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

Undergraduate Student Survey
Year 1: 1,881 respondents; Year 3: 3,364 respondents (2,680 new and 684 returning)

- Student identities in relation to STEM continue to be important
  - Science identity is a process of development (I am not a scientist yet, but I am working towards that position; I am a soon to be a scientist)
  - Dual identities (A woman in Engineering, Engineer and scientist)
  - Incorporating science into other identities (An English person who enjoys science as well, I am engineer, which enables me to apply scientific principles to a more direct and challenging problems)
- Parents as Engineers
  - 26.4% of engineering majors have a least one parent who is an engineer (vs. 15.7% of non-engineering majors)
  - 30% of engineering majors reported parents as the biggest influence in choice of major (vs. 17.4% of non-engineering majors)
  - 48.7% of engineering majors who have at least 1 parent in engineering reported parents as the biggest influence in choice of major (vs. 15.2% of non-engineering majors)
- Influences of College Major Choice: Generation Me (Figure 1)
  - Students cite themselves as the most influential person who influenced their choice of major
  - Differences by gender, race/ethnicity, and type of major were found (men, Blacks, Latinos, and Agricultural, Biological, Health Sciences, and Psychology majors most cited "myself")
- Academic and Social Engagement differs
  - Women in STEM are more academically engaged than men in STEM
  - Women in STEM report having to work harder than they thought they could to meet professor’s expectations
- Latinos in STEM discuss ideas and readings with other students outside of class at a higher rate than Blacks or whites.
- Underrepresented minority students in STEM are less likely to participate in Cultural Group Events as compared to those in Non-STEM
- Females of Latin/o students provide instrumental support in their decision to attend college, as well as provide encouragement to persist and high expectations to do well.

STEM Intervention Programs
Year 1: 55 participants; Year 3: 51 participants (20 new and 31 returning)

- How we talk about students matters:
  - Administrators should examine the language used in describing program participants, working to avoid deficit-oriented language
  - Social capital can be fostered.
  - Institutional Agents must continually work to develop social capital in order to create opportunities for students in their programs
- Students have opportunities to build social capital when they are exposed to new networks in STEM intervention programs
- The physical location, program visibility, and organization of program impact service delivery
- Faculty can be involved through efforts to secure funding, writing curriculum, and mentoring students
- Interest convergence is apparent through:
  - An emphasis on quantitative outcomes
  - Articulation of institutional benefits to garner program support
  - Maximizing institutional costs while maximizing benefits
- Program sustainability can be increased with the use of evaluation (Figure 2)
  - Evaluations help demonstrate the value and worth of the program
  - The program gains legitimacy in the eyes of stakeholders
  - Evaluation results can help secure recurring funding and other resources for the program
- Administrators are increasingly asked to “do more with less” – financial and other resources are scarce

Longitudinal Data of Undergraduates
(m=42,370)

- Tuition differentials in STEM fields may impact low-income students’ entrance and persistence in the STEM fields
- Low-income students majoring in Engineering had highest calculated student need and highest total financial aid awarded
- Amount and variety of financial aid initially offsets higher cost of Engineering, but the affordability fluctuates over time
- Receiving a Pell Grant increases odds of completing a degree in Engineering, with a tuition differential
- Initial access and enrollment in higher-cost STEM fields may still be an issue and represents an opportunity for financial aid counseling to students and families

Challenges and Opportunities

Challenge
STEM Intervention Program personnel have difficulty taking explicitly about racial and ethnic diversity in their program design and delivery. Legal parameters, such as restrictions on affirmative action, shape the way in which administrators talk about and address issues of diversity.

Opportunity
The six universities added under the supplemental grant offers data on more diverse student populations, as well applicant data, which is not available for the ten universities in the original study. The applicant data will allow for the exploration of "overmatching" or "mismatching" in the STEM fields. In addition, the contexts of the new universities will allow for additional insight on the many factors that impact STEM entrance and success.

Next Steps
- Continue data collection efforts at six new universities
- Analyze survey data gathered in Fall 2011 (new respondents and follow-up participants), including the examination of:
  - Changes over time for follow-up participants
  - Comparisons between first and second cohorts of respondents
  - Persistence in STEM for degree completers
- Analyze interview data gathered in Fall 2011 (new and returning participants)
- Examine and compare contextual factors on STEM participation and intervention programs

Acknowledgements
Erin Castro, Casey George-Jackson, Ph.D., Erin Harwell, Derek Houston, Gregory S. Kienzl, Ph.D., Ife Onyenekwu, Mariana G. Martinez, Blanca Rincon, Kathy Stoffle-McAllister, Kimberly S. Walker, Monirasha Williams

UMBC: Lisa Dickson (Co-PI)
UMBC: Kim Stolle-McAllister; Kimberly S. Houston; Gregory S. Kienzl, Ph.D.; Ife Onyenekwu; Mariana G. Martinez; Blanca Rincon; Kathy Stoffle-McAllister, Kimberly S. Walker, Monirasha Williams

UIUC: William T. Trent (PI) & Lorenzo Baber (Co-PI)
UMBC: Lisa Dickson (Co-PI)

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