Tapping HSI-STEM Funds to Improve Latina and Latino Access to STEM Professions

Lindsey E. Malcom, Alicia C. Dowd, and Terrence Yu
Tapping HSI-STEM Funds to Improve Latina and Latino Access to STEM Professions

This report was written by Dr. Lindsey E. Malcom, Assistant Professor at the University of California, Riverside, Dr. Alicia C. Dowd, Associate Professor and Co-Director at the Center for Urban Education (CUE), and Terrence Yu, consulting researcher.

Acknowledgements: The authors would like to thank CUE Co-Director Dr. Estela Mara Bensimon, Dr. Brian T. Prescott of the Western Interstate Commission for Higher Education (WICHE), Dr. Brian Pusser of the University of Virginia, and Sarah K. Spreitzer of Lewis-Burke Associates, for their input.

In 2007, the Center for Urban Education began a three-year research grant funded by the National Science Foundation (Grant No. 0653280) to determine practical ways of increasing Latinos’ access to and success in STEM fields, with Dr. Dowd as Principal Investigator and Dr. Bensimon as Co-Principal Investigator. Through this study, CUE is examining the features of exemplary STEM policies and programs to identify ways for institutions—both Hispanic-Serving Institutions (HSIs) as designated by the U.S. Department of Education, and non-Hispanic Serving—to increase the number of Latino STEM graduates.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The use of National Science Foundation data does not imply National Science Foundation endorsement of the research, research methods, or conclusions contained in this report.

HOW TO CITE THIS REPORT:

OTHER REPORTS IN THIS SERIES:

In March 2010, President Barack Obama signed the Health Care and Education Reconciliation Act (HCERA) into U.S. law. In addition to its reform of health care insurance and delivery in the U.S., HCERA makes substantial investments in federal financial aid and Hispanic-Serving Institutions (HSI), specifically the HSI-STEM and Articulation Program (HSI-STEM). As enacted in HCERA, HSI-STEM will receive an infusion of $100 million annually through 2019—a billion dollar investment—to increase degree attainment in science, technology, engineering, and mathematics (STEM) fields at HSIs. Combined with increased Pell grant funding, an expanded Income-Based Repayment program for borrowers and more resources for financial aid advising, the decade-long commitment to HSI-STEM creates a significant opportunity to increase the number of Latina and Latino scientists, engineers, and mathematicians.

This report examines the most commonly used forms of financial aid and college financing strategies among Latino STEM bachelor’s degree holders. Given the large number of Latinos enrolled in community colleges and at Hispanic-Serving Institutions (HSIs), the report examines the financing strategies of those students who earned associate’s degrees and attended HSIs in comparison with those who did not.

This report alerts STEM administrators and faculty members at HSIs that substantial funds will be available over the next decade to support Latina and Latino STEM students and provides recommendations for the best use of those funds. HSIs can improve the numbers of Latino students earning degrees in STEM by helping students to balance their reliance on loans and earnings with grants and scholarships. In addition, recognizing the time demands on working students, institutions should use the HSI-STEM funds to provide research-intensive experiences for all students in the core curriculum rather than in special or add-on programming.

This report also demonstrates the relationships among students’ access to STEM degrees and career choices and available financial aid. Any diminished prospect for student success in college is problematic at a time when President Obama, Congress, and the National Governors Association are all aiming to increase the number of college degrees awarded, particularly in STEM. The extent to which Latino degree attainment in STEM has not kept pace with population growth is troubling. After describing the three predominant college financing strategies of Latina and Latino STEM baccalaureates, it illustrates how HSI-STEM funds can be used to improve Latino students’ access to STEM professions. Of particular note are the Latino students who earn STEM bachelor’s degrees while working and borrowing to pay for college. These “self-supporters” tend to be graduates of HSIs, to earn an associate’s degree before going on for the bachelor’s, and to be older, first-generation students from economically modest backgrounds.

1 Defined by Title V of the Higher Education Act, a Hispanic-Serving Institution (HSI) is a non-profit institution that has at least 25% Hispanic full-time equivalent (FTE) enrollment (20 U.S.C. 1101, as amended).

2 In 2009-2010, funds previously allocated in this area were administered as the College Cost Reduction and Access Act—Hispanic-Serving Institutions program (CCRAA-HSI).

3 The fields included as STEM in this report are those included in the National Science Foundation’s (NSF) definition of STEM: biological sciences, physical sciences, computer science, mathematics, behavioral sciences, social sciences, and engineering.

