

Hispanic-Serving Institutions (HSIs) play a key role in diversifying the STEM workforce. This chapter provides an overview of a funded National Science Foundation (NSF) grant program that incorporates learning and work in an effort to address racial/ethnic underrepresentation in the field of geosciences. Observations also demonstrate the importance of engaging student affairs with academic affairs in such a program to address the diverse needs of students at HSIs.

Developing Work-Based Geosciences Learning Opportunities in a Hispanic-Serving Institution

Vanessa A. Sansone, Anne-Marie Núñez, J. K. Haschenburger, Alexis Godet, Walter Gray, Marina B. Suarez, Stuart Birnbaum, David Young

Geosciences is one of the least diverse fields in Science, Technology, Engineering, and Mathematics (STEM) (Huntoon, Tanenbaum & Hodges, 2015; National Science Foundation, 2016, Table 5-3). In the last 40 years, gender parity has improved, although it remains below that of other STEM fields, but racial/ethnic parity lags significantly behind (Wilson, 2014). For example, Latinas/os, who are the fastest growing population in the U.S., represent only 4% of the non-academic geoscience workforce (Houlton, 2015; Wilson, 2014). In fact, despite investments by the National Science Foundation (NSF) and other agencies in diversifying geosciences, the share of people of color in geosciences has not changed over the past 40 years (Bernard & Cooperdock, 2018).

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Within the next decade, a shortfall of 90,000 qualified U.S. geoscientists is predicted by the American Geosciences Institute (Wilson, 2016). To fulfill the future needs of the workforce, more demographically diverse students will need to be recruited to geosciences. Minority-Serving Institutions (MSIs) will play a key role in this supply. Among MSIs, Hispanic-Serving Institutions (HSIs) are particularly important in serving regional and local workforce needs. These types of institutions constitute a critical source of underrepresented students in geosciences and other STEM fields for entry into the workforce (National Academies of Sciences, Engineering, and Medicine (NASEM), 2018).

Preparing students for the world of work is a challenge, and some argue that academic faculty are not excelling at this responsibility, nor are faculty as concerned as they should be about equipping students with career/employer skills (Ciarocco, 2018; Graham, Frederick, Byars-Winston, Hunter, & Handelsman, 2013; Phillips, 2015). Career education tends to be located in Student Affairs, whereas, preparation and academic skill development for careers tends to be housed in Academic Affairs. This chapter is based on the research and implementation of a program called The University of Texas at San Antonio (UTSA) Geoscience Pathways (UGP) Program, run by STEM faculty at a Hispanic-Serving Institution (HSI). Because the UGP program connects students with internships on-campus and in local industry off-campus, the program offers insights about dimensions that can strengthen connections between Academic and Student Affairs in terms of preparing STEM students for the workforce.

This program was funded by an Improving Undergraduate STEM Education (IUSE) GEOPATHS grant from the National Science Foundation (Haschenburger, Godet, Gray, & Suarez, 2016). This grant serves students who demonstrate academic potential but are not at the top of their class (i.e., GPA 2.2–3.0; 73% of participants), and connects students with a one-semester internship in research

on campus, followed by two semesters in industry for a selected subgroup. Through faculty departmental efforts to build a career-oriented program component with the Career Services Center and the Tomás Rivera Center, a key component of the program, student affairs practitioners are asked to facilitate workshops on topics related to resume writing, networking, and time management. Thus, the program aims to leverage the strengths of Student Affairs in an effort to best support the success of geoscience students at this HSI.

Findings from our evaluation of the program and its activities indicate that students are enthusiastic about the program for a variety of reasons, regardless of the extent of their direct exposure to academic and career opportunities. Students report that the program raises their awareness about the fundamentals of research and their understanding of graduate school. It also offers them a more fine-grained understanding of different occupations/industries in the geosciences field. Students are afforded an opportunity to develop soft skills that employers are concerned about, as well as the geosciences skills necessary on the job. The challenges that this program faced in its implementation provides important implications concerning recruitment for other initiatives of its kind and more seamless ways to implement these programs, particularly with student affairs units at HSIs. The successes validate the power of connecting the classroom to the world of work and the expansion of educational and career possibilities, especially for historically underrepresented groups like Latina/o students. Thus, the purpose of this chapter is to describe a program that was designed with the AA-SA collaboration in mind and used the expertise of student affairs. To do this, we offer background context related to HSIs, STEM and the geoscience major, highlight program activities and assessment strategies, as well as present findings related to how the activities enhanced UGP students' career skills, awareness, interest in geosciences. Finally, we discuss what was learned from the UGP students about the AA-SA cross division collaboration.

