

Push and Pull: The Influence of Race/Ethnicity on Agency in Doctoral Student Career Advancement

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This study examined and enriched our understanding of the career choice process for doctoral students of color in science, technology, engineering, and math (STEM) fields. In addition, it explored the challenges facing all doctoral students in STEM in understanding and making meaning of diversity as it relates to individual perspectives and actions. We used an agency theoretical framework to explore career-related decisions of doctoral students. This framework captured how students “navigate, negotiate, reframe, and act” during the career decision-making process of a doctoral program.

Keywords: agency, doctoral students, career advancement, STEM, graduate education

The decision to pursue a faculty career can be a complex choice for many aspiring professors; however, this decision is particularly fraught with challenges for doctoral students of color. Will my future colleagues be welcoming? Will students afford me the same level of respect as my majority counterparts? Will my credentials be challenged? Will I be the only one of my race in the department?

Data show that faculty of color are woefully underrepresented in universities and colleges nationwide. According to the [National Center for Education Statistics \(2011\)](#), 7% of college

and university faculty are African American, 4% are Hispanic, 6% are Asian/Pacific Islander, less than 1% are American Indian/Alaska Native, and 79% are Caucasian. Ten-year completion rates for students of color in many STEM fields (e.g., Engineering, Math & Physical Sciences, Social Sciences) are lower than those of white students ([Council of Graduate Schools, 2010](#)). Although research shows all graduate students become less interested in faculty careers as training progresses, the decrease in interest can be even more pronounced for students of color and women STEM students. For example, [Gibbs, McGreedy, Bennett, and Griffin \(2014\)](#) found that biomedical science women and men students of color were more likely than men from well-represented groups to lose interest in academic careers from entry to graduation. [Gibbs et al. \(2014\)](#) explained that differences were not explained by research productivity, self-confidence, or how the student described their relationship with their advisor. Figuring out why STEM graduate students of color may be less likely to complete their doctoral programs, and more likely to lose interest in an academic career is critical to diversifying the professorate and academic science ([Gibbs et al., 2014](#)). In this paper we explore how and why doctoral students chose a particular

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career path and how agency influences that decision-making process. Understanding graduate student agency is important in all fields, but especially in STEM fields where there is a compelling national interest in retaining and advancing more graduate students of color into academic careers (National Science Foundation [NSF], 2006).

Our study departs in some important ways from previous work by examining doctoral students of color career choice from the perspective of agency instead of socialization. Agency theory helps us understand both the strategic perspectives (thought processes) and strategic actions (specific steps) of doctoral students career decision-making processes. Such an approach allows us to center the experiences of the graduate student as they move through phases of their programs. Socialization theory is most often used to describe and bring understanding to the experiences of graduate students (Antony & Taylor, 2004; Austin, 2002; Bess, 1978; Weidman, Twale, & Stein, 2001). More recent work on socialization theory calls needed attention to reciprocal relationships among students, faculty, and peers and how these interactions influence retention and career choice (Gardner & Mendoza, 2010). However, socialization theory is limited in its view by focusing primarily on students “adopt[ing] the values, skills, attitudes, norms, and knowledge needed for membership in a given society, group, or organization” (Gardner & Barnes, 2007, p. 2). Socialization theory places the doctoral student in the more passive role of being socialized into an existing academic departmental and disciplinary community, not accounting for the fact that perhaps the organizational community of practice the student desires to join may not be the one found in the student’s department. Socialization theory presents doctoral students as knocking at the door of an organizational community and completing tasks and gaining knowledge in hope of being let in. Further, socialization theory does not fully consider the unique cultural characteristics of graduate students of color (Haley, Jaeger, & Levin, 2014; Tuitt, Hanna, Martinez, & Salazar, 2009; Winkle-Wagner, Johnson, Morelon-Quainoo, & Santiago, 2010). Alternatively, the view of agency and doctoral students that we adopt in this study places student career interests, choices, and social identities interests at the center of the study. We consider how doctoral

student agency, as enacted through their actions and perspectives, shapes and is shaped by the departments, institutions, and fields around them toward specific career choices and outcomes. In this way, our mixed methods study seeks to illuminate the various ways students feel pulled toward, and pushed away from, academic careers—with them, rather than their departments, fields, or colleagues, as the central focus.

Literature Review

This study focused on the way in which doctoral student agency in pursuit of career goals is supported or constrained. We were particularly interested in how the agency of students of color may be impacted as they make career decisions and pursue career goals. In the review we examined doctoral student career choice more broadly, and then both academic and nonacademic career choices in STEM fields. Next, we discussed our conceptual framework: agency. We examined career choices in relationship to agency, for both doctoral students, in general, and students of color, in particular.

Doctoral Student Career Choice/Advancement

The literature on doctoral student career choice, while more limited than the body of literature on undergraduate career choice, has explored factors that motivate doctoral students to pursue an academic career. Among the many factors that influence career choices, Lindholm (2004) found that a perceived fit between personal values and preferences and academic work was a critical factor in the decision to pursue an academic career as were childhood experiences, especially exposure to academic family members, and undergraduate and graduate school disciplinary training. Doctoral students also cited graduate school advisors and the graduate school experience more broadly as being influential in determining their career path, whether steering them toward (pushing) the professoriate or away (pulling) from it (Austin, 2002; Mason, Goulden, & Frasch, 2009). Doctoral students’ perceptions of their advisor’s workload and stress level has been shown to serve as a deterrent from pursuing a faculty position, a problem that may push doctoral stu-

dents to pursue alternative careers outside of academia (Austin, 2002; Mason et al., 2009).

Doctoral Student Career Choice and Race

While doctoral students, in general, are impacted by a variety of factors in their career choices, doctoral students of color experience unique challenges in making career decisions. As mentioned above, when compared to their White peers, doctoral students of color are less likely to choose an academic career (Golde & Dore, 2001, 2004). This trend can be attributed to a variety of factors, including socialization in the discipline, or a lack thereof, due to possible stereotyping and racial bias (Antony & Taylor, 2004); however, the career choices of graduate students of color can also be explained by other factors, such as the desire to pursue a career where they have the opportunity to mentor other students of color as well as pursue opportunities that support aspects of their cultural background (Haley et al., 2014). Government and industry careers that offer such opportunities present attractive pulls for doctoral students to leave academe. Doctoral students of color, who may not see themselves and their values represented in the academy, are likely to pursue careers in other areas outside of academia, with those students who were the most critical of academia being the most likely to leave the academy to pursue private sector careers (Haley et al., 2014). In sum, research suggests doctoral students of color may be pulled toward nonacademic careers that they experience as having a better fit for their interests, and may feel pushed away from academic positions by inhospitable climates and work environments.