4 In this report, we use the terms Hispanic, Latina, and Latino to refer to persons who trace their origin to Mexico, Puerto Rico, Cuba, Spanish speaking Central and South American countries, and other Spanish cultures (Fry, 2008). In addition, rather than always subsuming the feminine to the masculine form, at times we use the expression “Latinas and Latinos” to be explicitly inclusive of Latinas and at times, for ease of reference, the expression “Latino” referring to both Latinos and Latinas.
Students benefit when they take advantage of grants and scholarships to reduce work hours and debt burden. Towards that goal, HCERA directs $150 million annually to the states to provide better information to students about the costs of college, available financial aid, and the benefits of various career choices. A total of $750 million is allocated through 2014 to the College Access Challenge Grant Program (CACGP) to improve the quality of information provided to low-income students through the states. Like the Federal TRIO and Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) programs, the CACGP aims to increase college access for low-income students by providing valuable resources and support services. HCERA also facilitates college access by increasing the maximum Pell grant award and by indexing the Pell grant to the Consumer Price Index for five years beginning in 2013. Mandatory funding for Pell outlined in the HCERA will fund the annual increases.

Latino Students Have Relatively High Levels of Financial Need

For many students, college attendance depends on financial aid, be it institutional, state, federal, or aid from private sources. Latina and Latino students have relatively high levels of financial need compared to other racial-ethnic groups. In 2007-08, over 41% of Latino undergraduates in STEM fields had an expected family contribution—which is the federal government’s measure of a family’s ability to pay—of $1,000 or less, compared to 28% for all STEM undergraduates (U.S. Department of Education, 2008b).

It is not surprising, then, that Latinos enrolled in postsecondary education are concentrated in open-access community colleges which are considerably less expensive than most four-year public and private colleges and universities. In 2009-10, the average tuition and fees at community colleges was $2,544, compared to $7,020 for in-state tuition and fees at public four-year institutions and $26,273 at four-year not-for-profit private institutions (College Board, 2009). In the five states\(^5\) that comprise two-thirds of the continental U.S. Latino population, the cost of attending community college is even lower than the national average ($2,353 vs. $2,544) (College Board, 2009).

More than half of Latino students enrolled in four-year postsecondary institutions attend HSIs. In comparison to four-year non-HSIs, HSIs also tend to be less expensive. Average in-state tuition at four-year non-HSIs in 2007 was $15,103. Average in-state tuition at four-year HSIs in 2007 was $8,035 (U.S. Department of Education, 2008a). This difference is due to the fact that the majority of four-year HSIs are public institutions, while the majority of four-year non-HSIs are private institutions.

Cost concerns appear to drive college choices. Latino students work while enrolled in college at higher rates and for longer hours, on average, than their more economically well-off peers. Nearly 60% of Latino graduating college seniors reported working an average of 30 hours or more per week (U.S. Department of Education, 2005). Working such extensive hours while enrolled in college significantly reduces the likelihood of degree completion.\(^6\)

\(^5\) Sixty-three percent of the continental U.S. Latino population resides in California, Texas, Florida, New York or Illinois (U.S. Census Bureau, 2008)

\(^6\) According to the National Center for Education Statistics Beginning Postsecondary Students Longitudinal Study (BPS: 96/01), 33% of Latino students who began college in 1995-96 and worked 1-19 hours per week while enrolled never attained a degree by June 2001, compared to more than 53% of those who worked 20 or more hours while enrolled in college.
As shown in Figure 1, the numbers of Latino students receiving STEM bachelor’s degrees increased by 80% between 1995 and 2007. During the same period the number of Latinos completing master’s and doctoral degrees grew by 105% and 144%, respectively; however, Latinos remain most severely underrepresented among STEM master’s and doctoral degree recipients. Given that advanced degrees are typically required for entry into STEM professions and faculty positions, these trends must improve.

Increasing participation of Latino STEM students at all degree levels is not just a matter of fairness and social equity, but of workforce need. The Bureau of Labor Statistics projects employment in STEM occupations will increase by 21.3% from 2008 to 2018—more than double the growth in other occupations (U.S. Department of Labor, 2009). Latinos are the fastest growing demographic group and are projected to be 25% of the U.S. population in 2020. By 2025, the majority of the U.S. population will be members of today’s racial-ethnic “minority” groups (NSF, 2009). Given these demographic shifts, it is critical that underserved populations, particularly Latina and Latino students, are educated to contribute to a diverse STEM workforce.