Background Context

Because of the need to increase ethnic minority representation in the geoscience workforce, we accessed literature on linkages between HSIs and STEM, as well as geoscience major selection and its connection to Student Affairs. We pay particular emphasis to understanding how the choices of geoscience major selection and career plays out for students from underrepresented groups.

Hispanic-Serving Institutions and STEM. As a collective, HSIs are celebrated for graduating a large number of STEM degree holders in the United States (Harmon, 2012). A recent comprehensive literature review that was commissioned by the National Academies of Sciences, Engineering, and Medicine (2018), identified that these results are related to the distinctive organizational qualities of MSIs, of which HSIs constitute the largest group (Núñez, Hurtado, & Calderón Galdeano, 2015). Specifically, the review found that MSIs' and HSIs' programmatic and institutional effects were often grounded in "*intentionality*" (NASEM, 2018). That is, many HSIs created STEM interventions that are "tailored to recognize and address student differences across multiple dimensions: academic, financial, social, and with cultural mindfulness" (NASEM, 2018, p. 116). Backing up this point, several studies based in HSIs have found that faculty encouragement to pursue STEM majors, financial support, and research opportunities and internships have contributed to Latina/o successes in the STEM field (Godoy, 2010, Stanton-Sálazar, Macías, Bensimon, & Dowd, 2010). Because of the high levels of support that have been found to contribute to STEM degree production among Latina/o students, it has also been suggested that, regardless of a Latina/o student's academic abilities, HSIs operate in a way that encourages Latina/o students' interest in STEM (Crisp, Nora, & Taggart, 2009; Dowd, Malcom, & Macías, 2010; Malcolm, Dowd & Yu, 2010).

Geoscience major selection. A review of the literature shows that one factor associated with underrepresented students' selecting a geoscience major is related to what they want to pursue for a career after college decisions (Munro, 2009; Sexton, Pugh, Bergstrom & Riggs, 2018; Sherman-

Morris & McNeal, 2016). Having familial support is another factor that has been found to be associated to a student's decision to major in geosciences (Holmes & O'Connell, 2003; Munro, 2009; Stokes, Levine & Flessa, 2015). When familial support is limited, it is found to be related to the family's disconnect between knowing about what being a geoscience major involves and understanding the potential career opportunities and salary this course of study will lend itself to achieving (O'Connell & Holmes, 2011). Some research indicates that when geosciences faculty interact with undergraduate students and discuss career options and pathways, students have a higher likelihood of pursuing a degree in this field (Wolfe, 2018). Even when students select a STEM major like geosciences, studies have shown that their persistence in the major is related to their knowledge and abilities about job pathways and placement, especially among undergraduate students from underrepresented racial/ethnic backgrounds, like African-Americans and Latinas/os (Chang, Sharkness, Hurtado & Newman, 2014; Martin, 2000).

These past studies emphasize a need for information about careers in geoscience, including salary, relevant industries, and pathways to and through the profession. Experiential learning is a strategy that has been found useful to addressing the need for career information, especially among minority students (Blake et al., 2017; Wolfe & Riggs, 2017). Evidence supports that offering experiential learning opportunities improves undergraduate students' knowledge about the geosciences major, and contributes to retaining majors and increasing the diversity of the workforce (Wolfe & Riggs, 2017). At the same time, research has demonstrated that frequent interactions with faculty are essential to increasing minoritized students' interest in the geoscience major (Wolfe & Riggs, 2017). Specifically, underrepresented students have pointed to their ability to receive career advice from geosciences faculty as a reason for choosing a career in this field (Baber, Pifer, Colbeck & Furman, 2010; Houser, Lemmons & Cahill; 2013; Packard, 2004).