Doctoral Student Career Choice in STEM Fields

Given the desire to expand the participation of students of color STEM fields, it is important to explore the career decision-making processes of doctoral students in STEM fields in order to gain a better understanding of approaches to diversify the STEM academic workforce. When compared to other fields, doctoral students in STEM fields do not choose academic careers in high numbers. In 2009, only 20% of doctoral students in physical sciences, 11.6% of students in engineering, and 11% of doctoral students in life

sciences chose to pursue an academic career (Akay, 2008; Fiegenger, 2010). Possible reasons for these low percentages include a perceived disconnect between their scholarship, values and faculty work, work-life balance, and negative perceptions of academia in general (Ferreira, 2003; Haley et al., 2014).

Career choice in STEM fields varies by discipline, however. In STEM fields where the possibilities of lucrative employment options exist outside of academia, such as chemistry and engineering, doctoral students are less likely to report pursuing a career as a faculty member and have indicated a preference for private sector employment (Association of American Universities, 1998; Fox & Stephan, 2001). These and other STEM fields have more well-paid, flexible options in industry and government. Students in fields such as physics and microbiology, who perhaps have fewer opportunities for employment within other sectors, are more likely to pursue careers in academia (Fox & Stephan, 2001). In addition to the presence of alternative careers, decreased interest in academia in some STEM fields is related to reduced federal funding for research and increased competition for fewer tenure track positions (Fuhrmann, Halme, O'Sullivan, & Lindstaedt, 2011).

While the labor market can certainly influence career choices, as has shown to be the case for some doctoral students in STEM fields, there could be other factors at play in STEM doctoral students' career decision-making processes. Our theoretical framework—agency theory—provides a foundation for our exploration of STEM doctoral students' of color career choices.

Theoretical Framework

For the purposes of this study, agency is defined as a graduate student assuming strategic perspectives, and/or taking strategic actions toward goals that matter to him/her, a definition supported by much social science literature on human agency (Alkire, 2005; Archer, 2000, 2003; Emirbayer & Mische, 1998; Ganz, 2010; Marshall, 2005; Neumann, Terosky, & Schell, 2006; O'Meara, Campbell, & Terosky, 2011; Sen, 1985). Agency can take two forms: perspectives and actions. Agentic perspectives are thought processes that make meaning of situa-

tions and contexts in ways that advance personal goals, while strategic actions are steps that individuals take to pursue their goals (Campbell, 2012; Campbell & O'Meara, 2013; O'Meara et al., 2011, 2014). If a doctoral student is considering a career outside of academia, for example, an agentic perspective might be being open-minded toward pursuing a career in government research. Applying for a summer internship with the EPA would be an agentic action to gain experience as a researcher with a federal agency would be a strategic action, a specific step taken to help her move closer to her ultimate career goal. While agentic perspectives may precede agentic actions, this is not always the case and the relationship between the two is often cyclical and intertwined. For example, an agentic action like making the decision to attend a university seminar on teaching undergraduates can lead to a shift in agentic perspective: considering a career at a community college or teaching-focused institution, for example, something that the student may not have considered previously. That perspective could, in turn, lead to further agentic actions.

In this study, agency theory helps us understand both the strategic perspectives and strategic actions of doctoral students in STEM fields, thereby developing a more complete picture of their career decision-making processes. Our view of agency assumes that individuals are nested in a variety of social contexts (Marshall, 2005) that shape the range of individual agentic perspectives and actions taken.

Much research has addressed the multitude of social identities, and their interactions, that affect student agency (Fries-Britt et al., 2010; Haley et al., 2014; Jones & McEwen, 2000; Millett & Nettles, 2006; Rhoades, Kiyama, McCormick, & Quiroz, 2008; Tajfel, 1978; Tajfel & Turner, 1985). This study explored those interactions and, at the same time, recognizes that individuals have free will and their fate is not solely determined by their social context (Elder, 1994; Lawton, 1989; Lerner & Busch-Rossnagel, 1981). A range of factors can affect a student's sense of agency including areas previously addressed by literature on doctoral education, such as departmental climate (Austin, 2002; Council of Graduate Schools, 2010), relationships with faculty (O'Meara et al., 2014; O'Meara, Knudson & Jones, 2013; Paglis, Green, & Baurer, 2006), and adequate prepro-

fessional preparation (Akay, 2008; Council of Graduate Schools, 2010).

Agency and Career Choices for STEM Doctoral Students

Although the study of agency in graduate education has only recently been explored (O'Meara et al., 2014), previous research does not specifically address agency as a concept used to describe STEM doctoral student career advancement, contextual research can help us understand how agency is related. STEM doctoral career choices can be impacted by a number of factors, including relationships with advisors (Paglis et al., 2006), belonging to a supportive community within their academic departments (Ali & Kohun, 2006; O'Meara et al., 2014), and possessing social capital in the forms of publications and presentations (Fuhrmann et al., 2011). Doctoral students in STEM fields are likely to have high levels of agency when they perceive a positive fit between themselves and academic work (Lindholm, 2004), encounter faculty members who students perceive to possess positive work-life balance (van Anders, 2004), and feel that they are receiving adequate training for future employment in the academy, especially in terms of skills such as teaching, mentoring, and service (Austin, 2002).

Agency and Career Choice for STEM Doctoral Students of Color

Research has suggested that STEM doctoral student career choices are impacted by a variety of factors, pushing or pulling them away or toward a particular career. Students of color in STEM fields face particular challenges in regard to agency and career choice, especially in terms of opting to pursue an academic career. As a whole, doctoral students of color are less likely than white students to express a desire to pursue a faculty career (Golde & Dore, 2001, 2004), a fact that can be attributed at least partially to how STEM fields socialize students from diverse backgrounds to the discipline in terms of providing mentoring relationships and opportunities to publish research (Millett & Nettles, 2006). As noted previously, having an encouraging mentoring relationship with an advisor has positive effects on success and satisfaction;

however, Latino doctoral students have been shown to not feel comfortable discussing the possibility of an academic career with their advisors, limiting their career prospects and their sense of agency in pursuing their career goals (Barnes & Wells, 2009). These trends are not irreversible, however. Students of color in STEM fields are more likely to feel a high sense of agency when they perceive to be working in an environment that provides equal opportunities for all doctoral students regardless of ethnicity, race, or gender and does not require students of color to “prove” their legitimacy as scholars (Austin, 2002; Ferreira, 2003; Mason et al., 2009; Wolfinger, Mason, & Goulden, 2009), suggesting that faculty members and administrators can take steps to ensure equal opportunity for all students to pursue faculty careers by creating a positive and inclusive learning environment.

