The Efficacy of a Student Organization for STEM Students

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Abstract

Our study tests the effectiveness of STEM Alliance, a student organization aimed at increasing academic and social support for students pursuing STEM majors. STEM Alliance offered weekly, extracurricular activities aimed at preparing students for graduate school and STEM careers. Students attending STEM Alliance events showed greater academic and social support, greater confidence in the institutional environment, and increased contact with faculty. First-generation students showed significant benefits of participation in STEM Alliance; however, continuing-generation students reported greater student-faculty contact. Although our quasi-experimental design cannot indisputably show a cause-and-effect relationship, our research strongly suggests that STEM Alliance represents a promising, inexpensive method of increasing support for students pursuing STEM degrees.

Keywords: STEM education, continuing-generation students, first-generation students, intervention, social support, academic support.

The Efficacy of a Student Organization for STEM Students

Despite a substantial national effort to attract students to science, technology, engineering and mathematics (STEM) careers, college graduation rates in STEM majors do not meet the current job-market demand in these fields (President's Council of Advisors on Science and Technology, 2012). Women, ethnic minorities, low-income students, and first-generation students are more likely to drop out of STEM majors in college than their peers (Shaw & Barbuti, 2010). Some authors have suggested that STEM programs provide an unwelcoming environment for underrepresented groups (Friedrich, Sellers, & Burstyn, 2007; Johnson, 2007). Interventions that modify the institutional environment have been successful at increasing support for underrepresented students in STEM disciplines (Gross, Iverson, Willett, & Manduca, 2015; Yelamarthi & Mawasha, 2008). Since many of these programs are costly to administer, we were interested in examining a low-cost institutional intervention aimed at supporting STEM students. The intervention consists of the formation of a student organization called STEM Alliance. Since a large proportion of our student body consists of first-generation college students, we were particularly interested in increasing support for this group.

First-generation students, those whose parents did not complete bachelor's degrees, are more likely to drop out of STEM disciplines (Shaw & Barbuti, 2010), be ethnic minorities (Engle & Tinto, 2008), have low incomes (York-Anderson & Bowman, 1991), and be more financially independent (Bui, 2002) than their peers. In college, first-generation students suffer from a range of academic (Soria & Stebleton, 2012) and social obstacles (Jenkins, Belanger, Connally, Boals & Duron, 2013) that compromise their ability to succeed in STEM fields. Not surprisingly, first-generation college students show alarming attrition rates: After six years, only 11% of first-generation students complete their bachelor's degrees, compared to 55% of continuing-generation students (Engle & Tinto, 2008).

Academic challenges represent formidable obstacles for first-generation college students pursuing STEM careers (Soria & Stebleton, 2012). First-generation students enter college with lower standardized test scores (Bui, 2002), critical thinking skills (Terenzini, Springer, Yaeger, Pascarella & Nora, 1996; Jenkins, Miyazaki, & Janosik, 2009), and grade point averages (Pascarella, Pierson, Wolniak, & Terenzini, 2004) than their continuing-generation peers. Lack of academic preparation makes first-generation students more likely to be placed in remedial mathematics courses (Jenkins et al., 2009). Academic unpreparedness is complicated by the fact that first-generation students have greater off-campus work obligations than their peers (Hsiao, 1992), making them unlikely to have the time and energy to devote to academic activities such as study groups and tutoring (Terenzini et al., 1996). Thus, first-generation students face substantial academic challenges that may compromise their ability to succeed in STEM disciplines.

Research shows that first-generation students also suffer from social obstacles in college (Terenzini et al., 1996) and particularly in STEM disciplines (Lam, Srivatsan, Doverspike, Vesalo, & Mawasha, 2005). First-generation students engage with faculty members and other students less frequently (Kim & Sax, 2009; Pascarella et al., 2004), and perceive college environments to be less supportive than do their peers (Pascarella et al., 2004). When they need advice, first-generation students tend to turn to peers, rather than faculty and staff (Kim & Sax, 2009; Torres, Reiser, LePeau, Davis, & Ruder, 2006). Living off-campus, in addition to greater work responsibilities, may lead to difficulties in forming social bonds in college (Pascarella et al., 2004). Social adjustment in college predicts a range of successful college outcomes including degree attainment (Pascarella & Terenzini, 2005). Thus, both academic and social obstacles compromise the ability of first-generation students to be successful in STEM majors.