Figure 1. Degrees Awarded to Hispanics in Science and Engineering Fields, 1995-2007

![Graphic chart showing degrees awarded to Hispanics in science and engineering fields from 1995 to 2007.](image)

Sources: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; and National Science Foundation, Division of Science Resources Statistics, Integrated Science and Engineering Resources Data System as cited in Science and Engineering Indicators 2010.
Three College Financing Strategies: Parental Support, Self-Support, and Balanced Support

The first phase of a three-year study by the Center for Urban Education, funded by the National Science Foundation, focused on the institutional and college financing pathways of Latina and Latino STEM baccalaureates, and the relationship between these pathways. For this portion of the study, we analyzed the National Science Foundation’s 2003 National Survey of Recent College Graduates (NSRCG), which comprises a nationally representative sample of bachelor’s and master’s degree earners in STEM fields. Clear patterns of participation in financial aid programs among Latino STEM bachelor’s degree holders emerged from our analysis. These patterns can be classified into three financial support strategies: parental support, self-support and balanced support.

Over 83% of Latino STEM bachelor’s degree holders received some form of financial aid, with loans being the most common type. Slightly less than 70% of Latino STEM bachelor’s degree holders borrowed to pay for college, either from family members or from the government or private lenders (see Table 1). Scholarships and grants were the second most commonly used form of financial aid, followed by student earnings and family support that did not need to be repaid. About 28% of Latino STEM bachelor’s degree holders used Federal Work-Study to finance college.

Table 1. Forms of Financial Aid Used by Latino STEM Bachelor’s Degree Holders

<table>
<thead>
<tr>
<th>Form of Financial Aid</th>
<th>Proportion of Latino STEM Bachelor’s Degree Holders Using Form of Aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private or Federal Loans</td>
<td>66%</td>
</tr>
<tr>
<td>Familial Loans</td>
<td>7%</td>
</tr>
<tr>
<td>Scholarships/Grants</td>
<td>65%</td>
</tr>
<tr>
<td>Student Earnings</td>
<td>60%</td>
</tr>
<tr>
<td>Familial Support (not to be repaid)</td>
<td>56%</td>
</tr>
<tr>
<td>Work Study</td>
<td>28%</td>
</tr>
<tr>
<td>Employer Support</td>
<td>9%</td>
</tr>
<tr>
<td>Other Source</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Analyses of NSF 2003 National Survey of Recent College Graduates (NSRCG), using final survey weight (WTSURVY).

As Table 1 clearly illustrates, Latino STEM bachelor’s degree holders, like all college students, use multiple means to pay for college, but the mix can differ significantly.

Through additional quantitative analyses (called latent class analysis) described in the Technical Appendix, it became clear that for some fortunate students—usually those of traditional college age—family wealth is the main source of financial support. This group is distinguished by having parental support to finance college. As indicated by the empty circle in the second row in Table 2, parentally supported Latino STEM bachelor’s degree holders were unlikely to take out a federal and/or private loan to pay for college. As shown in Figure 2, students in the parental support group account for just over a quarter (27%) of Latino STEM baccalaureates.

In contrast, self-supporters did not usually receive financial resources from their parents to help pay for college. Self-supporters were as likely as the parentally supported students to have scholarships or grants (or both). One in five (20%) Latino STEM baccalaureates can be characterized as using the self-support financing strategy (see Figure 2).

Lastly, a group emerged from our analysis that typically had balanced support, a mix of family support, loans, scholarships and grants, and earnings from jobs they held as students. The majority of Latino STEM baccalaureates (53%) can be characterized as having a balanced support college financing strategy, which is distinguished by the fact that students are tapping into so many different sources of financial aid. This group relied even more heavily than self-supporters on loans. Those in this balanced support group were also much more likely than the parentally supported and self-supporters to have scholarships or grants. Similar to the parentally supported, students with a balanced financing strategy tended to be of traditional college age.

Table 2. The Sources of Aid Used in the Self-Support, Parental Support, and Balanced Support Financing Strategies (Likelihood of Using Each Type of Aid)

<table>
<thead>
<tr>
<th>Source of Financial Aid</th>
<th>Parental Support</th>
<th>Self-Support</th>
<th>Balanced Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familial Support (not to be repaid)</td>
<td>●</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Federal and/or Private Loans</td>
<td>○</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Scholarships and/or Grants</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Student Earnings</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Work Study</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Employer Support</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Familial Loans</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Note: This table illustrates the likelihood that students using the parental support, self-support, or balanced support college financing strategy will draw upon the specified source of financial aid. See Technical Appendix for details of the analysis.