Method

To develop the most comprehensive understanding of agency in the doctoral student experience, we chose an explanatory mixed methods design (Creswell & Plano Clark, 2011). We selected a mixed methods research approach as it provides a better understanding of complex phenomena that are difficult to comprehend through the use of one methodological approach (Creswell, Fetters, & Ivankova, 2004; Kettles, Creswell, & Zhang, 2011; Mertens, 2010; Plano Clark, Huddleston-Casas, Churchill, O’Neil Green, & Garrett, 2008). The research questions for this study were designed to utilize the various types of data obtained. Both quantitative and qualitative data answered our first two research questions: What agentic actions did the doctoral students take in pursuit of career goals? What agentic perspectives (e.g., internal conversations, stances, views) did the doctoral students assume in pursuit of career goals? Our qualitative data addressed the aforementioned questions and three additional research questions: How do STEM doctoral students describe their sense of agency? What is the role of race/ethnicity in the career choice of STEM doctoral students? How can agency help us understand the career related choices of doctoral students of color in STEM fields? A mixed methods design includes collecting, analyzing, and integrating both quantitative and qualitative data at some

stage of the research process within a particular study to increase breadth and depth of understanding (Creswell & Plano Clark, 2011; Johnson, Onwuegbuzie, & Turner, 2007). Our final research question integrated the quantitative and qualitative data: How do our qualitative findings help explain our quantitative results?

The rationale for choosing such an approach was that neither qualitative nor quantitative methods are sufficient by themselves to understand the influence of agency on career choices of STEM doctoral students. A mixed methods approach was warranted for several reasons: (a) research has yet to explore career choices of STEM doctoral students through both a qualitative and quantitative lens, (b) additional exploration was necessary to understand the quantitative data originally collected, and (c) the agency theoretical framework has been used in a limited capacity in either qualitative or quantitative studies involving STEM doctoral students (O’Meara et al., 2014; Rhoades et al., 2008; Szelenyi, 2013).

Our explanatory mixed methods design (Creswell & Plano Clark, 2011) consisted of two distinct phases. In the quantitative phase, we distributed a short online survey through Qualtrics to STEM doctoral students at two major research universities. Key components and elements of agency were identified through the literature and formed the basis for development of survey items (Alkire, 2005; Archer, 2000. Emirbayer & Mische, 1998; Marshall, 2005). The construct of agentic perspectives was developed to include a sense of self efficacy, locus of control, awareness of choices, and empowerment to overcome obstacles; the construct of agentic actions was developed to encompass strategic choices and behaviors to accomplish meaningful goals. The survey was piloted with five graduate students before being implemented and minor revisions made as a result of feedback on item wording. The survey included 14 items, six of which measured agentic perspectives in career advancement and eight items measured agentic actions in career advancement. A 5-point Likert scale was used with 1 equaling “strongly disagree” and 5 equaling “strongly agree.” Negative items were reverse scored. We also measured the respondents’ willingness to engage in an in-depth qualitative interview as a variable. Item consistency was high for all survey questions (>.8 on Cron-

bach's alpha), indicating that these items were observable indicators that measure agentic perspectives and agentic actions.

Both study institutions are classified by Carnegie as having very high research activity. In addition, both institutions have nationally ranked programs in the STEM disciplines. The respondents were asked to submit demographic information, indicate at what stage they are in their programs, and respond to questions related to their sense of agency in their doctoral programs and pursuit of their career goals. Email addresses of students at one institution were obtained through the institutional planning office. At the second institution, participants were recruited through the email solicitation of department chairs. Disciplines included biological sciences, chemistry, earth and geological sciences, computer science, engineering, and physics. The first three of these disciplines have seen the most growth in diversity of students over the last 25 years, and the second three disciplines the least (see http://www.esa.doc.gov/sites/default/files/women_instemagaptoinnovation8311.pdf).

Among the 2,062 STEM doctoral students surveyed, 42.9% completed and returned the survey for analysis, 41.9% were usable surveys. Demographics for the survey responses are found in Table 1. A relatively even distribution of usable surveys were received from each in-

stitution, 418 and 448, respectively. Given that doctoral students' experiences vary greatly by phase (Ampaw & Jaeger, 2012; Bowen & Rudenstine, 1992; Tinto, 1993), we held this constant by only interviewing students in the postcomps phase of their work. We then randomly selected students for interviews, and our final breakdown of interviewees included a diverse mix of gender (55% women) and race (15% Asian, 8.3% African American, 13.3% Latino, 7% Biracial/Multi-Racial, 3.3% Native American, 53.1% White) within STEM fields. White women are included in this study due to the underrepresentation of White women in STEM, more broadly, and STEM doctoral programs, more specifically. Unfortunately our data did not allow us to explore the diversity within a particular subpopulation (e.g., Latino/Hispanic) and our institutional review board restricted us from providing any additional specificity about our participants. This mixed-sampling technique to recruit, identify, and select participants yielded interviews with 61 domestic graduate students (see the Appendix for participant information).

The interviews lasted between 45 and 90 min, with most lasting over an hour. The semistructured interview format allowed the researchers to have a general guide for the interviews, but were flexible enough to allow participants to

Table 1
Response Rates, Survey

Demographics	<i>n</i>	%	Demographics	<i>n</i>	%
Program stage	853		Discipline	850	
Early/mid coursework	220	25.79	Biology	156	18.35
Late coursework	124	14.54	Engineering	394	46.35
Proposal/qualifying exam	218	25.56	Chemistry	83	9.76
Dissertation/thesis	291	34.11	Computer Sciences	64	7.53
Career goal	854		Physics	87	10.24
Faculty, Research U	231	27.05	Earth/Geological Sciences	66	7.76
Faculty, Nonresearch U	71	8.31	Interview	854	
Government research	115	13.47	Yes	490	57.38
Industry/private sector research	311	36.42	No	364	42.62
Postdoc	39	4.57	Institution		
Other	87	10.19	University A	418	48.27
Race	843		University B	448	51.73
African American/Black	21	2.49	Gender	853	
Asian-American/Pacific Islander	142	16.84	Male	522	61.20
Latino/Hispanic	36	4.27	Female	331	38.80
Native American	5	.59			
White	610	72.36			
Biracial/Multiracial	29	3.44			

guide the direction of the interviews (Knox & Burkard, 2009). Face-to-face interviews enabled researchers to pick up on social cues and nonverbal communication, and these elements provided deeper insights into the participants' graduate school experiences (Opdenakker, 2006).

The interview questions focused on the actions participants had taken to pursue their goals. Researchers also asked questions about participants' internal self-talk or perspectives that influenced their career decisions and overall experiences in their doctoral programs. Finally, the interviews included questions related to race and ethnicity in relation to the doctoral experience. All interviews were audio-recorded and transcribed.

