The College Experiences that Influence Post-Baccalaureate STEM Pathways

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HIGHER EDUCATION RESEARCH INSTITUTE AT UCLA
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Why Study What Happens to STEM Degree holders?

- One million more STEM degrees over the next decade: Need to expand the pool of workers in science, technology, engineering, and math (STEM) disciplines to remain globally competitive.
- Retention in STEM is key: Easiest way to address this call is to make sure those with STEM graduates eventually have STEM-related careers
- Currently, there is a lack of research that links college experiences and the college context to graduates' actual post-baccalaureate decisions. Our goal is to address this with longitudinal research on STEM aspirants who completed STEM degrees: What are they doing now?

Literature Review

Demographic Factors

- SES
- Gender
- Race

High School Preparation

- Coursework
- SAT scores
- GPA

Institutional Characteristics

- Private institutions produce more STEM degrees
- HBCUs, and HSIs contribute to students' enrollment in STEM graduate study and/or the STEM workforce

Undergraduate Experiences

- Working & undergraduate debt
- Undergraduate major
- Targeted retention programs
- Faculty mentoring and support
- Undergraduate research programs
- Involvement in student organizations and professional associations
- Co- and extracurricular experiences

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Theoretical Framework: Careership

(Hodkinson & Sparkes, 1997)

An individual is an active part of the decision-making processes, as they accept or decline opportunities

However, “decision-making is never an exclusively individual act” and is deeply intertwined with personal circumstances and contexts (Hodkinson & Sparkes,1997; Hodkinson, 2008, p. 9).

The individual *and* the environment must be taken into account

Several pathways to arrive at a desired post-baccalaureate outcome

Acknowledges that social inequities influence the experiences and interactions individuals have within their environment – meaning people are both chosen for professions and actively choose them as well

Purpose

The purpose of this study is to identify the undergraduate experiences, student perceptions, and institutional contexts that predict three dichotomous outcomes among STEM bachelor's degree recipients

1) Whether the student had ever matriculated into a STEM graduate/professional program versus not

2) Whether the student is working in the STEM workforce versus not

3) Whether a student remained in a STEM pathway (via the workforce or graduate school) versus not

Methods: Data Sources and Sample

Data sources:

2004 CIRP Freshman Survey

2016 Post-Baccalaureate Survey

Integrated Postsecondary Education Data System (IPEDS) - 2006

Sample size:

1531 STEM bachelor's recipients who attended 252 undergraduate institutions

Analysis:

Descriptive statistics

Multinomial HGLM

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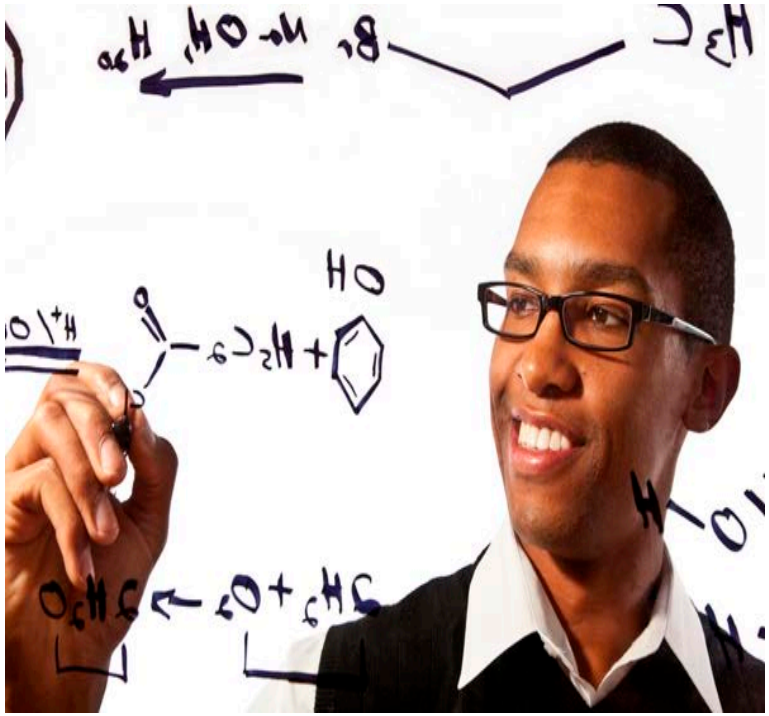
Methods: Dependent Variables (all dichotomous)



Status in terms of employment or matriculation into graduate school

- Enrolled in STEM graduate program (versus not)
- Employed in a STEM career (versus not)
- Remained in a STEM post-baccalaureate pathway (versus not)

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Methods: Independent Variables

Student-level

Pre-college (2004 TFS)

- Demographic characteristics
- Pre-college academic preparation
- Educational degree and career aspirations
- Pre-college educational experiences

During college: (2016 Post Bacc Survey)

- Undergraduate Major
- Co-curricular and extra-curricular experiences

After college: (2016 Post Bacc Survey)

- Perception of undergraduate training on skills
- Personal values Now

Institution-level

IPEDS 2006 Data

- Institutional Type – Liberal Arts, Masters Comprehensive, and Research Institutions
- Control (Private vs Public)
- Full-time equivalent student enrollment
- Percentage URMs of total enrollment
- Percentage women of total enrollment
- Selectivity (% admitted of total applicants)