Several interventions have been shown to improve support for first-generation college students in and out of STEM disciplines (Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012; Stephens, Hamedani, & Destin, 2014; Gross et al., 2015). Although varied in approach, the goal of most interventions is greater academic and social engagement, which is associated with improved GPAs, persistence from first to second year, and eventual degree attainment (Astin, 1993; Pascarella & Terenzini, 1991, 2005; Engle & Tinto, 2008; Yelamarthi & Mawasha, 2008).

Programs such as Living/learning (Inkelas, Daver, Vogt, & Leonard, 2007), FOcusing on CUltivating Scientists (FOCUS), and Carleton Summer Science Fellows (CSSF, Gross et al., 2015), use a holistic approach, that strives to support students both academically and socially. Living/learning programs are residential campus communities, while FOCUS and CSSF are cohort programs that structurally integrate with the curriculum as mandatory extensions to regular coursework. These programs provide academic resources along with high levels of interaction with students, faculty, and staff (Inkelas et al., 2007; Shapiro & Levine, 1999; Gross et al., 2015). Students report greater ease in social and academic transitioning after participating in these programs compared to those who did not participate (Inkelas et al., 2007; Gross et al., 2015). Holistic programs also tend to improve STEM enrollment and retention (Gross et al., 2015). Some intervention programs have even found "conditional effects," in which first-generation students benefitted more from the inter-

vention than did continuing-generation students (Kim & Sax, 2009; Pascarella et al., 2004; Wilsey, Friedrichs, Gabrich, & Chung, 2014). Holistic programs, while effective, are also costly and require a huge commitment of institutional resources (Brower & Inkelas, 2010). Moreover, these programs are highly structured and time consuming, making them most appropriate for students who live on campus and are not employed. Our study tests a program to increase academic and social engagement modeled after these holistic interventions. However, our program was specifically aimed at being successful with low-income, first-generation college students.

Our study tests the efficacy of an intervention, STEM Alliance, a student organization aimed at increasing academic and social support for STEM students at a Historically Black University (HBCU). Since we had few financial resources and many commuter students, we were interested in improving STEM student support using inexpensive methods that could involve commuter and residential students alike. STEM Alliance sponsored 15-20 events per semester for a full year. Some sessions were focused on academic success (e.g., Graduate Record Exam preparation), while others were focused on social engagement (e.g., discussions on social justice). The activities were selected according to previous successful interventions (Inkelas et al., 2007; Gross et al., 2015) and empirically supported theoretical models (Pascarella & Terenzini, 2005; Tinto, 1975) showing that academic and social integration are strong predictors of student persistence and success in higher education. We compared academic and social support among participants who attended STEM Alliance events and those who had not attended events. Our hypotheses were as follows:

H1: Participation in STEM Alliance will be associated with greater levels of academic and social support among STEM students.

H2: First-generation college students will show even greater benefit from attending STEM alliance events than continuing-generation college students.

Methods

Participants were 141 students (94 women, 46 men, 1 did not report gender; *M* age = 20.77, *SD* = 4.58) recruited from a Midwestern HBCU. Participants' self-reported ethnicities were 65 African American, 54 White, and 17 other ethnicities (5 did not report ethnicity). There were 55 freshmen, 20 sophomores, 24 juniors and 38 seniors. Participants self-reported being 36% first-generation students (neither of their parents had completed bachelor's degrees).

The intervention group was defined as those students who participated at least one STEM Alliance event over the course of the academic year. STEM Alliance was organized by a faculty member and three committed STEM majors who served as the organization's officers. Our intent was to provide academic and social support for STEM students outside of the classroom environment at a low cost. Therefore, the goal of each event was to provide academic information in a context of high social engagement with students and faculty. To include substantial social engagement time, each session included 30-75% active group activities and/or discussions.