Three researchers read each of the transcripts a minimum of three times and notes were made in the margins. This approach provided the researchers with a strong grasp of each participant (Creswell, 2007). Concept-driven coding (Glaser & Strauss, 1967) allowed us to use a set of predetermined codes based on the literature regarding agentic actions and perspectives to guide our data analysis. This provisional list of codes was determined beforehand and harmonized with our theoretical framework (Saldana, 2009), thus allowing us to directly answer our research questions. We also engaged in open coding or initial coding (Saldana, 2009) which allowed us to explore the raw data and remain open to all possible theoretical directions indicated by our reading of the data (Charmaz, 2006). We copied all the data related to race/ethnicity into a new transcript. This enabled the researchers to ascertain if there were differences in experiences based on ones' race/ethnicity or one's status as a minority/majority in their department. Finally, we employed a constant comparative method (Merriam, 1998) whereby we found patterns within the interview data related to race/ethnicity that influenced graduate student agency in career decision-making. After comparing and contrasting the findings, the key themes that emerged were affirmation action, strategic action/self-talk and career goals, strategic action/self-talk and social isolation, race as a nonevent, unconscious privilege, intersectionality, and advising/mentorship. After comparing and contrasting the themes as a research team, the most prominent and frequently men-

tioned themes that most closely related to students' career trajectories were identified.

As in all research, our study was limited by who chose to respond to both the survey and the interview. In comparison to the broader sample of students who responded to our survey, students who agreed to participate in an interview had significantly higher mean averages on six of the agency items. Since we did not interview all survey respondents who agreed to be interviewed, nor did we specifically examine levels of agency in the interview participants, we cannot say whether our sample is alike or different from the study population. Despite this limitation, our sample provided diverse perspectives and data saturation was obtained during our interviewing process. We focused on identifying commonalities across student stories and data saturation (Ragin, 1987) was reached as the evidence gathered became repetitive.

Findings

As a mixed methods study, we used both quantitative and qualitative analyses. First we present the quantitative survey results regarding graduate student agency in STEM disciplines. These findings addressed the first two research questions regarding agentic actions and perspectives of our participants. Second we offer our qualitative thematic findings, which addressed STEM doctoral students' agency in terms of their career choice process and their race/ethnicity. We conclude with a discussion of how our qualitative and quantitative data are integrated to better understand the career choice process of STEM doctoral students.

Analyses of variance (ANOVAs) were conducted to determine if race/ethnicity had a significant effect on items measuring agentic actions and agentic perspectives in pursuit of career goals. In addition, two-sample *t*-tests were used to compare means on agentic items based on STEM disciplines (biology, chemistry, and earth/geological sciences) that have seen growth in diversity of students over the last 25 years, and STEM disciplines (engineering, computer sciences, and physics) with less growth in diversity of students. Table 1 first shows the number of responses from each demographic question and Table 2 shows descriptive statistics for survey items that mea-

Table 2
Descriptive Statistics of Survey Items

	Agentic action and perspectives	<i>N</i>	Mean	<i>SD</i>
Agentic actions				
	I have been strategic in achieving my career goals	868	3.83	.84
	I have intentionally made choices to focus my career goals in ways that are personally meaningful to me	868	4.14	.77
	I seize opportunities when they are presented to me to advance my career goals	867	4.13	.76
	If I lack something (e.g., a skill or specific knowledge) that I need to obtain my career goals, I take steps to obtain it	865	4.12	.68
	When I face a setback, I take strategic steps to overcome the barrier to move ahead	864	4.01	.62
	I ask for help when I need it	865	3.87	.89
Agentic perspectives				
	I feel stuck in my ability to advance toward my career goals ^a	864	3.35	.99
	In general, I feel that I have little control over whether I advance my career goals ^a	867	3.68	1.02
	My advisor (rather than I) controls whether I will achieve my career goals ^a	868	3.66	1.03
	I know how to conduct research to achieve my career goals	867	3.79	.79
	When I face a setback, I view it as a temporary roadblock that I can overcome	865	4.03	.69
	I can acquire all of the knowledge and skills that I need to be successful in my career goals as long as I work hard	866	4.04	.92
	I view critical feedback on my work as a way to grow	864	4.17	.92
	Rather than seeing one path, I see there are multiple paths to be successful in achieving my career goals	864	4.12	.79

^a Reverse-scored survey questions.

sured students' agentic actions and perspectives.

One-way ANOVAs were performed to examine mean differences in students' agentic actions and perspectives by race. When appropriate, a post hoc Scheffé test was conducted to examine whether significant differences existed among subgroups of the demographic questions. Two of the five agentic action items found a significant mean difference by race. Latino/Hispanic students had a significantly higher mean than their Asian American peers on being strategic in achieving career goals, $F(5, 837) = 3.38, p < .05$. In addition, Latino/Hispanic students demonstrated a significantly higher mean than Asian American students on seizing opportunities when presented to advance career goals, $F(5, 836) = 5.99, p < .05$. This finding is consistent with other work on resiliency in Latino college students (Ong, Phinney, & Dennis, 2006) that found that "three cultural resources—ethnic identity, family interdependence, and parental support" led to greater academic achievement despite low socioeconomic status, a characteristic that would normally predict lower academic achievement in higher education (p. 961). Though this study does not explore cultural beliefs about education in depth, future work is necessary to more completely understand the higher sense of agency that Latino

students in our study have toward their doctoral work and career goals.

Differences in doctoral students' agentic perspectives were found on two of the eight items. Caucasian students had a significantly higher mean than Asian American students on the perception of feeling stuck on the ability to advance toward career goals, $F(5, 833) = 4.45, p < .01$. This question was reverse scored to be in alignment with other questions, thus higher scores were "better" scores in terms of student's agency. In other words, Asian American students more frequently felt that they were stuck in advancing toward career goals than their Caucasian counterparts. Similar to the previous reverse-scored question, Caucasian students demonstrated a significantly higher mean than Asian American students on the perception that their advisors, rather than themselves, had control over whether they would achieve their career goals, $F(5, 836) = 5.99, p < .05$. In other words, Asian American students are more likely to feel that their advisors have control over their career goals than Caucasian students.

T tests were conducted to compare means on respective agentic items based on the disciplines (biology, chemistry, and earth/geological

sciences) that have seen the most growth in diversity of students over the last 25 years and the disciplines (engineering, computer sciences, and physics) with the least growth. Students pursuing degrees in disciplines with the most growth in diversity of students demonstrated significantly higher means in four of six agentic actions items and two of eight agentic perspectives items. Results from *t* tests are shown in Table 3.

In exploring our research questions through our qualitative data, we found two key ways in which the race and ethnicity of graduate students, and its interaction within their graduate programs, mattered to student agency in pursuit of career goals. First, they experienced affirmative action at work in their de-

partmental work environments. Second, participants experienced varying degrees of a sense of belonging, experiencing both a sense of isolation and a sense of community at different times and in different situations.