University Career Services offer valuable resources that can help students learn about careers and choosing a college major. Partnering with a geosciences department could help with the dissemination of career information to geoscience students, especially given that Career Services staff are experts on such topics as resume writing, interview skills, and job searches (Schaub, 2012). This collaboration deepens the Career Service Centers' understanding of the geoscience major, the profession, as well as fulfilling the need to inform underrepresented students about careers in geoscience. And the collaboration improves overall services offered by Career Services, especially those at MSIs who serve students with diverse needs (Conrad & Gasman, 2015). This improvement is not only beneficial to the expansion of geoscience enrollments and graduations, and the associated placement of students in sustainable career options, but also ensures relevancy of Career Services in the future (Dey & Cruzvergara, 2014).

Evaluation Method of the UTSA Geoscience Pathways Program

The evaluation of UGP program is key to understanding how well the activities did at accomplishing the overall program goals related to increasing UGP students' career knowledge and skills in the geoscience profession. These assessment strategies also point out where the AA-SA collaboration in the UGP program can be improved. As such, we offer details here about how the UGP program was evaluated, describe the HSI and UGP students and offer insights about the way data was collected.

Program evaluation. Assessments were conducted to examine the participants' satisfaction with program activities and to understand how these activities influenced their professional identity, interest in geosciences, and understanding of the geoscience career. A qualitative approach was chosen in order to center the students' experiences in the program (Creswell, 2013).

Site. The UTSA Geoscience Pathways program (www.utsa.edu/geosci/pathways/) is located at The University of Texas at San Antonio (UTSA), one of the largest HSIs in the nation. UTSA is

located in one of the ten fastest growing cities in the United States, where 63% of the city population identified with Latina/o ethnicity in the 2010 U.S. Census. In 2015, UTSA's undergraduate student body was composed of 53% Latina/o, 17% other ethnic minorities, 46% first-generation, and 41% economically disadvantaged (Pell Grant-eligible) students (UTSA Institutional Research, n.d.). Based on the 2012-13 academic year, UTSA ranks ninth and twelfth among all U.S. institutions for the number of Latinas/os receiving bachelor's and master's degrees in STEM fields, respectively (Santiago, Calderón Galdeano, & Taylor, 2015).

The Department of Geological Sciences is part of the College of Sciences, which is the fourth largest college in the university. As of 2018, the department educates 119 undergraduate majors, with a female to male ratio of 1:1.8, and 31 M.S. graduate students. Currently around 60% of the undergraduate majors are self-declared minorities, 39% are first generation students, and 31% are recognized as economically disadvantaged. The historical military presence in San Antonio is reflected in a cohort of veterans that comprise 7% of geology majors. UTSA is typical among many public institutions (e.g., Wilson, 2014) in that the majority of students enter into the geology program in their sophomore or junior year by changing majors (51%) or transferring in from a community college (43%). Most transfer students come from community colleges located in San Antonio.

UTSA Geoscience Pathways Program student participants. The sample for this evaluation included two cohorts of undergraduate students who were enrolled as geological science majors. Cohort 1 included nine students who were at the end of the UGP program and had completed their second rotation of external internships. Of this, 44% were classified as transfer students, 22% were first-generation college students, 56% were from racial/ethnic minority backgrounds, and 33% were female. Cohort 2 included 15 students who were at the beginning of participation in the program. And, 67% were classified as transfer students, 47% were first-generation college students, 53% were

from racial/ethnic minority backgrounds, and 27% were female. All students from both cohorts took part in career workshop activities that were offered by the UGP program and were facilitated by University Career Services.

Data collection and analysis. Data were collected through three rounds of semi-structured focus group interviews with all student participants. Each interview lasted about 60 minutes (Kvale, 1996). The interviews were conducted on-campus and held in a private space that allowed for confidentiality. The protocol consisted of a series of questions that were used to guide the direction of the interview with the focus groups. All interviews were audio recorded and transcribed verbatim. Data analysis consisted of several rounds of content coding of the focus group interviews, which identified a series of codes that reflected themes about the program (Saldaña, 2012). The identities of the participants were made confidential to preserve anonymity.