Over the course of a year, STEM Alliance held 39 events including *Graduate Record Examination (GRE) preparation sessions* (weekly, 28 sessions), a *Journey to Graduate School* series (4 sessions), a *Critical Conversations in Social Justice* series (4 sessions), and a *Professional Development in STEM Fields* series (3 sessions). Five additional organizational planning meetings were also held throughout the year. Each meeting or event was 50 minutes long. Events were advertised in STEM courses and though an email list of STEM majors and faculty members. Event attendance ranged from 9-46 students and 1-3 faculty members, but typically consisted of about 15 students and 2 faculty members. Although attendance was not mandated, faculty in STEM disciplines frequently awarded extra credit points for student participation in events. Faculty members also donated snacks for most events. Most speakers and event facilitators were volunteer faculty members or students, with the exception of GRE instructors who were paid $2800 ($100/class session). GRE instructor pay represented the only monetary cost of the program.

Data were collected toward the end of the one-year period during STEM courses. Of those surveyed, 82 students had participated in at least one STEM Alliance event and 59 students had never attended any STEM Alliance event. Of those who attended STEM Alliance events, the mean number of events attended was 5.32 (*SD* = 5.08).

The survey packet contained demographic questions (age, gender, class, ethnicity, participation in STEM Alliance, and first-generation status) and the Student Support Needs Scale (SSNS; Hardy & Aruguete, 2014). The SSNS is a 33-item self-report measure (α = .90) designed to measure both academic and social support. SSNS support scores positively correlate with student success measures such as grade point average and frequency of visits to professor office hours (Hardy & Aruguete, 2014). The measure assesses five student support systems: (1) *Knowledge* (6 items; α = .69 on our sample) addresses whether students have the academic preparation to perform well, (2) *Time and Energy* (6 items; α = .63) addresses whether students have the time, energy, or financial resources to complete the tasks necessary for good performance, (3) *Motivation* (5 items; α = .77) addresses whether students desire and consider themselves able to perform well, (4) *Personal Contact* (10 items; α = .90) addresses the amount of interaction with faculty members including receiving performance feedback, and (5) *Tools and Environment* (6 items; α = .78) addresses whether students have adequate resources and a helpful work environment at the institution. For each item, participants choose one of five response options ranging from "Strongly Agree" (scored as 5) to "Strongly Disagree" (scored as 1).

We calculated overall SSNS mean scores, in addition to mean subscores for *Motivation, Personal Contact,* and *Tools and Environment*. We did not calculate mean subscores for *Knowledge* and *Time and Energy* due to low reliability estimates for these measures.

As a first step in the analysis, we examined whether first-generation students attended STEM Alliance sessions at the same rate as their continuing-generation peers using a Chi Square test of independence. Using 2 X 2 ANOVAs, we then examined whether STEM Alliance participation was associated with increased student support and whether such participation disproportionally influenced first-generation college students when compared to continuing-generation students. Finally, we calculated correlations assessing whether greater particpation in STEM Alliance was associated with improved academic and social support.

Results

We used a Chi Square test to examine the relationship between first-generation status and STEM Alliance participation. The relationship between these variables was not significant, $X^2(1, N = 118) = 1.08$, $p = .30$, showing that continuing-generation students were no more likely to attend STEM Alliance events than their first-generation peers.

ANOVA showed a main effect of STEM Alliance participation on overall student support (SSNS Scores; See Table 1, $F_{1,79} = 4.83$, $p = .03$; partial eta$^2 = .06$). Students who attended at least one STEM Alliance session (M = 3.89, SD = .47) reported feeling more supported than students who did not attend any sessions (M = 3.77, SD = .45). First-generation and continuing generation students showed no significant differences ($F_{1,79} = 3.09$, p = .08; partial eta$^2 = .04$). We also found no significant interaction ($F_{1,79} = 1.44$, $p = .23$; partial eta$^2 = .02$), meaning that there was no support for the hypothesized conditional effect that first generation students would benefit from the intervention more than continuing-generation students (See Table 1). Further analysis examined the individual support subscales to determine where differences in support occurred.

We found a main effect of first-generation status on *motivation* (See Table 1, $F_{1,116} = 5.77$, p = .02; partial eta^2 = .05). First-generation students (M = 3.92, SD = .69) reported feeling significantly less motivated than their continuing-generation peers (M = 4.20, SD = .62). There were no main effects of STEM Alliance participation ($F_{1,116}$ = .65, p = .42; partial eta$^2 = .01$), nor an interaction effect ($F_{1,116} = 1.07$, $p = .30$; partial eta$^2 = .01$) on student motivation.