“Affirmation Action” and Its Influence on Agency

A central theme relating to race/ethnicity and agentic perspectives on the career choices of doctoral students focused on affirmation action. Many participants recognized that affirmation action was indeed at work in the doctoral process. However, the way in which students perceived the impact of affirmative action on agency in career choices differed depending on

Table 3
Agentic Actions and Agentic Perspectives Two-Sample t-Test, Disciplines

Agentic actions and perspectives	Disciplines		<i>T</i>	<i>df</i>
	With the most growth in diversity of students	With the least growth in diversity of students		
Agentic actions				
I have been strategic in achieving my career goals	3.97 (.43)	3.77 (.04)	3.43***	848
I have intentionally made choices to focus my career goals in ways that are personally meaningful to me	4.24 (.04)	4.10 (.03)	2.56*	848
I seize opportunities when they are presented to me to advance my career goals	4.21 (.04)	4.10 (.03)	2.05*	847
If I lack something (e.g., a skill or specific \ knowledge) that I need to obtain my career goals, I take steps to obtain it	4.12 (.04)	4.11 (.03)	.21	845
When I face a setback, I take strategic steps to overcome the barrier to move ahead	4.03 (.04)	4.03 (.03)	.10	845
I ask for help when I need it	4.00 (.05)	3.81 (.04)	3.02**	845
Agentic perspectives				
I feel stuck in my ability to advance toward my career goals	3.43 (.05)	3.31 (.04)	1.65	844
In general, I feel that I have little control over whether I advance my career goals	3.78 (.05)	3.63 (.04)	2.14*	848
My advisor (rather than I) controls whether I will achieve my career goals.	3.72 (.06)	3.63 (.05)	1.20	848
I know how to conduct research to achieve my career goals	3.90 (.04)	3.72 (.04)	3.21**	847
When I face a setback, I view it as a temporary roadblock that I can overcome.	4.05 (.04)	3.99 (.03)	1.24	844
I can acquire all of the knowledge and skills that I need to be successful in my career goals as long as I work hard	4.05 (.05)	4.03 (.04)	.32	847
I view critical feedback on my work as a way to grow	4.16 (.04)	4.19 (.03)	.55	844
Rather than seeing one path, I see there are multiple paths to be successful in achieving my career goals	4.18 (.04)	4.08 (.03)	1.70	844

Note. Standard deviations appear in parentheses after means.
* $p < .05$. ** $p < .01$. *** $p < .001$.

the individual characteristics of the students and the dynamics of race and ethnicity in their department.

Several who identified as being White felt that the perceived benefits going to those in minority groups limited their agency in their career goals. Susan, a biological sciences student, echoed this sentiment when discussing her fear of being passed over during the hiring process:

Yeah, it's gotten to the point where affirmative action is going overboard. I mean it's—I would say it might actually end up hurting me, not strongly hurting me but it may be just when they look, "Okay, we want certain statistics for our department." I'm Caucasian—there's so many Caucasians in the field already. So they might—hopefully they're not going to think, "Okay let's hire the Asian professor over the Caucasian." I think it's something I've come to accept, having grown up in the U.S. that this could happen.

Evelin, a student in engineering, shared the impact that being an American student from a diverse background within her program has had upon her perceptions of those in her field:

Being white and a graduate at an engineering program, I almost feel like a minority. And I do not think I'm being discriminated against, but it does make for a different experience. Like you kind of get the perception that maybe the best talent is elsewhere in the world, and they're [the best talent] coming here for an education. But it's just sort of a weird, sort of disappointing that we have—I do not know why there are fewer white graduate students, in [my area of] engineering.

As Evelin noted, she feels as if the most talented engineers appear to be coming from overseas. This could have the effect of either inhibiting her sense of agency toward her career goals or fostering an agentic belief that she must try harder or work more diligently to "prove others wrong."

The belief that affirmative action might somehow be benefitting others surfaced as a general frustration among several of the Caucasian and Asian students interviewed, appearing to limit certain agentic actions. Will, an Asian student in engineering, exemplified this dichotomy. He said: "It's sort of like the minorities get more push and more help into the field. And so with females being underrepresented or less so now but a lot more before, that there's so many programs to help out those less represented. So I'd say being a male I am more lost in the weeds more than anything else."

Although Will felt that affirmative action had at times narrowed his career opportunities, he went on to note that he also benefitted by being a member of a minority group:

I think a couple of the opportunities I've gotten it's helped because of my race being of Asian descent so I'm technically considered a minority but I also have I guess American citizenship so that helps. I was more versatile in what projects I could work on. I think that was appealing to some of the advisors I worked for. Compared to a noncitizen or, I think how it works is for the programs I applied to the professors got kickbacks or got deductions for hiring minority students, and I think that was one of the factors why I was chosen for those opportunities.

It is clear that a tension exists for those who are privileged by race but perhaps not by gender as Will describes. They perceive benefits of affirmative action but also fear instances where they may be overlooked in their careers due to other aspects of their identity.

In contrast, specific agentic actions relating to affirmative action were varied. Although few of the Caucasian students discussed the influence of affirmative action on the agency they demonstrated in their career choices—whether they benefitted or not—several African American, Native American, Asian, and Latino students described taking agentic action to join programs targeted to students of color. Diego, a Mexican American student, was inspired to pursue his doctorate after participating in a minority engineering program as an undergraduate. "And I'm sure at some point in that program, because of what they've showed me, that's when I made that decision, that's when that light bulb went on about wanting a PhD."

Kevin, an African American male in chemistry, noted that he joined a program designed to recruit more minorities to the sciences and engineering fields offered by his institution's graduate school. These students took agentic action to join these targeted career-related programs for students of color, which greatly influenced how they navigated and negotiated their way into graduate school and toward a doctorate. Yet none of these students expressed a conflict about participating in these specially targeted programs or applying for and receiving scholarships targeting students of color. They intentionally sought them out in some cases. In many instances, the option to engage in these

affirmative action programs augmented students' agency toward their career goals.

Isolation and Desire to Build Community

Frequently STEM doctoral students spoke of a desire to build connections with others in their programs due to feelings of isolation. In addition to expressing concerns at the low numbers of diverse others in their programs, several graduate students of color demonstrated agency by building relationships with others to combat feelings of isolation. These relationships and connections were ones they planned to continue into their careers as they saw them as a means to "survive" and "succeed" in environments that were isolating or unwelcoming or simply put, "lacked the community" they were seeking. Evan, a computer science student from Puerto Rico, spoke of being a minority in the United States and not knowing anyone. These feelings of isolation encouraged him to connect to others who shared similar perspectives. Donita, a Cuban student in engineering, mentioned that she has had few minority professors during her time in her program:

The classes I've took I actually had two minority woman professors and that was actually better from what I had at my undergrad at [school name] where I had I think only one white professor female in the whole five years versus the one year here.