Findings

Offered here are the themes that emerged from the UGP students' experiences in program activities. The results from their perceptions are used to measure how the activities influenced or exposed UGP students' interest in geosciences, awareness of career options, and understanding of the skills valued by industry employers. The first theme discusses what was found about the industry needs of geoscience students and how the perceived the program addressed such needs. The second theme offers insights into the AA-SA collaboration on program activities that were designed to support the geoscience faculty in the accomplishment of the program's related to fostering HSI student success in geosciences.

Expanded knowledge of what geologists do. The off-campus rotational internship of the program allowed students to experience working in three different areas of the geological

industry – energy resources, water resources and geo-environmental assessment. The program experience made students more aware of different career industries in the field of geosciences. They also mentioned that this experience changed their perception not only of careers in the geological field, but also of the field as a whole. For example, one student who had limited knowledge of the industry stated,

So, I did know there's such thing as an environmentalist, but I didn't think you could go in that field as a geologist. I mean, I had different assumptions as to what you could do. I guess getting the internship experience, you could either be a staff scientist or a field geologist, and then you can work your way up. So, I did get exposed to how geologists can work within the environmental field.

In many instances, student participants stated that the experience cleared up misunderstandings and assumptions that they had about the geosciences major and career. As one female student put it, “I had the misconception that geologists were solely technicians. But they do a lot more.” Not only did these responses reveal potential misunderstandings that students currently majoring in geosciences can have about the career, they also showed that students may have limited familiarity with a full range of pathways or industries. To this point, one Latino male student asserted, “I always knew geology was a huge really wide spectrum field, but I didn't realize it was so wide within the oil and gas industry.” Thus, taking part in the program at this HSI broadened the students’ knowledge of the career opportunities in the geoscience major and helped them gain exposure to working in different geoscience pathways and industries.

Exposure to soft skill and career development. Program participants remarked that they anticipated their participation in the workshop activities related to time management, networking, interviewing, resume writing, and scientific writing would help them gain soft

skills and career development in these areas. Many students in the program mentioned that they were first-generation college students and had not been exposed to this type of learning. A Latina participant who was the first in her family to go to college described this point by stating,

And that's kind of what I expect...Building the resume thing, I've never built one...

I've worked in restaurants my whole life. So, I don't really know how to build a professional resume, necessarily. So, I'm excited for little things like that as well. And we have a career workshop as well. So, yeah, I think this semester will be well worth it.

Her comments emphasized that the workshop activities gave her an opportunity to gain skills that she had not been exposed to, even though she had previous work experience. They also revealed the varying levels of career development knowledge and skills that geoscience students at this HSI, came to campus with, and how such activities can foster significant skill development.

Despite the anticipated desire and need to participate in the workshop activities, several students reported that the workshops did not meet their expectations. For example, one male student said, “me, personally, I don't feel like I got anything out of it.” One reason the students mentioned this as a reason for their disappointment was that the information presented was what one student called, “common sense stuff.” In other words, students felt that the information offered was too general. Specifically, they referenced and expressed that the activities related to learning skills in time management and resume writing could have been improved by being more tailored to the geoscience profession. A student exemplified these concerns by describing,

I think the resume writing workshop would have helped more if it was actually one of the geology faculty who presented the resume writing. Or just science-based, if it was just like the geology like outside of academia if you want to have this specific type of CV setup but depending what field you want to go in the oil field or academia, I think that would have been better if one of the faculty on-campus would have kinda told us how to order our resume.

As previously mentioned, these activities were done in collaboration with University Career Services and presented by a career services advisor. These students felt that after participating in these activities, they were unable to leverage the general knowledge that was presented to specifics in the geological field. They also mentioned that they were disappointed with the format of the workshops. One student noted that she did not like “how the interview workshop was done in groups” as she felt that the group interview structure did not follow a real interview scenario in geosciences. Several others noted that they were not given an opportunity to receive individualized support, which they felt they would have benefitted from. Certainly, these experiences note areas where improvements can be made and tailored to the needs of the field and geoscience students.

