

Developing a Science Identity

Long-Term Effects of First-Year Experiences That Matter

Higher Education Research Institute, University of California at Los Angeles



Purpose

Developing a commitment to a discipline early in college can have long-lasting effects on major persistence as students matriculate toward graduation. With the high attrition rates found in science, technology, engineering, and mathematics (STEM) disciplines, practitioners and policymakers need to identify best practices that promote students' development of a stronger identity with their STEM major. Using a longitudinal dataset, this study examines how pre-college and first-year experiences affect students' science identity development over four years.

Data Source

Survey data from students at three time points:

- 2004 Freshman Survey
- 2005 Your First College Year
- 2008 College Senior Survey

Sample:

- 1,133 STEM aspirants across 137 institutions
- Race/Ethnicity: 19% Black, 21% Latino, 5% Native American, 13% Asian American, 42% White
- Women (71%) are overrepresented in the sample

Science Identity Construct (STEM ID)

Personal importance of my goals:

- Become an authority in my field
- Obtain recognition from my colleagues for contributions to my special field
- Make a theoretical contribution to science
- Work to find a cure to a health problem

Accentuation and Cumulative Advantage

Accentuation:

College accentuates students' predispositions, as students:

- Find peers with mutual interests
- Seek opportunities that meet their goals and interests
- Identify early opportunities for strengthening their STEM identities, which may have both short- and long-term effects

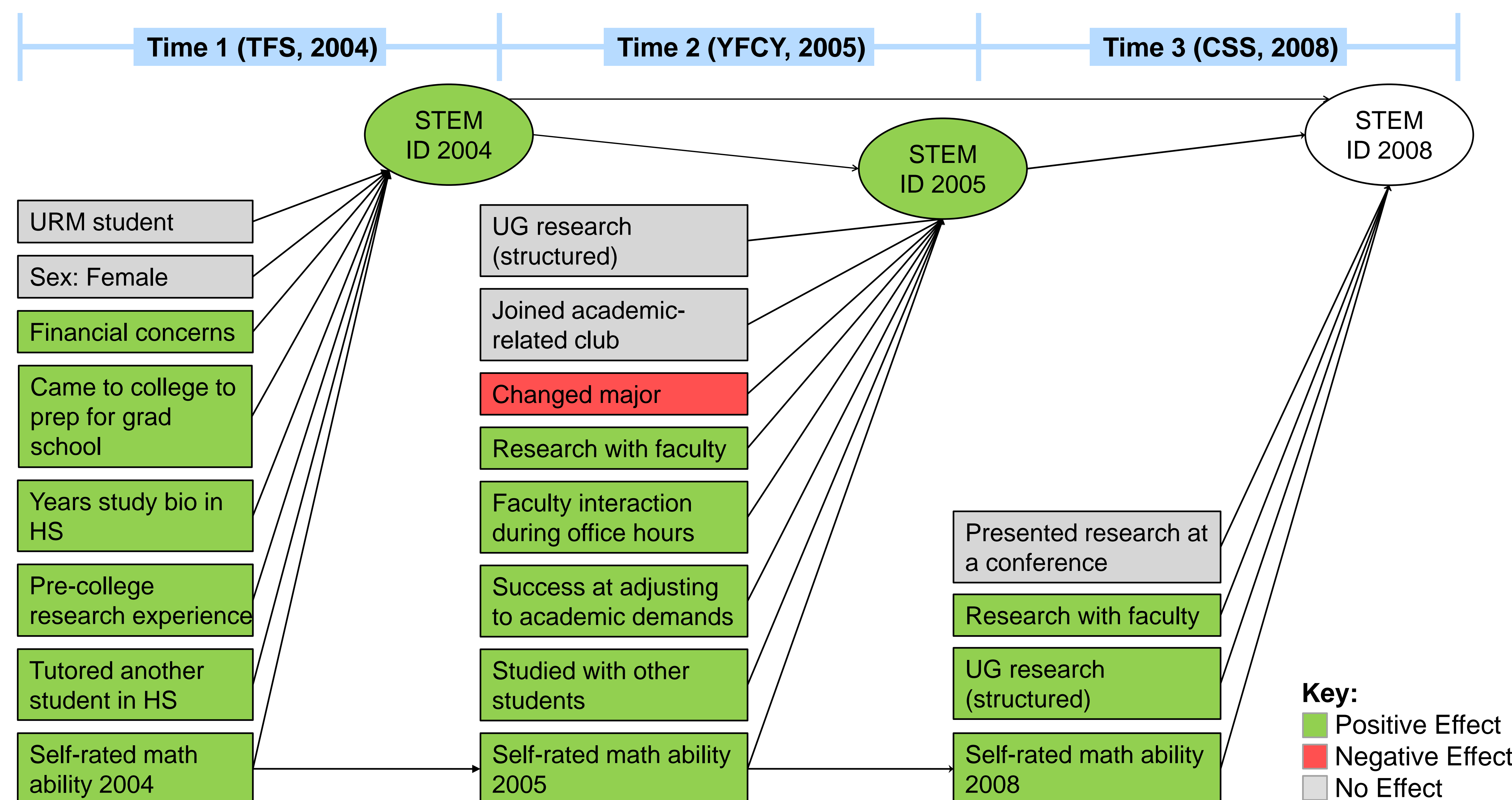
Cumulative Advantage:

Students who start with stronger STEM identities are more likely to have even stronger STEM identities in the future

- Feedback loops
 - Be recognized, and recognize oneself, as a scientist early
 - Early recognition increases motivation & interest in STEM
 - Increased recognition as a scientist, both intrinsically and extrinsically, may provide access to additional resources that provide further opportunity to strengthen one's STEM identity

Stronger early STEM identity leads to stronger commitment to scientific work, thus increasing STEM identity

Three Time Point Structural Equation Model



Key Direct Effects

Influences on 2004 Science Identity:

- Pre-college preparation (years of biology and pre-college research)
- Coming to college to prepare for graduate school
- Mathematical self-confidence
- Tutoring another student in high school

Influences on 2005 Science Identity:

- Initial (entering) science identity
- Connecting with faculty generally and conducting research
- Successfully adjusting to the academic demands of college
- Changing major (negative effect)

Influences on 2008 Science Identity:

- Initial science identity and end-of-first-year science identity
- Conducting research with faculty and in structured programs
- Presenting research at a conference

Key Indirect Effects

Pre-College and First-year Influences on 2008 Science Identity:

- Long-term effects of early research experiences
- Developing confidence in areas like math early, particularly in the first year of college
- Adjusting to the academic demands of college in the first year
- Developing first-year support networks with students and faculty

Next Steps

In the future, our project will:

- Analyze additional outcomes across these three time points
- Administer post-baccalaureate survey to initial sample of 40,000 students who entered college in 2004
- Identify additional first-year and senior-year experiences that contribute to students' development as scientists during college

Project Team

Sylvia Hurtado, Co-Principal Investigator
Mitchell Chang, Co-Principal Investigator

Kevin Eagan, Postdoctoral Research Fellow
Josephine Gasiewski, Postdoctoral Research Fellow

Aaron Pearl, Administrative Specialist

Monica H. Lin, Research Analyst
Christopher B. Newman, Research Analyst
Jessica Sharkness, Research Analyst
Minh Tran, Research Analyst
Juan Garibay, Research Analyst
Gina Garcia, Research Analyst
Cindy Mosqueda, Research Analyst
Felisha Herrera, Research Analyst