Diego revealed that during his time in graduate study, he was one of only two Latino students in his program. The other Latino student left after completing his master's. Diego questioned which career path would lead him to an environment that was more diverse than his current environment.

In terms of agentic actions taken to foster community in the graduate program, Jasmin, an engineering student, created a black graduate student group at her institution. This exposure allowed her to connect with others who shared similar values and similar career paths:

So the idea is that you have a network of others, some look like you, have your experiences to kind of pull on each other to help you continue your graduate route because sometimes people quit because they're lonely or they're missing those connections that they do not have. And I know a lot of the times we come from more of community-based experiences and so we thrive better in a group setting sometimes than just being by yourself.

She noted that she was seeking a career choice that would align with her community interests and approach. Heather, an African American student in engineering, reached out to a fellow student who has become her "school sister," an important peer connection for her:

I mean there's just some days where if there hadn't been anybody else around, I really might have just been like, "All right. That's it." So it does help to have somebody else to say, "Yeah. Today's a bad day. This is ridiculous. That's crazy," type of thing. And then some days just be like, "Oh great." So when there is something positive, you know somebody really is rooting for you. . . . So I say she's my school sister.

Evan spoke of a desire to build community with same-race peers; although, he also articulated that one of the challenges with doing so was further separation between races, and he would be less prepared to deal with similar issues when he entered his career:

I think it is important in grad school is immersing yourself in the culture, so if I'm just going to stay with my culture the whole time, than I'm not really doing that part and then things will just be a little bit more difficult for me and harder to understand because of cultural differences.

Despite feelings of isolation, students demonstrated agency toward their career goals by proactively reaching out to others in their field to create connections. These peers, often of the same ethnicity, played a critical and immediate role of providing community now and in future positions.

Role of Race and Ethnicity in the Career Choice Process of Doctoral Students of Color

Within this section, we explore the findings related to the role of race/ethnicity in the career choice of STEM doctoral students, specifically the role that agency plays in their career-related decisions. Three themes surfaced as being of central focus in the career-related decisions of the doctoral students of color in our study—a goal of impacting the recruitment of diverse groups to the STEM field; the desire to serve in a mentorship role to other students of color; and a desire to prove others wrong.

Several of the students from diverse ethnic or racial groups described wanting to pursue doctoral education or the professoriate to improve the number of diverse students entering the

STEM pipeline, a finding consistent with previous research that shows that doctoral students of color often describe wanting to pursue careers where they could enact their values, particularly those rooted in culture and identity (Haley et al., 2014). For several participants in this study, this agentic perspective led to specific career-related choices. Kevin, an African American male in biological sciences, exemplified this agentic action:

I went to a conference in Boston to actually recruit for the school that I'm in . . . that influenced me to want to be an academic and maybe eventually have a position where I recruit for a program, a minority program, or something like that. So that's one of the really big things and just talking with different people and seeing their ideas and how they got to their—the position they're in. Just trying to figure out how to align myself in kind of the same way.

Jasmin, an African American female, also described how the low number of African Americans in engineering spurred her to want to create a school to increase the pipeline of students of color in the STEM fields:

I'm a member of the National Society of Black Engineers, also known as NSBE and so there was one conference, I think it was in Orlando. I think that was my first actual national convention, and he gave a talk about pretty much the stats of why you should go to graduate school and everything, and looking at the numbers, I think at the time African American women were about .01% of the population graduating, I think, with PhD's in engineering. . . . I wanna see more growth of minorities in the STEM education area.

Sarah, a student in earth and geological sciences, noted that it is important for organizations such as NSF to develop programs that reward faculty who target underrepresented groups. She advised that if faculty made specific outreach to recruit minorities or other underrepresented groups and were then recognized or rewarded for their efforts, it “would go a long way to . . . increasing the agency of doctoral students or graduate students.”

Offering mentorship. Doctoral students of color also emphasized the importance of fulfilling a mentorship role for future students of color. Kevin addressed how powerful it was to realize how few African American males there are in his field and he spoke of demonstrating agency in his career goals by aspiring to serve as a faculty mentor to young men like himself:

Yeah, especially my career decisions because I see, being an African American male, I do not think I've ever met another African American male in my field. I mean I know there's one at [institution omitted] and I've seen some when I'm looking up schools that I might want to do a postdoc at, but as far as meeting them in person, I've never. I know mentoring is a big part of the reason why I chose to be a faculty member.

Matt, a student in biological sciences, chose a faculty career when he realized the potential impact that he could have as a professor to break stereotypes that others may have about his culture. “I never thought of it in that way, but yeah, probably, because to be, like I said, a Native American, teaching hundreds of students, that can help break those stereotypes.” Being Native American and seeing himself as a potential role model prompted his agentic action to pursue the professoriate.

Proving others wrong. For students of color, the decision to pursue the doctorate has been shown to stem from a desire to legitimize oneself or one's community. This was evidenced in our findings as well. Jasmin, an African American in engineering, acknowledged the negative perceptions of students of color, which fostered her agency to change those misconceptions:

I also realized that there weren't a lot of African American or Hispanic engineers that were actually getting into fields even in my undergraduate classes, and so I thought that it was a problem, and I thought maybe, a lot of times you hear the myths that, “Oh, we can't do it,” or for whatever reason. I can change that.

Evan, a computer science student, added that sometimes diverse students were not exposed to information about careers in the STEM fields in the schools:

I think it's just up to—at the elementary school level or at the middle school level—them to sort of get exposed to different areas so they'll see that they're not expected to do or not do something because of their culture.

Matt, a biological sciences student, also commented on the negative stereotypes and myths present in his community about pursuing higher education:

I'm Native American and there's not that many Native American doctors. So that's one thing. I have heard at a point in my life that since you're a minority, you're not really gonna do good. I've actually heard that. It's things like that where you want to just prove people wrong.

Exploring unconscious influences. Several students articulated that although they were aware of issues of race, gender, and immigration status and how the issues might affect their career choices, they could not articulate whether these factors consciously played a role in their agentic career decisions. These participants indicated this was the first time someone had asked them about how their identities affected their career decisions.

Emily, a physics student, spoke of her decision to shift from physics to a specialization within physics focused on education research:

I guess most White girls that I know in physics have gone into education research, and I'm not sure if that was a conscious decision on my part or what, but the stereotype is that they kind of go into education, and I've done that, so I'm not sure. I do not think one affected the other, but it may have subliminally or something.