Enhanced self-confidence and geoscience identity. Because HSIs are an institutional type that has been found to have a unique ability to develop talent among underrepresented students, we pay particular attention to the results in this section (e.g., Godoy, 2010; NASEM, 2018). All student participants indicated that their on- and off-campus internship rotational experiences helped them to gain more self-confidence in the geoscience major and career. One first-generation male student explained that before the program he was “...terrified. I mean, if it weren't for this program, I'd be terrified about going into a career in geosciences.” Specifically, many students, particularly first-generation low-

income students, stated that the program gave them an opportunity to demystify their own assumptions about the geoscience career, their abilities, and identity. One student described an example of how his internship validated his abilities to do the work,

Today was my last day at [field industry rotation site]. I did a little mock presentation of what I'll be presenting on Saturday, so my internship gave me some good feedback. This semester with them, it went really great...They integrated me into their overall plan and business plan. I was able to locate pilot wells that they could use for reference during horizontal drilling. One of the geologists over there is already using one of the data points that I provided. It was really surprising to find that out. It was cool seeing that my work with them is actually being used.

The ability to work and present their projects or assignments to the career mentors was noted by this student and several other participants as a rewarding experience. One student identified that the internship experience increased their confidence so much that it changed their decision to withdraw from college. The student described this by saying,

When they hear like you're gonna be a geologist...I got a lot of false information and it just kind of fed me into this. And then, you know, once I got into this program, I feel like it did something. 'Cause I was planning on dropping out right before I got into the program...Yeah I probably would have dropped out, had it not been for UGP.

This student emphasized how the UGP program enabled them a sense of pride and purpose in being a geoscience major – which is an important turning point for students who had not felt affirmed in their abilities to persist in major.

Additionally, student participants felt that the internal and external internships, as well as workshop activities increased their marketability to gain a geoscience job. They also felt their experiences in the program made them able to compete against students at Predominantly White

Institutions (PWIs) that they perceived to be more advantaged in training. One Latino male student noted this perception and how the program changed it. He explained,

If you wanna stay in this state and work in the oil and gas industry, the big schools have a monopoly as far as hiring goes. If you go to those schools, you automatically get more interviews and get more recognition. Having something like the UGP program I think really sets you apart from those students.

Student participants noted that their experiences made them feel like they had an advantage in the geoscience workforce, made them more confident, and more likely to apply for other opportunities like graduate school. One of the biggest advantages that students felt they gained from the program was an understanding of what the different geoscience industries valued in their prospective employees and what they were looking for in hiring. All student participants commented that before the program, they were not knowledgeable about what would make them competitive in the field. They also felt that they would have never been able to get an internship without the opportunities offered by the program, due to the competitive nature of geoscience industries (i.e., these positions usually require a master's degree). This feeling was especially pronounced by students who indicated that they were first-generation college students from underrepresented backgrounds with no ties to the industries. One student echoed this point when he said,

Honestly, before I started UGP, I was very concerned about my resume, about not even just having experience, but not having anything. You just hear so much about how competitive everything is. I mean, that's what I was worried about, because I had no experience, no internships, no anything. I mean, not only did this provide internships, but just everything that we've gotten to do in the networking and the everything. It's been amazing.

Because students were able to connect and work with industry employers, the career process became more transparent and accessible to them. In fact, several industry employers mentioned in

interviews that they would consider hiring students participating in the program at UTSA for entry-level positions in their firms. The industry employers indicated a main reason for hiring was deeply related to the fact that students' internship experience meant that they had knowledge and training about the specifics of their firm/industry. Industry employers also felt that the program allowed them to be exposed to and learn about the scholarly excellence of undergraduate geoscience students at this HSI. This was noted by some as an important component of the program because several firms mentioned their reliance on recruiting interns who either have a master's degree or are enrolled at institutions that they perceived to be more rigorous, which tended to be PWIs.

Discussion of Findings

This program offers an innovative example of a program at an HSI aiming to link students, particularly low-income students and students of color, to careers in geosciences. It is a critical endeavor, given that geosciences are one of the least diverse STEM fields. Centered in a geosciences department, and organized by geosciences faculty, the program engaged Student Affairs units via Career Services and external partners in industry to support students in their career choices and advancement. Accordingly, it offered students multiple levels of academic and social support in their educational and career trajectories.

