# Discrimination, friendship diversity, and STEM-related outcomes for incoming ethnic minority college students ☆

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## ARTICLE INFO

## ABSTRACT

Ethnic minority students are underrepresented in science, technology, engineering and math (STEM). The current study utilizes social cognitive career theory (SCCT) to examine the associations between ethnic discrimination and friendship group diversity, and academic self-efficacy, as well as the intent to major in a STEM-related field in two cohorts ($N = 1307$ and 1701) of incoming ethnic minority college students (71% and 70% women; 59% and 54% Asian, 24% and 29% Latino/a, 3% and 3% African American, 13% and 14% Multiethnic for Cohorts 1 and 2, respectively). Discrimination was negatively associated with math/science self-efficacy while having more diverse friends was positively associated with both academic self-efficacy (math/science for Cohort 1 and general for Cohort 2) and intention to major in STEM for both cohorts. Additionally, friend group diversity served as a buffer (Cohort 1) such that discrimination was associated with a decreased intent to major in STEM only when students had few friends from different ethnic, racial, or cultural backgrounds. For those with diverse friends, there was no association between discrimination and intent to major in STEM. Ethnic group differences between Asian and a combined group of Latino/a, African American, and Multiethnic students were assessed. No ethnic group differences were found for any of the associations between discrimination or friendship group diversity and STEM outcomes. These findings suggest supporting interethnic friendships may promote STEM involvement among ethnic minority college students.

In the United States, Latino/a and African American students obtain fewer college degrees in science, technology, engineering, and math (STEM) than White and Asian men (NSF, 2013). This is despite ethnic minority group representation increasing in the US, including in undergraduate institutions (Dougherty & Jordan, 2012). While efforts are being made in earlier stages of education to promote STEM involvement, there remains a large numerical disparity between White and Asian men and other ethnic minority groups declaring a STEM-related major when they transition to college (Hispanic and African American students; Lowell, Salzman, Bernstein, & Henderson, 2009; NSF, 2013). This disparity is not trivial, as diversifying the STEM workforce can add to the range of ideas, experiences, and perspectives needed to improve scientific discovery in the 21st century (Grossman & Porche, 2013). The present study focuses on examining collegiate barriers and supports for ethnically diverse students in STEM majors, in order to inform universities of effective strategies to recruit and retain greater numbers of ethnic minority students, and in turn to increasingly diversify the workforce.

Reasons for the lack of ethnic minority students declaring STEM-related majors are multi-faceted and can be societal, social, and/or individual; however, one prevalent social concern is the normative experience of ethnic discrimination (Eccles, Wong, & Peck, 2006; García Coll et al., 1996; U.S. Department of Health and Human Services, 1999). Ethnic discrimination occurs when an

individual attributes a negative event or action (e.g., given an easier task) to have occurred because of their ethnic background. When these discrimination experiences occur in the context of educational settings they can have implications for academic outcomes, particularly in majors in which ethnic minority students are in the numerical minority (Hughes, Del Toro, Harding, Way, & Rarick, 2016; Levin, Van Laar, & Foote, 2006). Such homogenous social environments are found not only in higher education, but also in the STEM-related work force (Finley, 2014; Snyder, 2014). The related perceptions of discrimination have been found to affect ethnic minority students' self-efficacy for academic success in STEM-related fields, causing many to never start in these fields (MacPhee, Farro, & Canetto, 2013; Moakler & Kim, 2014; O'Brien, Martinez-Pons, & Kopala, 1999).

In contrast, ethnically diverse environments (e.g., friends, peer groups, classrooms) have the potential to increase positive academic outcomes that are directly related to future career attainment (Milem & Umbach, 2003). A large body of research on secondary education presents the benefits of being educated in diverse versus homogenous *institutions* (Antonio, 2001; Chang, 1999; Gurin, 1999; Milem, 2003; Milem & Hakuta, 2000; Smith, 1997). This research highlights benefits to the individual in terms of enhancing ideas, exposure to new information, and intellectual growth. Additionally, meta-analytic work has demonstrated that more proximal environments, such as the friend group, may provide slightly stronger benefits for academic-specific outcomes (Bowman, 2010). Despite these findings, research is lacking on how a diverse friend group may benefit students specifically within STEM majors. This is of increasing importance due to the continued ethnic homogeneity in STEM majors regardless of overall campus diversity (Finley, 2014; Snyder, 2014). The goal of the present study is to examine the potential direct associations between ethnic discrimination and friendship group diversity and STEM-related outcomes, as well as the buffering role friendship diversity might play for students who experience ethnic discrimination. These associations were assessed in two separate cohorts of ethnic minority students who were about to transition to college.