Kyle, a computer science student of Indian descent, echoed that he too may have been unconsciously affected by cultural norms in his community around career choice:

I know there is some stigma of Asian men and engineering. Engineering and medicine are the big things for people coming from my background. My parents are both from India and the big thing coming here is there are a lot of opportunities in those two fields. That might be why we're looking at STEM careers. I cannot say for certain that ethnicity and gender and things like that didn't play a part but, it was not part of that conscious decision-making part.

Overall, the students were conscious of society's "expected roles" for them based on their race, gender, or ethnicity. However, students could not say with certainty if they had been impacted by these perceptions or how these expected roles may have influenced their agency in their own career decision process.

Discussion and Implications

This mixed-methods study sought to understand whether there were important differences by race and ethnicity in the agency experienced by doctoral students in different STEM fields. Both our quantitative and qualitative data indicate that there are ways in which race and ethnicity, as enacted within doctoral programs and fields, influenced agency in pursuit of career goals. Here we highlight two key findings,

consider implications for practice, and areas for new research.

Race and ethnicity was associated with doctoral student agency in ways that both advanced doctoral careers and pushed doctoral students away from academic careers. We found Latino/Hispanic students had significantly higher means than Asian Americans on being strategic in achieving career goals and on seizing opportunities when presented to advance career goals. In addition, we found that Asian American students were more likely than Caucasian students to feel stuck in terms of advancing career goals and to feel their advisors, rather than themselves, had control over whether they achieved their career goals. These findings are consistent with previous research regarding challenges faced by Asian American students when they are perceived as the "model minority" (Kim, 1999). Furthermore, as growing numbers of international students enter STEM fields, Asian American students are left trying to find a place where they fit. Inkelas (2006) asserts that Asian American students' perspectives on race are more similar to those of other minority students than they are to White students; yet, they are significantly different than other minority students as well. And although there are growing numbers of Asian students in STEM fields, Asian American student perspectives and experiences are not the same as Asian international students. Asian American doctoral students may be seen as part of a larger Asian population and thus their specific issues are overlooked. Previous research has suggested that Asian American students experience distinct challenges (Ro & Loya, 2015; Museus & Chang, 2009) and are less likely to seek support and thus limiting the resources and capital from which other students benefit (Kim, Sherman, Ko, & Taylor, 2006). Research (Lindholm, Szélenyi, Hurtado, & Korn, 2005; Ponjuan, Conley, & Trower, 2011) on Asian American faculty also contributes to this conversation. This work proposed that Asian American and Asian faculty express difficulty in creating supportive collegial relationships and have similar workplace challenges as African American and Latino faculty. Institutionalized privileges afforded majority undergraduate students carry over to graduate students

and ultimately those that enter academe as faculty. Identifying barriers for Asian American doctoral students in reaching their career goals will also support these individuals as they move into faculty positions.

There was a clear conflict over fully taking advantage of what may feel to some like “unearned privileges.” There is significant international attention to diversifying STEM disciplines. The awareness of this demand for diversity is felt within our doctoral programs as traditionally students of color, international students, and Caucasian students each express differing opinions of how race/ethnicity or citizenship plays out in terms of students’ perspectives and actions and how they will navigate eventual career decisions and goals. The belief that affirmative action might somehow be benefitting others surfaced as a frustration among some Caucasian and Asian American students, even as these same students struggled with the fact that they may reap the rewards of affirmative action themselves. In contrast, the students of color in our study sought out programs or scholarships targeting minority groups, and these particular programs appeared to greatly influence their trajectory into graduate school, toward a doctorate, and, at times, to a particular career.

As research has shown (Ali & Kohun, 2006; Haley et al., 2014; Sallee, 2011) isolation is often common for women and students of color. Our research was no exception. Despite students’ feelings of isolation, students demonstrated agency by developing connections with peers, typically of their same ethnicity. These social connections led students to feel encouraged to persevere in their pursuit of the doctorate and helped students remain culturally connected even in programs where they were heavily underrepresented.

Research shows that doctoral students of color describe wanting to pursue careers where they could enact their values, particularly those rooted in culture and identity (Haley et al., 2014). For several participants in this study, this agentic perspective led to specific career-related choices such as joining an organization like the National Society of Black Engineers or working with a minority recruiting program. These agentic actions and perspectives extended to a responsibility to mentor other diverse students. One student commented on the potential impact

that he could have as a professor to break stereotypes that others may have about his culture, stating: “a Native American, teaching hundreds of students, that can help break those stereotypes.” In addition, students took agentic steps to “prove people wrong,” which is consistent with previous work (Austin, 2002; Ferreira, 2003; Mason et al., 2009; Wolfinger et al., 2009).

Students also expressed that they were not certain whether factors such as race, immigration status, or gender might have affected their agency in their career advancement. As they reflected on their responses, they expressed their uncertainty: “I don’t think one affected the other, but it may have subliminally or something” (Emily, physics student). At the same time, we saw differences in terms of agency across race/ethnicity in our quantitative findings. Bridging the two sets of data indicates that race/ethnicity is an important consideration for understanding the agency of STEM doctoral students in their career decisions. This finding was not unique to either students of color or majority students. Our findings underscore the idea that race and ethnicity are enacted in particular department environments and academic fields. These enactments and academic environments can pull students forward and make them feel as if their identity and career interests fit, and are affirmed. Or, doctoral students can find themselves in environments with tensions, disconnects, and fractures between the careers they desire and their identities. More attention needs to be paid to the kinds of inclusive or exclusive department environments that are offered to doctoral students and the outcomes associated with each for recruitment of doctoral students of color into academic careers.

A second important finding relates to disciplines with more or less diversity among their students. We found that students pursuing degrees in disciplines with the most growth in racial diversity demonstrated significantly higher means in four of six agentic actions items and two of eight agentic perspectives items. Although there was no causal relationship between agency of students and the disciplines within which they received their degree, students in biology, chemistry, and earth/geological sciences had significantly higher mean scores in six of the 14 agentic perspectives/

actions. This finding could suggest that disciplines making progress on enrolling a diverse student body are developing programs and support systems to engage and connect students during their doctoral career, thus offering students opportunity to develop their own agency. Further research should examine whether the more diverse disciplines are sending stronger messages than the less diverse disciplines to faculty of color and women faculty in terms of inclusiveness and the potential for advancement, success, and belonging. Another way to say this is which disciplines seem to be pushing students away, and which ones are pulling more diverse students in, how, and why?

This study offered implications for practice, policy, and future research. In terms of practice and policy, departments should consider how they create connections between faculty mentors and their students. Specifically, our data showed that Asian American students, in particular, feel stuck and with limited control over their career goals. There may be cultural differences at play that were not explored here, but that could be creating a difference in how Asian students view the role of faculty in their departments or the students' perceptions of their influence over their own career trajectories. Additionally, our study showed that being one of few students of color in a department can create feelings of isolation. Departments and faculty mentors should be encouraged to share information with their students about programs, resources, or support networks that are available to foster social and academic communities for diverse students. Programs that target students of color appeared to promote social connections that assisted our participants in taking agentic action to achieve career goals and persevere toward the doctorate, a finding that suggests that programs should put emphasis on these and similar programs at their own institutions.