A recent National Academies of Sciences, Engineering, and Medicine (NASEM, 2018) report addressed in depth how MSIs in general, and HSIs in particular, make essential contributions to build the STEM workforce in the U.S. According to the report, many HSIs demonstrate intentionality (NASEM, 2018) in serving students from diverse backgrounds who might not otherwise have opportunities to pursue higher education or STEM fields. The UGP program's strategies are representative of the NASEM report's recommendations to better address the needs of students at MSIs, through understanding students' specific needs and drawing upon multiple human and financial resources to address those needs. The NASEM report emphasized not only the role of

external agencies in recognizing and funding MSIs' and HSIs' efforts, but also the importance of MSIs and HSIs being proactive in leveraging multiple sources to serve students, including external grants, partnerships with industry, and collaborations across units within universities, to provide students with extra support. As recommended in the NASEM report, this program engaged in collaborations both within and outside of the university, to address the distinctive needs of its students.

Our findings about the UGP program indicate that, like many programs at HSIs (e.g., NASEM, 2018; Núñez et al., 2015), this program has engaged in talent development of human potential that has historically been untapped in U.S. higher education. Within an HSI whose goal is to provide access to higher education for diverse students, the program itself focused on identifying students with potential to succeed, but who might not otherwise have had opportunities to participate in such a program. Rather than select the most able students earning "A" grades, who might otherwise be successful, the program selected student participants who had a 2.20 – 3.00 GPA. Findings from our data indicate that the program helped students improve their self-confidence in both academics and their process of seeking careers in geoscience, through engaging students in meaningful work with internship employers and increasing students' understanding of the range of careers in geosciences. Especially for students from low-income backgrounds and students of color, increased knowledge of and experience in geosciences fields could afford them additional cultural and social capital – access to helpful information and social networks to pursue these fields (e.g., Chang et al., 2014).

Historically, the contributions of MSIs and HSIs to the nation's STEM workforce has been overlooked (NASEM, 2018). Reflecting this condition, the students in the UGP program were keenly aware of the disadvantages they might have in seeking careers due to attending a less selective HSI, as opposed to a more selective PWI. Specifically, students expressed that part of the reason they had lower self-confidence in their academic ability and capability of earning employment in geosciences

was because: (1) they compared their abilities to those of students at more selective institutions, and (2) they perceived that graduate programs or employers would perceive their abilities as lower than those of geoscience students at PWIs and selective flagship institutions. They believed that their counterparts at these institutions had advantages in obtaining internships with geoscience industries because of the comparative prestige of their institutions, and because students at these other institutions were able to take advantage of more research opportunities.

Participation in this program's holistic programmatic practices, which were intentionally designed to engage students in geosciences careers, however, increased their confidence that they could successfully pursue careers in geosciences, even when they might be competing against students from other more well-known institutions. Specifically, students expressed that working in internships helped them better understand what employers were looking for in applicants and therefore increased their confidence that they could apply successfully. Furthermore, the social networking afforded these students increased access to more avenues of information to find out about career opportunities.

Notably, among employers outside of the institution, this program also raised the awareness of the value of this particular HSI in contributing to the local economy and workforce (NASEM, 2018). Specifically, career mentors mentioned that the program allowed them to learn that UTSA had quality students, and, in many cases, that student participants outperformed interns from PWIs at the same companies. Career mentors were able to see the distinctive assets that UTSA students brought to the workplace, including increased work and life responsibilities that, in comparison to typically more affluent PWI students, afforded these particular students additional maturity, organization, and resilience on the job.

In sum, the UGP program offers a vivid example of an Academic and Student Affairs collaboration at an HSI involved in: (1) connecting students with undergraduate research experiences; (2) building student-faculty mentoring relationships; (3) forging partnerships with industry to provide students with career experiences; and (4) providing students with information about how to develop career portfolios and job applications. Its holistic approach is reflected in the range of benefits that students reported in their participation in the program. The implementation of the program demonstrates the importance of engaging Student Affairs in addressing the needs of students at HSIs, to provide these students with more holistic support in their academic, social, and career development. Findings from the program implementation indicate that when engaging Career Services in such a program, an increased focus on situating resume development, job application preparation, and interview practice within more authentic geoscience disciplinary and employment settings would be useful. This finding speaks to the challenges of, and opportunities for, strengthening collaborations between Academic and Student Affairs in addressing the needs of diverse students. Examining this program's possibilities and successes affords important lessons for increasing the untapped potential of geosciences students at HSIs.