We found a main effect of STEM Alliance participa-

Descriptive Statistics

	First-Generation Students				Continuing-Generation Students			
	Participants		Non-Participants		Participants		Non-Participants	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Overall Support	3.74	.55	3.64	.39	4.04	.37	3.69	.37
Motivation	4.01	.85	3.76	.58	4.19	.58	4.22	.67
Personal Contact	3.66	.76	3.60	.61	4.13	.50	3.55	.70
Tools and Environment	3.79	.71	3.67	.52	4.18	.45	3.65	.52

Note: "Participants" are those students who attended at least one STEM Alliance session. Cell sizes are as follows: First-generation participants ($n = 30$), First-generation non-participants, ($n = 18$), Continuing-generation participants ($n = 37$), Continuing-generation non-participants ($n = 33$).

Table 1.

tion on tools and environment (See Table 1; $F_{1,82} = 6.29$, p = .01; partial eta^2 = .08). STEM Alliance participants ($M = 3.97$, $SD = .67$) felt as though they had a more supportive environment at the university than those who did not participate in STEM Alliance ($M = 3.73$, $SD = .57$). There was no significant effect of first-generation status ($F_{1,82} = 2.11$, $p = .15$; partial eta^2 = .03), nor a significant interaction ($F_{1,82} = 1.07$, $p = .30$; partial eta^2 = .03) on *tools and environment*.

We found a significant interaction between STEM Alliance participation and first-generation status for *personal contact* with faculty members. Participants who never attended STEM Alliance events and first-generation students who did attend STEM Alliance events all showed relatively low personal contact with faculty when compared with continuing-generation students who attended STEM Alliance events (See Table 1, $F_{1,116} = 4.32$, $p = .04$; partial eta^2 = .04). Contrary to our hypothesis, the STEM Alliance intervention appeared to increase personal contact for continuing-generation students more than it did for first-generation students. There was a significant main effect of STEM Alliance participation ($F_{1,116} = 6.41$, $p = .01$; partial eta^2 = .05) on personal contact, with those attending STEM Alliance showing greater personal contact with faculty. However, the main effect of first-generation status was not significant ($F_{1,116} = 2.82$, $p = .10$; partial eta^2 = .03).

Finally, we examined Pearson correlations between the number of STEM Alliance sessions attended and student support (See Table 2). There was a significant relationship between events attended and the tools and environment subscale. Students who attended more STEM Alliance events perceived the university to be a more supportive environment for STEM students.

Discussion

This study examined the efficacy of STEM Alliance, a low-cost intervention designed to increase the academic and social support of STEM students. We were particularly interested in whether STEM Alliance would increase support for first-generation students. We found that participation in STEM Alliance was associated with increased overall student support, an improved perception of the institutional environment, and enhanced personal contact with faculty members. First-generation and continuing-generation students were equally likely to attend STEM Alliance sessions. However, continuing-generation students showed slightly more positive effects from participating in STEM Alliance than did first-generation students. Although there were limitations to our study, our results suggest that programs like STEM Alliance can be a low-cost way of improving support for undergraduate STEM students.

Research has shown that engagement in a wide range of purposeful educational activities is positively associated with college success measures such as GPA, student persistence from first to second year, and degree attainment (Astin, 1993; Pascarella & Terenzini, 2005; Engle & Tinto, 2008). The recognition that student engagement is critical to retention has led to a proliferation of holistic programs designed to promote a high level of student engagement in residential college settings (Inkelas et al., 2007; Shapiro & Levine, 1999; Gross et al., 2015). While holistic programs offer impressive results, they are not feasible in every institution due to the high cost of administering programs or the predominance of commuter students. Our findings show that the formation of student organizations like STEM Alliance can be successful at engaging students at a lower cost, in a non-residential setting. Our study also supports research showing that low-cost, student-organized activities are associated with greater student academic and social integration among first-generation students (Folger, Carter, & Chase, 2004).