A related implication for practice addresses the issue of leaving race and ethnicity "unsaid" within doctoral programs. No doubt, well-meaning students from majority backgrounds as well as students of color did not raise the issue of race or ethnicity in order to avoid making students of color feel further isolated or singled out. However, because there are small numbers of graduate students of color in particular

STEM fields, and because majority students are aware of being in the majority, the issue, though unsaid, was there nonetheless, exerting an influence on agency in pursuit of career goals. It needs to be brought into the sunlight in programs and discussed because it will influence many aspects of doctoral programs and how students feel about them. For example, issues surrounding affirmative action led to many Caucasian and Asian students feeling ambivalent about programs that served students of color in the STEM fields. However, research shows that diverse campus environments can have benefits for both minority and majority groups (Gurin, Dey, Hurtado, & Gurin, 2002). One implication for practice is to encourage faculty and departments to reiterate the important academic imperative that diverse perspectives can bring to creativity and innovation for all involved. As one participant noted, "teams work better when you have different types of people at the table." By highlighting how everyone benefits from a diverse community, this may assuage some of the feelings among majority students that others are "benefitting" at their detriment. Attention has been given to highlighting benefits of diversity within the undergraduate population; our study suggests we need to further the conversation of diversity in our graduate populations.

Students of color described a desire to reach out and give back to their communities by recruiting diverse students to the STEM workforce to improve the low numbers of diverse PhD candidates in the field. Departments might encourage doctoral students of all backgrounds to conduct community service or get involved in outreach programs to recruit more diverse students to the field and provide incentives for student engagement in these activities. In addition to creating a social and service opportunity for doctoral students of all backgrounds, it provides an outlet for students who wish to impact their communities through their positions as students of color in STEM fields. As one aspiring faculty member noted, although she is Caucasian, she feels a strong commitment to making females and students of color feel welcome in the academic environment. If both majority and minority students feel that sense of commitment, those who will someday be future faculty will have the power to impact change in

their departments, regardless of race/ethnicity.

This mixed methods investigation addresses a new area in research on graduate education. Previous research has not examined the issue of race/ethnicity, agency, and career choice, thus there are several areas that need further exploration. Future research should further explore the intersection of identities, particularly in terms of gender. In addition, Ampaw and Jaeger (2012) suggest that doctoral students have unique experiences at various stages in their career. Our research focused on students at the end of their doctoral experience in the dissertation phase. Future research should explore agency at other critical points in the doctoral career, such as the candidacy and proposal phase.

Further research should pay attention to the quantitative differences in agency identified for our Asian American students. Differences in terms of relationships with faculty and overall expectations for Asian American students should be explored. It is possible cultural differences influence not only the agentic actions one takes but how one articulates and names agency when asked. Research methods outside of interview and survey designs might be used to observe student agency in ways that removes the barrier of having to articulate it. In addition, further exploration could better illuminate the historical, structural, or situational barriers these students are facing.

Finally, further research should explore the relationship between agency and disciplines (biology, chemistry, and earth/geological sciences) that seem to be making more progress in terms of diversifying their student bodies. This study showed statistically significant differences across disciplines that cannot be explained without access to additional data within individual departments including demographic data as well as data from departmental leadership. Having obtained such data, a more in-depth look at disciplines with students showing more or less agency could be understood. Furthermore, these additional data may reveal programs, interventions, or activities that support agency and pull students closer toward their career interests, and those which are constraining career interests and pushing students of color away.

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Appendix

Interview Participants

Interview Participant Chart

Name (pseudonym)	Gender	Race/Ethnicity	Discipline
Alecia	Female	White	Chemistry
Amber	Female	White	Physics
Andy	Male	Latino/Hispanic	Computer Science
Barrett	Male	White	Biology
Becky	Female	White	Physics
Bella	Female	Biracial	Biology
Bernard	Male	White	Biology
Cathryn	Female	White	Engineering
Chase	Male	Native American	Engineering
Christian	Male	African American/Black	Chemistry
Corina	Female	White	Chemistry
Crystal	Female	White	Engineering
Danny	Male	Latino/Hispanic	Engineering
Diego	Male	Latino/Hispanic	Engineering
Donita	Female	Latino/Hispanic	Engineering
Donna	Female	White	Physics
Emily	Female	White	Physics
Evan	Male	Latino/Hispanic	Computer Science
Evelin	Female	White	Engineering
Heather	Female	African American/African American/Black	Engineering
Hubert	Male	White	Physics
Ishmael	Male	Asian American/Pacific Islander	Engineering
Jacqueline	Female	White	Chemistry
Jasmin	Female	African American/African American/Black	Engineering
Jeff	Male	African American/African American/Black	Engineering
Jenica	Female	Latino/Hispanic	Biology
Joel	Male	Asian American/Pacific Islander	Engineering
Justin	Male	Biracial/Multiracial	Computer Science
Karrie	Female	White	Engineering
Kevin	Male	African American/African American/Black	Chemistry
Kimberly	Female	White	Astronomy
Kira	Female	White	Physics
Kyle	Male	Asian American/Pacific Islander	Computer Science
Kylie	Female	White	Biology
Lamar	Male	White	Computer Science
Lindsay	Female	White	Biology
Matt	Male	Native American	Biology
Michael	Male	White	Biology
Michelle	Female	White	Engineering
Nola	Female	White	Chemistry
Orlando	Male	Latino/Hispanic	Biochemistry
Padma	Female	Biracial	Engineering
Rachel	Female	White	Biology
Ray	Male	White	Computer Science
Renee	Female	White	Biology
Ron	Male	White	Astronomy
Sam	Male	Biracial/Multiracial	Engineering
Sarah	Female	White	Earth and Geological Sciences
Scott	Male	Asian American/Pacific Islander	Chemistry
Suanne	Female	White	Computer Science
Susan	Female	White	Engineering
Tess	Female	Latino/Hispanic	Engineering

(Appendix continues)

Appendix (continued)

Name (pseudonym)	Gender	Race/Ethnicity	Discipline
Theresa	Female	Asian American/Pacific Islander	Biology
Tricia	Male	Asian American/Pacific Islander	Engineering
Tristan	Male	Biracial	Biology
Valarie	Female	White	Engineering
Victoria	Female	White	Engineering
Will	Male	Asian American/Pacific Islander	Engineering
Wilmer	Male	Asian American/Pacific Islander	Physics
Zach	Male	Asian American/Pacific Islander	Engineering

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