Descriptive Statistics

Dependent Variable	Percent
Has or had enrolled in a STEM grad program	55%
Currently in the STEM workforce	62%
Departure from STEM pathway	23%
Demographics	
Gender: Female	56%
American Indian	2%
Asian/Pacific Islander	16%
Black	6%
Latino/a	9%
White	67%

DV = Enrollment in a STEM Graduate Program

		T-Ratio	P-Value
Pre-College Achievement, Dispositions, and Aspirations (TFS 2004)			
Degree Aspirations: Bachelor (ref. Masters)	–	-3.57	0.00
Degree Aspirations: Doctorate (ref. Masters)	+	2.42	0.02
Undergraduate Experiences and Contextual Influences (Follow-up Survey 2016)			
UG Major: Math/Statistics/Computer Sciences (ref. Biological Sciences)	–	-4.91	0.00
Overall GPA	+	5.37	0.00
To what extent did your undergraduate program contribute to your ability to:			
Pursue Graduate or Professional Schools	+	11.94	0.00
Workforce Readiness	–	-6.42	0.00
When you think about your long-term career choice, how important are the following considerations:			
Job Security	+	2.26	0.02
Leadership Opportunities	–	-1.99	0.05
Institutional Characteristics (IPEDS 2006)			
Selectivity	–	-2.70	0.01

DV = Currently in the STEM Workforce

		T-Ratio	P-Value
Demographic Characteristics (TFS 2004)			
URM	--	-1.98	0.05
Gender: Female	--	-5.21	0.00
Pre-college Aspirations (TFS 2004)			
Career Aspirations: Scientific Researcher (ref: Health Professional)	--	-2.57	5.61
Career Aspirations: Other Non-STEM Career	--	-1.98	5.61
When you think about your long-term career choice, how important are the following considerations? (Follow-up Survey 2016)			
Job Security	+	5.61	0.00
Leadership Opportunities	--	-3.56	0.00
Institutional Characteristics (IPEDS 2006)			
Institutional Type: Liberal Arts (ref: Masters comp)	--	-2.02	0.04
Control (Higher Value Private)	+	2.36	0.02

DV = Remained in a STEM Pathway

Significant Predictors of STEM Graduate Program Enrollment	Sign	T-Ratio	P-Value
Demographic Characteristics (TFS 2004)			
Gender: Female	--	-3.70	0.00
Pre-College Achievement, Dispositions, and Aspirations (TFS 2004)			
Years of HS Study: Math	+	2.48	0.01
Participated in a summer research program or health science research program	+	2.31	0.02
Degree Aspirations: Doctorate	+	2.19	0.03

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DV = Remained in a STEM Pathway (Cont.)

Significant Predictors of STEM Graduate Program Enrollment	Sign	T-Ratio	P-Value
Undergraduate Experiences and Contextual Influences (Follow-up Survey 2016)			
UG Major: Health Professional Science (ref: Biological Sciences)	+	2.89	0.00
Overall GPA	+	2.91	0.00
To what extent did your undergraduate program contribute to your ability to:			
Pursue Graduate or Professional Schools	+	4.82	0.00
When you think about your long-term career choice, how important are the following (Follow-up Survey 2016)			
Job Security	+	4.51	0.00
Leadership Opportunities	–	-4.83	0.00
Institutional Characteristics (IPEDS 2006)			
Institutional Type: Liberal Arts (ref: Masters Comp)	–	-2.15	0.03

Discussion

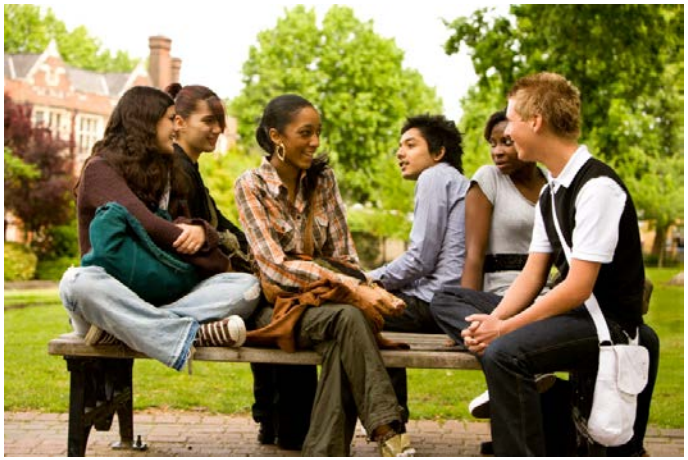
These are preliminary results since our survey is still in the field, but we expect there are key takeaways that will not change as we complete the study:

- Early exposure to STEM learning experiences are critical to shaping students' trajectories in STEM
- Equity issues remain in the post-college years: URM and female STEM graduates less likely to remain in a STEM pathway
- Institutional contexts play a significant a role, selective institutions v. less selective institutions
- Job stability values were important for this cohort in their long-term career choices matter, the were completing college as the Great Recession hit

Conclusion & Implications

Considering the complexity of career decision-making, there needs to be more guidance of STEM graduates *before* they leave the university so that they can achieve their career goals

Long term career guidance is also necessary in graduate school and research careers.



Directions for future research

- Diversity Program Consortium and CEC longitudinal tracking of students and career progress
- NRMN coaching for mentees and faculty mentors
- Multiple methods extending research to all career stages

Questions?

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