For Further Information

herinih@ucla.edu

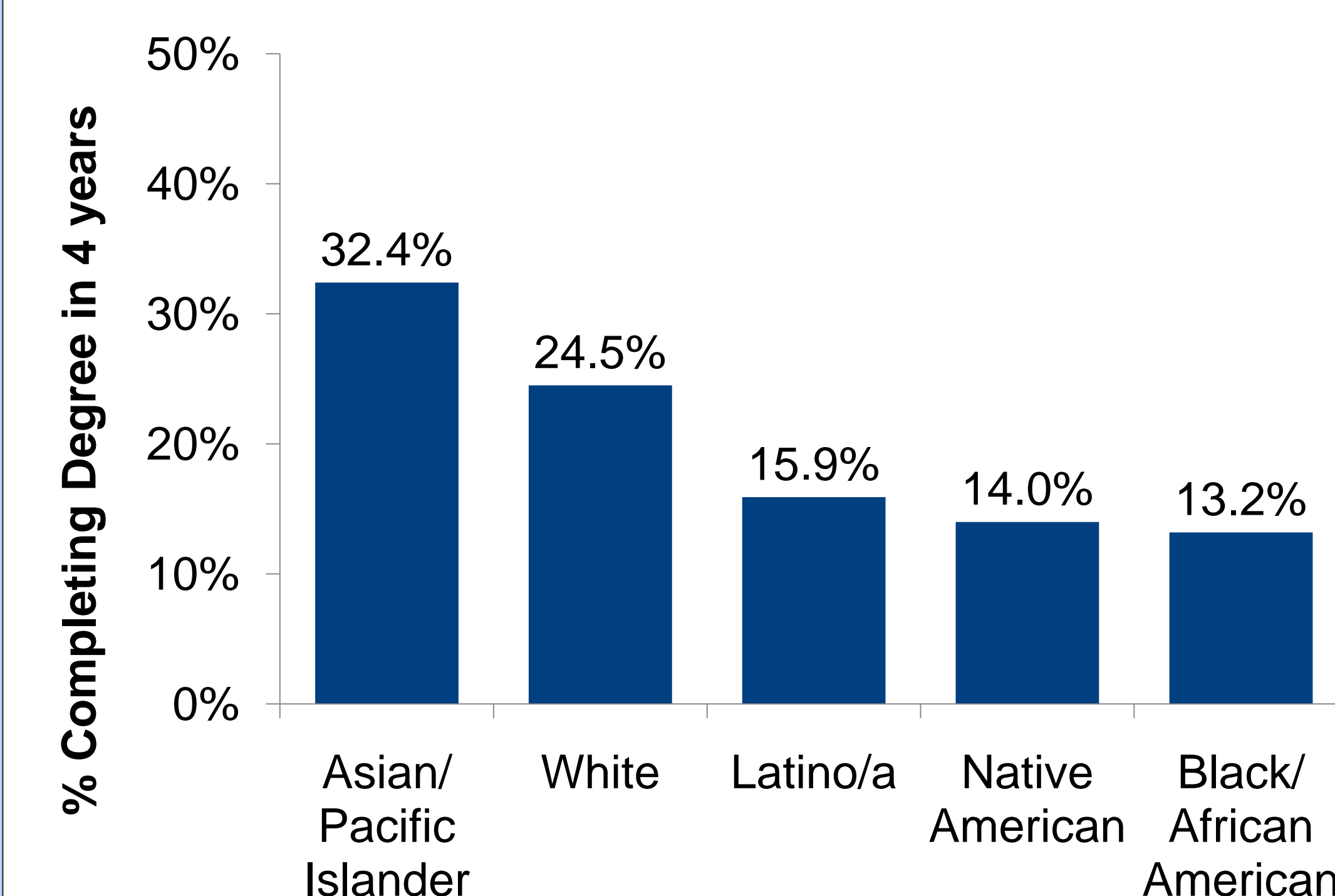
<http://www.heri.ucla.edu/nih>



POST-BACCALAUREATE
EXPERIENCES, SUCCESS, & TRANSITION



4-Year STEM Degree Completion, by race



Source: HERI, 2010

Implications for Practice

Our findings indicate that early experiences with research, both pre-college and during students' first year of college, accentuate science identity as students progress through college. We found direct and indirect effects of early research opportunities on students' science identity at the end of their first year of college and at the end of four years of college. Likewise, early contact and recognition from faculty directly affected students' science identity at the end of their first year and indirectly affected this construct at the end of their fourth year of college. Finally, results emphasize the importance of developing strong science identities early, as students with a stronger identity at college entry and at the end of their first year of college had significantly stronger connections to science later in college. These findings suggest that colleges and universities would be well-served to engage STEM majors in research opportunities as early as possible, as such experiences provide opportunities for students to apply knowledge learned in the classroom and to connect with faculty.