Since previous interventions have often shown "conditional" effects (Eddy & Hogan, 2014; Kim & Sax, 2009; Pascarella et al., 2004; Wilsey et al., 2014), we hypothesized that first-generation students would show greater benefits from STEM Alliance participation than their peers. Although STEM Alliance attendance was associated with benefits for both first-generation and continuing-generation students; contrary to our hypothesis, only continuing-generation students reported increased personal contact with faculty. The reluctance of first-generation students to interact with faculty members has been well documented (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006). Some STEM Alliance events may have been dominated by a few academically confident, continuing-generation students, creating an environment where more passive students did not feel comfortable speaking to faculty members (Johnson, 2007). Special attention aimed at increasing interaction between first-generation students and faculty would likely improve the STEM Alliance intervention. Maintaining smaller groups for activities (e.g., 6-10 participants) or limiting some activities to first-generation students only could further encourage first-generation students' interactions with faculty (Folger et al., 2004).

One major limitation of our study was our quasi-experimental design, which does not allow us to be certain about causal effects. Since STEM Alliance participants were volunteers, they may have had pre-existing differences with the control group (e.g., they may have already been inclined toward achievement-seeking behaviors). Future research should randomly assign groups in order to establish a causal relationship between STEM Alliance and student support. Another limitation was that we collected our data at a small HBCU. Our findings may not generalize to larger or less ethnically diverse institutions. Finally, we were not able to track STEM Alliance attendees to assess changes in grades or retention. Doing so would have allowed us to examine the long-term academic impacts of participation. Despite these limitations, our data suggest that STEM Alliance is an effective and low-cost intervention that institutions can easily implement as part of

Correlations

	1	2	3	4	5
1. STEM Alliance Events Attended	1				
2. Overall Support	.18	1			
3. Motivation	.02	.63**	1		
4. Personal Contact	.16	.88**	.40**	1	
5. Tools and Environment	.21*	.75**	.34**	.69**	1

Note. * = $p < .05$, ** = $p < .01$

Table 2.

their efforts to improve student support and engagement among STEM students.

References

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco, CA: Jossey-Bass.

Bui, K. V. T. (2002). First-generation college students at a four-year university: Background characteristics, reasons for pursuing higher education, and first-year experiences. *College Student Journal, 36*(1), 3-11.

Brower, A. M., & Inkelas, K. (2010). Living-learning programs: One high-impact educational practice we now know a lot about. *Liberal Education, 96*(2), 36-43. Retrieved from https://www.wesleyan.edu/reslife/faculty-academic-partners/Brower_Inkelas,%202010%20Liberal%20Education.pdf

Eddy, S. L., & Hogan, K. A. (2014). Getting under the hood: How and for whom does increasing course structure work? *CBE-Life Sciences Education, 13*(3), 453-468. http://dx.doi.org/10.1187/cbe.14-03-0050

Engle, J., & Tinto, V. (2008). Moving beyond access: College success for low-income, first-generation students. *Pell Institute for the Study of Opportunity in Higher Education*. Retrieved from http://files.eric.ed.gov/fulltext/ED504448.pdf

Folger, W. A., Carter, J. A., & Chase, P. B. (2004). Supporting first generation college freshmen with small group intervention. *College Student Journal, 38*(3), 472.

Friedrich, K., Sellers, S. L., & Burstyn, J. (2007).Thawing the chilly climate: Inclusive teaching resources for science, technology, engineering, and math. In D.R. Robertson and L.B. Nilson (Eds.), *To improve the academy: Resources for faculty, instructional, and organizational development* (pp. 133-144). San Francisco: Jossey-Bass.

Gross, D., Iverson, E., Willett, G., & Manduca, C. (2015). Broadening Access to Science With Support for the Whole Student in a Residential Liberal Arts College Environment. *Journal of College Science Teaching, 44*(4), 99. http://dx.doi.org/10.2505/4/jcst15_044_04_99

Hardy, P., & Aruguete, M. (2014). Needs assessment in STEM disciplines: Reliability, validity and factor structure of the Student Support Needs Scale (SSNS). *Assessment & Evaluation in Higher Education, 39*(5), 553-562. http://dx.doi.org/10.1080/02602938.2013.857642

Hsiao, K. P. (1992). *First-generation college students* (ERIC Digest Report No. EDOJC-00-04). Los Angeles, CA: ERIC Clearinghouse for Junior Colleges. (ERIC Document Reproduction Service No. ED 351 079.)

