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The science identity and entering a science occupation

Jan E. Stets [a, *], Philip S. Brenner [b], Peter J. Burke [a], Richard T. Serpe [c]

[a] University of California, Riverside, United States
[b] University of Massachusetts, Boston, United States
[c] Kent State University, United States

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ABSTRACT

The initiative to increase the number of students in STEM disciplines and train them for a science-related job is a current national focus. Using longitudinal panel data from a national study that followed underrepresented college students in STEM fields, we investigate the neglected role that social psychological processes play in influencing science activity among the young. We study the impact of identity processes related to being a science student on entering a science occupation. More broadly, we examine whether an identity formulated in one institutional setting (education) has effects that persist to another institutional setting (the economy). We find that the science identity positively impacts the likelihood of entering a science occupation. It also serves as a mediator for other factors that are related to educational success. This provides insight into how an identity can guide behavior to move persons into structural positions across institutional domains.

1. Introduction

Improving the rate at which individuals enter into and remain in a career in science remains a national concern. For example, in 2010, as part of his “Educate to Innovate” campaign, President Obama announced an initiative wherein select major companies, universities, and government agencies would partner to prepare more than 10,000 new teachers in science and math, and support the professional development of more than 100,000 current teachers in science, technology, engineering, and mathematics (STEM) by 2015 (White House Press Secretary, 2010). The U.S. lags behind other nations in STEM education, and Obama's objective in addressing the teacher shortage in STEM was to raise America as a leader internationally in STEM achievement. Jobs in STEM are anticipated to be a major area of future growth and, coupled with the higher earnings in this area, it seems wise to educate more youth into the STEM fields (Bureau of Labor Statistics, (2012)).

Women and racial minorities historically have been underrepresented in higher education, especially STEM fields. For example, recent data reveals that Blacks and Latino/as comprised less than 10% of all doctoral degrees in STEM fields (National Science Foundation, 2012). Since racial minorities will continue to comprise a larger proportion of the US population rise (over 40% will be Black or Latino/a by 2045) (United States Census Bureau, 2012), it is important that efforts are made to increase the participation of minorities in STEM fields so that we may have an adequate number of qualified STEM workers.

One way to increase minority participation in STEM occupations is to develop enrichment programs in colleges that will help channel students into these fields. These programs facilitate the development of skills that increase the rate at which

* Corresponding author. Department of Sociology, University of California, Riverside, 92501-0419, United States.
E-mail address: jan.stets@ucr.edu (J.E. Stets).

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students will retain an interest in science during college and enter a science-related occupation rather than leaking out of the scientific pipeline (Schultz et al., 2011). While involvement in science enrichment programs helps, what also may be important is whether individuals see themselves as a "science" student such that they enact behaviors consistent with this characterization. Here we refer to people as having a "science identity."

The idea that the science identity is an important factor producing minority students' involvement in science has received some attention (Carlone and Johnson, 2007; Lee, 1998, 2002; Merolla and Serpe, 2013; Merolla et al., 2012). However, the outcomes examined in many of these studies is "developing an interest in" or an "intention to pursue" a STEM career. We extend this line of work in several ways. First, rather than focusing on whether minority students retain an interest in science during the schooling years, or whether they intend to pursue a science-related career after they have graduated, we examine whether they enter a science-related occupation upon leaving the education setting. While interest and intention are important (and we include intention in our current analysis), leaking out of the pipeline may still occur. Thus, we study the impact that the identity process has on obtaining work in a science field in the economy.

Second, we study different but interrelated dimensions of the identity process during the school years as they impact obtaining a science occupation (Stets and Serpe, 2013). These include seeing oneself as having a science identity, holding the science identity as important to oneself (identity prominence), and experiencing verification (or the lack thereof) of the science identity during the school years. Focusing on these multiple dimensions of the identity process and applying it to the education setting advances the theoretical development of identity theory (Stryker and Burke, 2000) as well as identifies the dimensions of one's science identity that importantly influence obtaining a science occupation.

Third, we study these identity processes while controlling for other processes that may be theoretically relevant in understanding achievement in STEM education. Specifically, we operationalize self-efficacy theory (Bandura, 1997), goal theory (Covington, 2000), and attitude theory (Fishbein and Ajzen, 1975) as alternative explanations for entering a science career. We find that even controlling for these alternative processes, the science identity that is formulated in the educational system increases the likelihood of channeling minority students into a science occupation. To show this, we use data from five waves of a national panel study that followed underrepresented college students involved in a STEM-related program. Data collection began in 2005 and ended in 2013. The multiple waves of data consist of repeated measures on all of the variables. A total of 966 participants are followed across ten waves.

2. Theory

2.1. Identity theory

An identity is a set of meanings that define who a person is in terms of their roles (role identities), group or category memberships (social identities), or as unique individuals (person identities) (Burke and Stets, 2009). Our approach focuses on the science identity as a role identity given an individual's occupancy of the student role. We are interested in minority students defining themselves as science students. What does it mean, for example, to be a science student? In general, it is understood that the meanings that define the identity are portrayed in behavior that emanates from the identity. A person who thinks of herself as a science student will act in ways that convey these meanings to others as well as to herself. To the extent that minority students see themselves as "very good" or "excelling" as science students, they can be conceptualized as having a higher science identity standard compared to those who see themselves as "not at all good" or "failing" as a science student.

The science identity matters for some important student outcomes. Research reveals that for minority students, the science identity is related to students' interest in science, their persistence or tenacity in a science discipline, their intention to pursue a scientific career, and even their decision to enter a graduate science program (Lee, 1998; Merolla and Serpe, 2013; Merolla et al., 2012). While previous research has revealed that persistence in science as a field of study during the school years requires mastering the skills and activities related to science, also important is that individuals see themselves in terms of being a student of science; that is, having a science identity (Carlone and Johnson, 2007; Lee, 1998, 2002; Merolla et al., 2012). However, it is unclear whether science outcomes in school translate into taking on work in the economy that is science-related. We examine science-related employment to evaluate the impact that minority students' self-views as students of science (the science identity) has on the work that they do once they leave the educational setting.

A long-standing tenet of identity theory is that the meanings that individuals attribute to themselves should correspond to the meanings implied by how they behave in situations (Burke and Reitzes, 1981). If we did not know people's identity, observing their behavior and the meanings evoked through it would give us a sense as to their underlying identity. Research evidences the link between one's identity and behavior that corresponds to it (Burke, 2003; Burke and Reitzes, 1981; Reitzes and Burke, 1980; Riley and Burke, 1995; Stryker and Serpe, 1982). Given this, we hypothesize that among these primarily minority students:

H1: *The higher the students' science identity, the more likely they will be to enter a science occupation.*

Since identities are comprised of different dimensions that are internally experienced, we investigate not only how individuals see themselves in terms of being a science student (the science identity), but also the prominence/importance of their science identity, and the degree to which their science identity is verified in situations. Identity prominence refers to the