Latino Students’ College Financing Strategies Depend on Personal Circumstances

Students’ knowledge of the many forms and sources of college financial aid is related to socioeconomic status and access to informational resources within their families, high schools, and communities. Our findings illustrate that the ways in which Latino students combine multiple forms of financial aid to pay for college are also closely related to personal circumstances.

Parental Support

The parentally supported group was defined by the fact that students had had parental financial support for college. The vast majority of the parentally supported (83%) were of traditional college age, and their parents were likely to have earned at least an undergraduate college degree. Given these greater financial resources, these students were able to afford more academically selective private four-year universities and were unlikely to earn an associate’s degree before earning the bachelor’s or to graduate from an HSI.

Characteristics of the Parentally Supported

Parentally supported Latino STEM Bachelor’s degree holders were more likely to:

- Be students of traditional college age.
- Have college-educated parents.
- Directly enroll in a four-year institution without earning an associate’s degree.
- Receive the bachelor’s degree from a non-HSI research university.

Figure 2. College Financing Strategies of Latino STEM Baccalaureates

Weighted N=61,233
Source: Analyses of the NSF 2003 National Survey of Recent College Graduates (NSRCG) using survey weight (WTSURVY).
The following vignettes tell the stories of three fictional students—Armando Garcia, Laura Montero, and Ivette Torres—as they navigate college and career pathways and make decisions about how to pay for college. Their stories illustrate in narrative form the three predominant financing strategies revealed through our statistical results. The purpose of the narratives is to provide profiles of students that demonstrate the importance of financial aid, financial aid advising, and undergraduate research opportunities at HSIs.

Armando Garcia: Parentally Supported

Armando Garcia, a Mexican American whose grandparents had immigrated to the Southwestern United States, suspected he would wind up attending Flagship University. His parents were among the few Mexican Americans on campus when they met each other there as undergraduates. They gave not-so-subtle hints to Armando that they expected him to attend their alma mater.

Armando, an “A” student planning to attend college directly out of high school, would have preferred to go to Top Private University. Though Armando’s parents began saving for his college education when he was quite young, they both felt that Top Private U. was not worth the loan debt Armando would have to take on if he went there. When Armando was accepted to Top Private U., but only received a small scholarship, he decided his parents were right and enrolled at Flagship U. His parents covered the cost of in-state tuition and room and board, leaving Armando responsible for books and other living expenses. Armando got an on-campus job at the library where he worked for 10 hours each week.

Armando also worked full time during the summers, except after his junior year when he had the opportunity to do an independent study and go on field trips to the Grand Canyon with Professor Rodriguez, a gregarious and charming geologist who made a special point of taking Latino students under his wing. Armando entered college undecided about his major, but after he took what he expected to be a “rocks for jocks” class with Professor Rodriguez in his sophomore year to satisfy a science General Education requirement, Armando began to imagine that he too could become a geology professor.

When conducting field work and gathering data alongside Professor Rodriguez, Armando learned that he would have a better chance at graduate school if he graduated from one of the top 100 research universities. He looked into transferring to his first choice school, Top Private U., because many of Top Private U.’s graduates went on to faculty careers after earning Ph.D.s in the sciences. However, Armando was again stymied by the high cost at Top Private and the prospect of having to repay college loans. He stayed at Flagship, but regretted it when his applications were rejected from the top three geology graduate programs. In his senior year, Armando complemented his geology major with a minor in business. When he graduated he went to work for an oil industry services firm.
Self-Support

Students in the self-support group had characteristics nearly opposite to the parentally supported. Only 15% of self-supporters had parental financial support for college, whereas the parentally supported group was defined by that support. Other characteristics create a fuller portrait of the Latina and Latino STEM bachelor’s degree holders who used the self-supporting college financing strategy. Sixty-five percent of self-supporters were of non-traditional college age (i.e. above 24 years of age), compared to only 31% of all Latino STEM baccalaureates in this age group. They also tended to be first-generation college students (56% compared with 36% of Latino STEM baccalaureates). Given the relationship between parental education and socioeconomic status, it is not surprising that self-supporters, more often than other Latino STEM baccalaureates, were from economically modest backgrounds.