## 1. Self-efficacy and college major intent as important components of STEM involvement

Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) posits that there are multiple sources of threat (barriers) and encouragement (supports) that an individual cognitively processes when choosing to pursue a given academic or career field. SCCT has been used in STEM-based research to examine how the interaction between aspects of the environment (e.g., social interactions and experiences) and cognitive-person variables (e.g., self-efficacy, outcome expectations, and goals) impact an individual's career trajectory (Byars-Winston, Estrada, Howard, Davis, & Zalapa, 2010; Lent et al., 2005; Lent, Lopez, Sheu, & Lopez, 2011). Although the full SCCT model includes multiple predictors of an individual's career trajectory, self-efficacy has been consistently found to be the predominant predictor of both positive and negative outcomes across multiple STEM related fields, such as engineering and biology (Byars-Winston et al., 2010; Flores, Navarro, & DeWitz, 2008; Lent et al., 2005; Lent, Ireland, Penn, Morris, & Sappington, 2017).

Self-efficacy (Bandura, 1986) has been examined in the context of academic and career behaviors over the course of the last 40 years (Hackett & Betz, 1981) and has been found to be a main driver in college achievement (Chemers, Hu, & Garcia, 2001; Elias & MacDonald, 2007). SCCT specifically posits that higher STEM-related self-efficacy should result in students' satisfaction and interest in their STEM field (Lent et al., 1994; Lent, Brown, & Hackett, 2000). Further, when it comes to STEM and other nontraditional, male-dominated career fields, self-efficacy appears to be equally important for men and women of minority ethnic groups (Flores & O'Brien, 2002; Wang, 2013; Zeldin, Britner, & Pajares, 2008). Thus for the purpose of this study, intent to major in a STEM field, as well as self-efficacy (subject specific and broader academic; Zimmerman, 2000) will be examined as outcome variables.

## 2. Supports and barriers related to STEM self-efficacy and college major intent

SCCT suggests that social-environmental factors—threats (barriers) and encouragement (support)—can also play a role in academic and career-related behaviors, including for STEM (Lent et al., 1994). A mixed-methods study by Grossman and Porche (2013) found that despite social support from both teachers and parents, discrimination was a salient barrier for ethnic minority high school students pursuing further STEM education. In the present study, we focus on two specific social factors—ethnic discrimination as a potential barrier and friendship group diversity as a potential support—that may be especially salient for ethnic minority students.

### 2.1. Ethnic discrimination as a barrier

In previous research utilizing SCCT, barriers have included factors such as financial limitations, lack of parental support, and inadequate access to good teachers (Lent et al., 2000; Lent et al., 2001, 2003; Lent et al., 2005, 2002). There has been a moderate amount of research exploring ethnic discrimination as a barrier to STEM-specific self-efficacy and the intent to major in a STEM field (Lent et al., 2001). We focus on the experience of discrimination, or unfair treatment that an individual attributes to being caused by their race or ethnicity, because these experiences have been found to be negatively associated with physical and mental health, as well as an array of educational outcomes (Benner & Graham, 2011; Brody et al., 2006; Seaton, Caldwell, Sellers, & Jackson, 2008). Discrimination experienced in educational settings or related to academic performance (e.g., perceiving receiving a poorer grade because of one's ethnic background) is expected to be a strong predictor of academic outcomes (Huynh & Fuligni, 2010).

Most research examining ethnic discrimination and poor academic outcomes in adolescent samples is conducted with homogenous ethnic minority samples. For instance, studies conducted with African American adolescent samples have identified a negative association between discrimination and grades, value of education, academic curiosity and persistence, and self-concept of ability (Eccles et al., 2006; Neblett, Philip, Cogburn, & Sellers, 2006; Smalls, White, Chavous, & Sellers, 2007; Wong, Eccles, & Sameroff,