Inkelas, K. K., Daver, Z. E., Vogt, K. E., & Leonard, J. B. (2007). Living–Learning programs and first-generation college students' academic and social transition to college. *Research in Higher Education, 48*(4), 403-434. http://dx.doi.org/10.1007/s11162-006-9031-6

Jenkins, A. L., Miyazaki, Y., & Janosik, S. M. (2009). Predictors that distinguish first-generation college students from non-first generation college students. *Journal of Multicultural, Gender and Minority Studies, 3*(1), 1-9.

Jenkins, S. R., Belanger, A., Connally, M. L., Boals, A., & Durón, K. M. (2013). First-generation undergraduate students' social support, depression, and life satisfaction. *Journal of College Counseling, 16*(2), 129-142. http://dx.doi.org/10.1002/j.2161-1882.2013.00032.x

Johnson, A. C. (2007). Unintended consequences: How science professors discourage women of color. *Science Education, 91(5)*, 805-821. http://dx.doi.org/10.1002/sce.20208

Kim, Y. K., & Sax, L. J. (2009). Student–faculty interaction in research universities: Differences by student gender, race, social class, and first-generation status. *Research in Higher Education, 50*(5), 437-459. http://dx.doi.org/10.1007/s11162-009-9127-x

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). What matters to student success: A review of the literature. *National Postsecondary Education Cooperative*. Retrieved from http://nces.ed.gov/npec/pdf/kuh_team_report.pdf

Lam, P., Srivatsan, T., Doverspike, D., Vesalo, J., Mawasha, P. (2005). A ten year assessment of the pre-engineering program for under-represented, low-income and/or first generation college students at the University of Akron. *Journal of STEM Education, 6*, 14-20.

Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *Journal of Higher Education, 75*(3), 249-284. http://dx.doi.org/10.1353/jhe.2004.0016

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research (Vol. 2)*. K. A. Feldman (Ed.). San Francisco, CA: Jossey-Bass.

President's Council of Advisors on Science and Technology (2012). Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics. Retrieved from: https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf

Shapiro, N. S., & Levine, J. H. (1999). *Creating learning communities: A practical guide to winning support, organizing for change, and implementing programs*. San Francisco, CA: Jossey-Bass.

Shaw, E. J., & Barbuti, S. (2010). Patterns of persistence in intended college major with a focus on STEM majors. *NACADA Journal, 30*(2), 19–34.

Soria, K. M., & Stebleton, M. J. (2012). First-generation students' academic engagement and retention. *Teaching in Higher Education, 17*(6), 673-685. http://dx.doi.org/10.1080/13562517.2012.666735

Stephens, N. M., Fryberg, S. A., Markus, H. R., Johnson, C. S., & Covarrubias, R. (2012). Unseen disadvantage: How American universities' focus on independence undermines the academic performance of first-generation college students. *Journal of Personality and Social Psychology, 102*(6), 1178. http://dx.doi.org/10.1037/a0027143

Stephens, N. M., Hamedani, M. G., & Destin, M. (2014). Closing the social-class achievement gap a difference-education intervention improves first-generation students' academic performance and all students' college transition. *Psychological Science, 25*(4), 943-953. http://dx.doi.org/10.1177/0956797613518349

Terenzini, P. T., Springer, L., Yaeger, P. M., Pascarella, E. T., & Nora, A. (1996). First-generation college students: Characteristics, experiences, and cognitive development. *Research in Higher education, 37*(1), 1-22. http://dx.doi.org/10.1007/BF01680039

Tinto,V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*, 89-125.

Torres, V., Reiser, A., LePeau, L., Davis, L., & Ruder, J. (2006). A model of first-generation Latino/a college students' approach to seeking academic information. *NACADA Journal, 26*(2), 65-70. http://dx.doi.org/10.12930/0271-9517-26.2.65

Wilsey, S. A., Friedrichs, J., Gabrich, C., & Chung, T. T. (2014). A privileged pedagogy for privileged students? A preliminary mixed-methods analysis comparing first-generation and non-first-generation college students on post-evaluations of service-learning courses. *PRISM: A Journal of Regional Engagement, 3*(2), 79-97.

Yelamarthi, K., & Mawasha, P. R. (2008). A pre-engineering program for the under-represented, low-income and/or first generation college students to pursue higher education. *Journal of STEM Education, 9*(4), 5-15.

York-Anderson, D. C., & Bowman, S. L. (1991). Assessing the college knowledge of first-generation and second-generation college students. *Journal of College Student Development, 32*(2), 116-122.

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