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References

Baber, L. D., Pifer, M. J., Colbeck, C., & Furman, T. (2010). Increasing diversity in the geosciences: Recruitment programs and student self-efficacy. *Journal of Geoscience Education*, 58(1), 32-42.

- Bernard, R. E., & Cooperdock, E. H. G. (2018). No progress on diversity in 40 years. *Nature Geosciences*, 11(5), 292-295.
- Blake, R., Liou-Mark, J., Norouzi, H., Vladutescu, V., Yuen-Lau, L., & Ikramova, M. (2017). Bridging nongeoscience STEM majors to the geoscience workforce through a skills training and enrichment program. *Bulletin of the American Meteorological Society*, 98(11), 2303-2309.
- Chang, M. J., Sharkness, J., Hurtado, S., & Newman, C. B. (2014). What matters in college for retaining aspiring scientists and engineers from underrepresented racial groups. *Journal of Research in Science Teaching*, 51(5), 555-580.
- Ciarocco, N. J. (2018). Traditional and new approaches to career preparation through coursework. *Teaching of Psychology*, 45(1), 32-40.
- Conrad, C., & Gasman, M.-B. (2015). *Educating a diverse nation*. Cambridge, MA: Harvard University Press.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Los Angeles, CA: Sage.
- Crisp, G., Nora, A., & Taggart, A. (2009). Student characteristics, pre-college, college, and environmental factors as predictors of majoring in and earning a STEM degree: An analysis of students attending a Hispanic Serving Institution. *American Educational Research Journal*, 46(4), 924-942.
- Dey, F., & Cruzvergara, C. Y. (2014). Evolution of career services in higher education. In K. K. Smith (Ed.), *Strategic directions for career services within the university setting* (New Directions for Student Services, no. 148, pp. 5-18). San Francisco, CA: Jossey-Bass.
- Dowd, A. C., Malcom, L. E., & Macías, E. E. (2010). *Improving transfer access to STEM bachelor's degrees at Hispanic Serving Institutions through the America COMPETES Act*. Los Angeles, CA: University of Southern California.

- Godoy, C. (2010). *The contributions of HSIs to the preparation of Hispanics for STEM careers: A multiple case study* (Unpublished doctoral dissertation). University of Pennsylvania, Philadelphia, PA.
- Graham, M. J., Frederick, J., Byars-Winston, A., Hunter, A. B., & Handelsman, J. (2013). Increasing persistence of college students in STEM. *Science*, *341*(6153), 1455-1456.
- Harmon, N. (2012). *The role of Minority-Serving Institutions in national college completion goals*. Washington, DC: Institute for Higher Education Policy.
- Haschenburger, J.K., Godet, A., Gray, W., & Suarez, M. (2016). GP EXTRA-Using professional career experiences to strengthen pathways into the geoscience workforce, NSF IUSE-GEOPATHS program, 9/1/16 - 8/30/19.
- Holmes, M. A., & O'Connell, S. (2003). Where are the women geoscientist professors?. *Eos, Transactions American Geophysical Union*, *84*(50), 564-564.
- Houlton, H. R. (2015). *Geoscience career master's preparation survey report*. Alexandria, VA: American Geosciences Institute.
- Houser, C., Lemmons, K., & Cahill, A. (2013). Role of the faculty mentor in an undergraduate research experience. *Journal of Geoscience Education*, *61*(3), 297-305.
- Huntoon, J.E., Tanenbaum, C., & Hodges, J. (2015). Increasing diversity in the geosciences. *EOS, Transactions American Geophysical Union*, *96*, 13-15.
- Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.
- Malcom, L. E., Dowd, A. C., & Yu, T. (2010). *Tapping HSI-STEM funds to improve Latina and Latino access to STEM professions*. Los Angeles, CA: University of Southern California.
- Martin, D. 2000. Mathematics socialization and identity among African Americans: Real-life experiences, research, and recommendations. In D. Martin (Ed.), *Mathematics success and*