Of the three groups, self-supporters were most likely to earn an associate’s degree before earning the bachelor’s. Self-supporters were also likely to graduate from Hispanic-Serving Institutions. Attending a community college and an HSI is consistent with self-supporters’ interest in keeping their college costs to a minimum. HSIs tend to be less expensive than non-HSIs and a community college is typically the lowest cost option available to students. Given that self-supporting students tend to be older and commonly have employer support (Table 2), proximity of the college is very important. For adult, working students who don’t wish to give up their employment, traveling long distances or relocating to attend school is not feasible. In addition the family and community commitments of older students limit their geographic mobility.

Characteristics of Self-Supporters

Self-supporting Latino STEM Bachelor’s Degree holders were more likely to:

- Be older students.
- Come from more economically modest backgrounds.
- Be first-generation college students.
- Earn an associate’s degree from a community college prior to completing the bachelor’s degree.
- Receive the STEM baccalaureate from a Hispanic-Serving Institution.

---

8 In this report, students who earn associate’s degrees prior to the baccalaureate are referred to as “transfers.” While we note that 46 percent of the Latinos in the 2003 sample of recent college graduates analyzed for our study had attended a community college at some point and some of them may have earned a substantial number of credits before enrolling at a four-year institution, we do not designate them as transfers. In other studies, however, individuals who earn twelve or more credits at a community college prior to matriculating at a four-year institution are also designated as transfers.

9 In 2007 average in-state tuition at all four-year non-HSIs was $15,103; at four-year HSIs it was $8,035.
Laura Montero graduated from high school with a solid B average and an interest in chemistry, but opted to delay attending college. She took a job as an administrative assistant at a local office of a national environmental organization. She used her earnings to help her family make ends meet and was able to move up after a couple of years to become the office manager. She had often encouraged her bosses to shift some of the advocacy focus from wildlife and endangered species to urban issues such as air quality, transportation, water use, and lack of green space, but she didn’t have much impact on their thinking. Laura decided to go to college and pursue a bachelor’s degree when she realized that she did not have any influence on decision making at the organization.

Laura opted to keep working full time and take classes at night at the nearby community college. She completed her associate’s degree when she was twenty-four and then transferred to the local State University, a Hispanic-Serving Institution within commuting distance of her home. This was Laura’s first choice institution because they offered a major in environmental science that had a very good reputation. Several reports published by researchers at State were on file in her office and were referenced by the scientists she worked with.

When she transferred Laura received need-based aid from the state in addition to a federal Pell grant. This was not enough and left Laura to cover living expenses, books, a computer, and lab fees. Laura arranged to work part time with her employer and took out $7,000 in federally subsidized student loans.

During her second semester at State University, Laura discovered that she would not be eligible to enroll in the environmental sciences major, because she had not transferred with some of the prerequisite courses. Her chemistry lab instructor encouraged her to major in chemistry instead. To catch up with the other non-transfer juniors in her class, the instructor recommended that Laura seek out research opportunities or internships with private companies. Though a few non-paying lab assistantships were available at the university, they were time-intensive. She didn’t apply. And working 20 hours a week, Laura didn’t have much chance to find out if any local companies offered internships and she wasn’t sure she would want to disrupt her work life if they did.

Laura never gained additional laboratory experience and continued to feel uncomfortable doing lab work. Fearing that a master’s degree program or a position in a scientific firm would require her to know her way around the lab, she never seriously considered these options after she graduated with her bachelor’s degree. Laura sent her resume to other environmental advocacy organizations. Although she ultimately landed a new managerial position with a better salary, she was never called for an interview for positions classified as a research associate or project specialist.
Balanced Support

Students who used the balanced support college financing strategy were similar to parentally supported students in that they were of traditional college age and unlikely to earn an associate’s degree before earning the bachelor’s. Perhaps due to the lower costs of HSIs, students with balanced support were more likely than parentally supported students to graduate from an HSI. In addition, compared to the self-supporting group and the parentally supported group, those who had balanced support were also most likely to graduate from a private, rather than a public, institution. This association between the balanced support strategy and private college enrollment suggests that individuals in this group were attending more expensive institutions and needed to tap into the full range of financial aid sources to pay for college.10

Characteristics of those with Balanced Support

Balanced support STEM Bachelor’s degree holders were more likely to:

- Be students of traditional college age.
- Directly enroll in a four-year institution without earning an associate’s degree.
- Graduate from a four-year Hispanic-Serving Institution.
- Graduate from a private institution.

