-year institutions: Perspectives of leaders from baccalaureate-granting institutions. College Board, July 2011.

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

Source: Issue Brief (June 24, 2011). NGA Center for Best Practices. National Governor's Association: Washington, D.C.

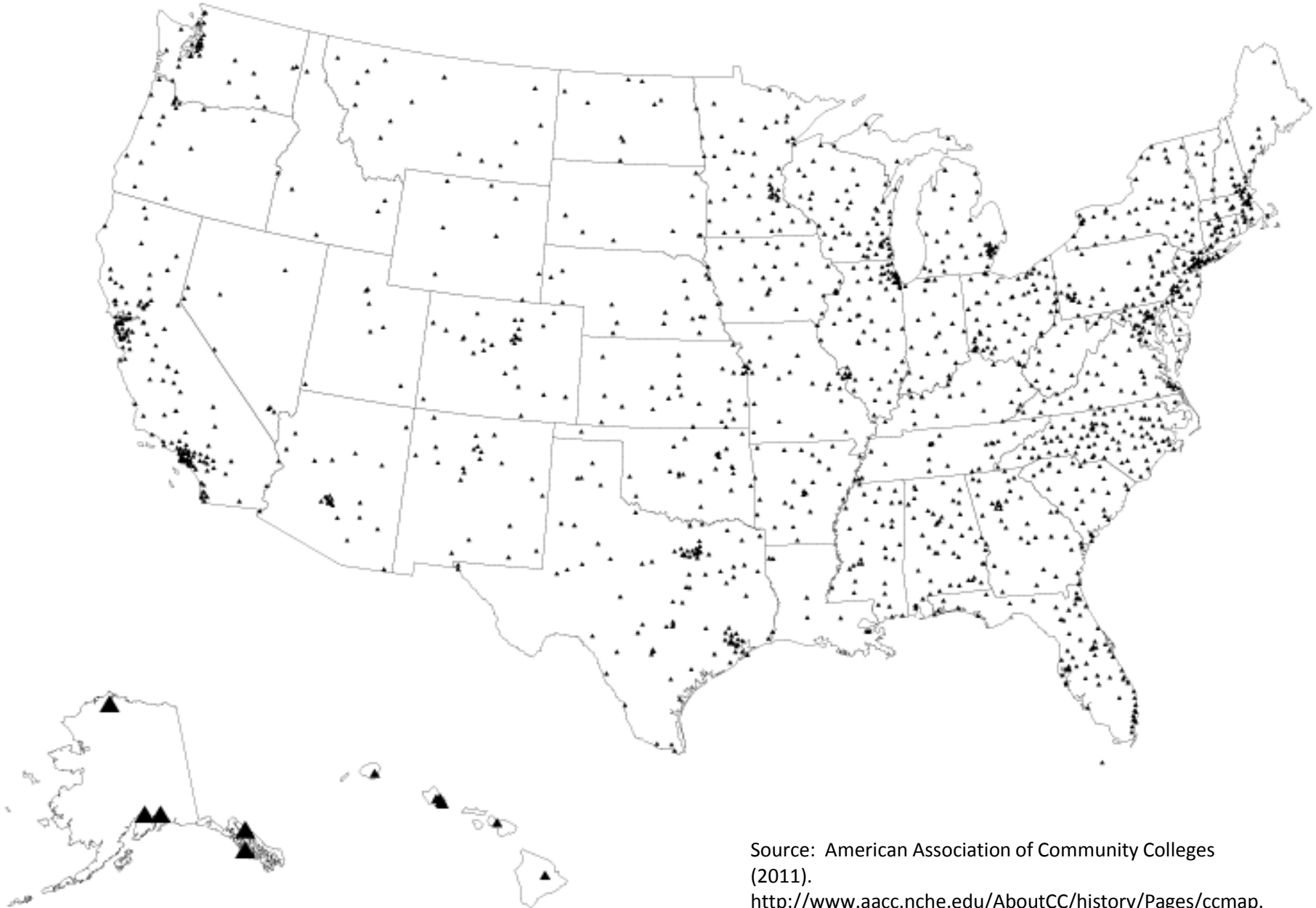
Highlights

- 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).

