

## Underrepresented Undergraduates in STEM at Large, Public, Research Universities: From Matriculation to Degree Completion

### Project Summary

This three-year study examines the matriculation, persistence, and degree attainment of full-time, first-time women, students of color, and low-income undergraduate students in the STEM fields at a consortium of large, public, research universities.

Quantitative and qualitative methods are used to comprehensively examine individual, institutional, and cross-cutting factors and programs that impact the (under)representation of these students in STEM fields at universities that are significant producers of the nation's STEM degrees. Longitudinal data on students who began college in 1999 at eight universities allows for examination of their selection into a STEM field, movement in and out of STEM majors and postsecondary outcomes.

Qualitative data gathered from administrators and directors of STEM intervention programs at ten universities will focus on the design and delivery of such programs. Finally, students enrolled at the ten universities were surveyed to assess what factors influence their choice of major and the impact of program intervention participation.

Collectively these data will allow the researchers to identify factors that influence students to opt in, are filtered out, and persist in STEM majors at large, public, research universities.

### Project Goals

- Examine entrance, persistence and attainment of the following groups into STEM fields at large, public, research universities
  - Females
  - Non-Asian minorities
  - Non-Asian females
  - Low-income students
- Examine movement in, out, and within STEM between students' enrollment and degree attainment
- Disaggregate STEM Fields
- Examine the design, implementation, and impact of STEM intervention programs on underrepresented undergraduate students
  - Understand the reasons for and influences on students' choice of major and persistence in major, including participation in intervention programs

### Challenges and Opportunities

**Challenge**  
The ability to oversample underrepresented minority students at Predominantly White Institutions.

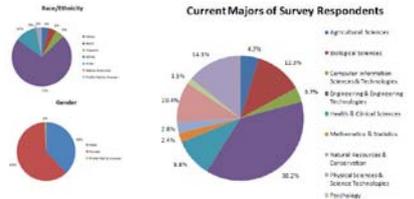
**Opportunity**  
Apply for additional funding to administer undergraduate survey at other institutions, including Minority Serving Institutions and institutions that are top producers of minority degrees in STEM

### Acknowledgements

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### Undergraduate Student Survey

(n=1,881; 9 universities)



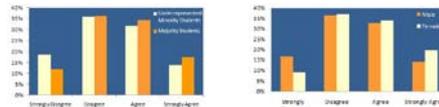
#### Science Identity

- More women report having to work harder than their peers to be recognized as a scientist because of their gender
- Women are less comfortable identifying as a scientist
- More women than men report that faculty recognize them as a scientist
- A greater percentage of women disagree that seeing people who look like them in their field reinforces their science identity

#### Departmental Climate

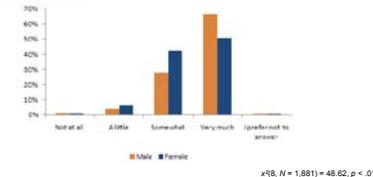
- Underrepresented minority students are less likely to report that they have a sense of belonging in their major.
- Minority students within both "hard" and "soft" STEM majors are more likely to feel that students and faculty within their departments are unwelcoming.
- More women report having social support within their major, underrepresented minority students are less likely to.

Social Support in Major, by Race/Ethnicity and Gender



#### Confidence in Math and Science Skills

- More men report being very confident in their math and science skills as compared to women

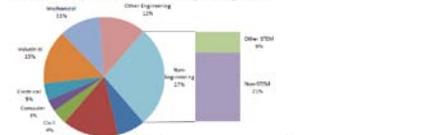


### Longitudinal Data of Undergraduates

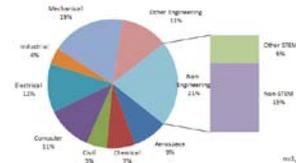
(n= 42,370 students; 8 universities)

- Mellon Foundation data (Fall 1999-Spring 2005)
- Of 4,336 students who began in General Engineering in Fall 1999
  - 3,391 males (78%); 943 females (22%)
  - More women enter Industrial and Chemical Engineering while more men enter Mechanical, Electrical, and Computer Engineering, in Years 1 and 2
  - More departures from Engineering occur in Year 2
  - More men enter Other STEM fields in Year 2 than Year 1 (STEM switching)

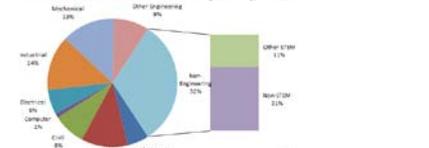
#### Women's Movements from General Engineering, Year 1



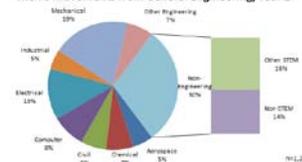
#### Men's Movements from General Engineering, Year 1



#### Women's Movements from General Engineering, Year 2



#### Men's Movements from General Engineering, Year 2



### STEM Intervention Programs

(n=55 directors & administrators; 10 universities)

#### Profile of Participants

	N (%)	N (%)
Female	43 (78.2%)	Male 12 (21.8%)
African American	21 (38.2%)	Bachelor's 3 (5.5%)
Latino/Latina	5 (9.1%)	Master's 21 (38.2%)
Asian American	2 (3.6%)	PhD (in progress) 5 (9.1%)
Native American	1 (1.8%)	PhD (obtained) 20 (36.4%)
White	26 (47.3%)	Did not indicate 6 (10.9%)

Source: Project STEP-UP, 2011.

#### Observed Themes

##### Establishing Legitimacy

- Personnel
- Source(s) of funding
- Central Role on Campus
- Evaluations

##### Tight Coupling with STEM Industry

- Interest Convergence
- Financial Stream (non-recurring)
- Evidence of Success
- Challenged by current economic times

##### Financial, Philosophical and Political Support from Upper Level Administrators

- Recurring Funds to support programs and staff
- Administrative position related to STEM intervention at least at the mid-level of organizational hierarchy
- Prominent display of STEM intervention on external communication from College
- Consistent communicative support from top of organizational hierarchy

##### Moving Students from Passion for STEM to Persistence in STEM

- Academic planning
- Support for perseverance through difficult courses
- Emphasis on collaboration and study group work
- Providing Consistent STEM Role Models

### Next Steps

Starting Fall 2011, we will collect additional data in the form of follow-up interviews with STEM Intervention Program directors and online surveys with undergraduate students. These new data collection efforts will provide longitudinal observations, including funding sources of SIPs and whether or not students persist in STEM majors. In addition, a graduate-level course on factors that impact students' participation and success in STEM and issues surrounding underrepresentation in STEM will be offered online in Spring 2012. Students from the thirteen universities which form the Committee on Institutional Cooperation, including Michigan State University and the University of Chicago, will be able to take the course. The course will draw upon existing literature and research, as well as incorporate findings and implications from this project.