- failure among African-American youth: The roles of sociohistorical context, community forces, school influence, and individual agency* (pp. 169-195). Mahwah, NJ: Lawrence Erlbaum.
- Munro, J. L. (2009). *Understanding decisions Latino students make regarding persistence in the science and math pipeline* (Unpublished doctoral dissertation). University of Arizona, Tucson, AZ.
- National Academies of Sciences, Engineering, and Medicine. (2018). *Minority Serving Institutions: America's underutilized resource for strengthening the STEM workforce*. Washington, DC: The National Academies Press. Retrieved from <https://doi.org/10.17226/25257>
- National Science Foundation (2016). Table 5-3 Bachelor's degree total. In National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA. Retrieved from www.nsf.gov/statistics/wmpd/.
- Núñez, A.-M., Hurtado, S., & Calderón Galdeano, E. (Eds.). (2015). *Hispanic-serving institutions: Advancing research and transformative practice*. New York, NY: Routledge.
- O'Connell, S., & Holmes, M. A. (2011). Obstacles to the recruitment of minorities into the geosciences: A call to action. *GSA Today*, 21(6), 52-54.
- Packard, B. W. L. (2004). Mentoring and retention in college science: Reflections on the sophomore year. *Journal of College Student Retention: Research, Theory & Practice*, 6(3), 289-300.
- Phillips, B. C. (2015, July 20). *Educators, should it be your job to prepare students for the workforce?* Retrieved from <https://www.mheducation.com/highered/ideas>.
- Saldaña, J. (2012). *The coding manual for qualitative researchers* (2nd ed.). Los Angeles, CA: Sage.
- Santiago, D. A., Calderón Galdeano, E., & Taylor, M. (2015). *Factbook 2015: The condition of Latinos in education*. Washington, DC: *Excelencia* in Education.

- Schaub, M. (2012). The profession of college career services delivery: What college counselors should know about career centers. *Journal of College Student Psychotherapy, 26*(3), 201-215.
- Sexton, J. M., Pugh, K. J., Bergstrom, C. M., & Riggs, E. M. (2018). Reasons undergraduate students majored in geology across six universities: The importance of gender and department. *Journal of Geoscience Education, 66*(4), 319-336.
- Sherman-Morris, K., & McNeal, K. S. (2016). Understanding perceptions of the geosciences among minority and nonminority undergraduate students. *Journal of Geoscience Education, 64*(2), 147-156.
- Stanton-Salazar, R. D., Macías, R. M., Bensimon, E. M., & Dowd, A. C. (2010). *The role of institutional agents in providing institutional support to Latino students in STEM*. Annual Meeting of the Association for the Study of Higher Education, Indianapolis, IN.
- Stokes, P. J., Levine, R., & Flessa, K. W. (2015). Choosing the geoscience major: Important factors, race/ethnicity, and gender. *Journal of Geoscience Education, 63*(3), 250-263.
- UTSA Institutional Research. (n.d.). *Student demographics*. Retrieved from <http://www.utsa.edu/ir/>.
- Wilson, C. (2016). *Status of recent geoscience workforce 2016*. Alexandria, VA: American Geosciences Institute.
- Wilson, C. (2014). *Status of recent geoscience workforce 2014*. Alexandria, VA: American Geosciences Institute.
- Wolfe, B. A. (2018). Introductory geosciences at the two-year college: Factors that influence student transfer intent with geoscience degree aspirations. *Journal of Geoscience Education, 66*(1), 36-54.
- Wolfe, B. A., & Riggs, E. M. (2017). Macrosystem analysis of programs and strategies to increase underrepresented populations in the geosciences. *Journal of Geoscience Education, 65*(4), 577-593.

Vanessa A. Sansone is an assistant professor of Higher Education at The University of Texas at San Antonio.

Anne-Marie Núñez is a professor of Educational Studies at The Ohio State University.

J. K. Haschenburger is a professor of Geological Sciences at The University of Texas at San Antonio.

Alexis Godet is an assistant professor of Geological Sciences at The University of Texas at San Antonio.

Walter Gray is a distinguished senior lecturer of Geological Sciences at The University of Texas at San Antonio.

Marina B. Suarez is an associate professor of Geological Sciences at the University of Kansas.

Stuart Birnbaum is an associate professor emeritus of Geological Sciences at The University of Texas at San Antonio.

David Young is a visiting assistant professor of Earth Sciences at The Ohio State University.

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