Community Colleges in the United States



Source: American Association of Community Colleges (2011).
<http://www.aacc.nche.edu/AboutCC/history/Pages/ccmap.aspx>

Figure 1. Conceptual Framework of Educational Trajectories via Community College

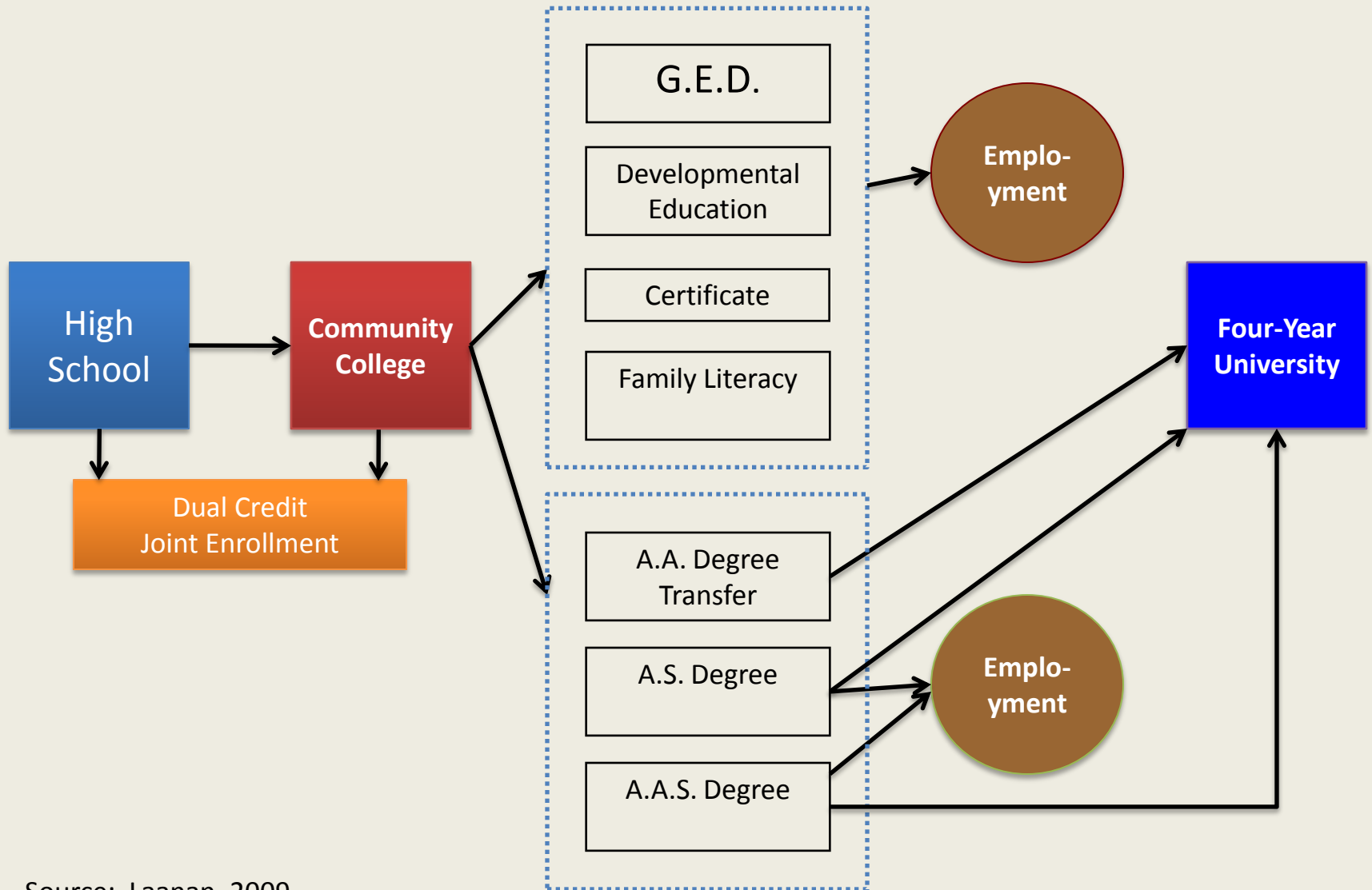
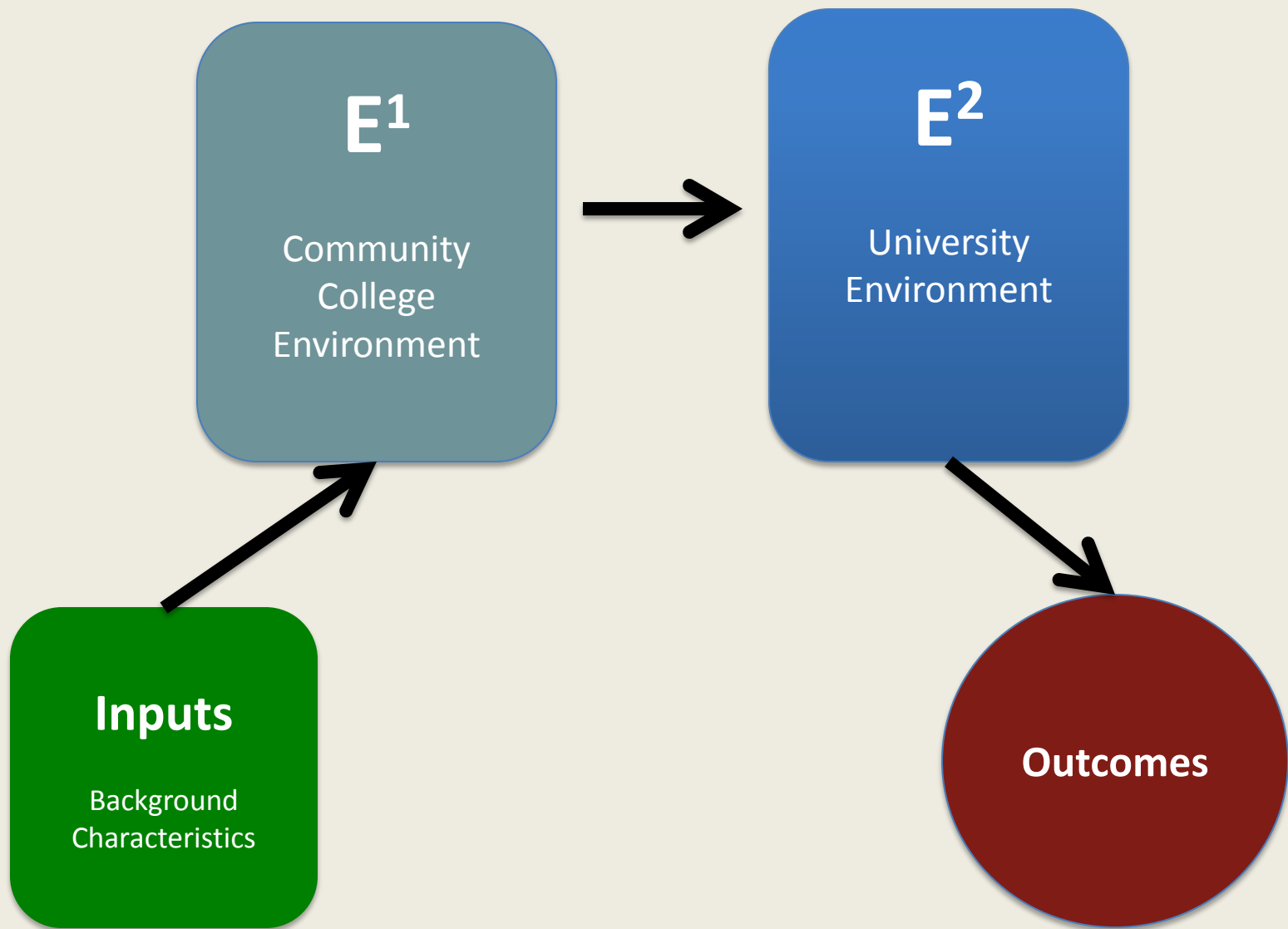


Figure 2. Conceptual Framework of Understanding Transfer Students' College Experiences and Transition to 4-Year University



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

E¹

Community
College
Environment

- 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

E²

University
Environment

- 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



**Outcomes or
Outputs**

- 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
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**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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