Ivette Torres: Balanced Support

Directly after graduating from high school, Ivette Torres enrolled in an in-state, private HSI. Her mother, a licensed nurse, went to community college but never attended a four-year institution and was unable to provide much advice about where to seek out financial aid. Fortunately for Ivette, Mr. Rowe, her high school math club advisor, informed her about Pell grants, work-study, and loans; he helped her fill out the FAFSA and identified multiple private scholarships for which Ivette was eligible.

Because of her level of financial need, Ivette received a Pell grant, federal work-study, and an institutional grant from Hispanic-Serving College. Added to her modest private scholarships, Ivette’s first-year financial aid package was enough to cover all of her costs and expenses. In subsequent years she went home for the summer and worked, saving up the money she would need for the year.

Ivette’s faculty advisor, Dr. Sanchez, had been a biology professor at Hispanic-Serving College for nearly fifteen years. When Ivette went to him at the beginning of her junior year seeking career advice, he called former students now working in the biotech industry and asked if they had opportunities for college students. Due to the doors that Dr. Sanchez opened, Ivette was offered an internship during the summer between her junior and senior years. The small biotech firm offered her a stipend for living expenses. Ivette accepted the position at the urging of Dr. Sanchez and took out a small loan during her senior year to cover her foregone summer earnings, completing college with a manageable debt level. Ivette continued to intern on a limited basis throughout her senior year and after graduation was offered a permanent position.

---

10 We note that these associations are not causal relationships.
Transfers Who Graduate from Hispanic-Serving Institutions Are Most Likely to Use the Self-Support Financing Strategy

Latina and Latino STEM baccalaureates who transferred from a community college with an associate’s degree and graduated from a Hispanic-Serving Institution were the most likely to use the self-supporting college financing strategy. As shown in Figure 3, 50% of those who transferred and graduated from HSIs were self-supporters, compared with 34% of those who transferred and graduated from a non-HSI.

Latino STEM students who graduated from four-year institutions without first earning an associate’s degree, whether from an HSI or a non-HSI, were much less likely to use the self-support financing strategy—only 18% of HSI graduates and 14% of non-HSI graduates. Over half of these students financed college through a balanced support strategy. As shown in Figure 3, nearly a third (31%) of those who graduated from non-HSIs without an associate’s degree were parentally supported, compared with fewer than one in five among transfers (16% of HSI graduates and 18% of non-HSI graduates) and a quarter (25%) of those graduating from HSIs without an associate’s degree.

Figure 3. College Financings Strategies by Institutional Pathway

<table>
<thead>
<tr>
<th></th>
<th>Hispanic-Serving Institutions</th>
<th>Non-HSIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer with Associate’s Degree</td>
<td>Balanced Support 57%</td>
<td>55%</td>
</tr>
<tr>
<td></td>
<td>Self-Support 18%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Parental Support 25%</td>
<td>31%</td>
</tr>
<tr>
<td>No Associate’s Degree</td>
<td>Balanced Support 34%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>Self-Support 16%</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>Parental Support 16%</td>
<td>18%</td>
</tr>
</tbody>
</table>


Clearly, the lower cost community college and transfer options are appealing to self-supporting Latino STEM students as a pathway to the bachelor’s degree. This can be a savvy approach to reduce debt burden after graduation. However, self-supporters were much less likely to graduate from research universities than their peers who enjoyed parental support or balanced support.
Just over 26% of self-supporters graduated from a research university, compared to 46% of those who were parentally supported and 42% of those with balanced support aid packages. Similarly, self-supporters were graduating from institutions of lesser academic prestige. Only 21% of self-supporters attended highly selective institutions compared to 32% of the parentally supported and 34% of those employing a “balanced support” college financing strategy.

That so many self-supporters are graduating from HSIs illustrates the importance of HSIs to enabling working students to earn degrees. These lower cost and often more geographically accessible institutions are indeed critical to increasing the STEM degree attainment of less economically advantaged Latina and Latino students. However, despite being a critical path to STEM for Latino self-supporting students, the amount of federal funding Hispanic-Serving Institutions have received for science and engineering research is comparatively quite low (NSF, 2009). Instead, the vast majority of federal support for science and engineering research is awarded to the “top 100,” a group of 100 highly selective research universities, of which only two are HSIs.11 It is clear that in order to fully broaden participation of Latinos in the STEM professions, further investments in the STEM research infrastructure of HSIs are necessary. The call to fully support minority-serving institutions including HSIs and Historically Black Colleges and Universities (HBCU) is longstanding (Hispanic Association of Colleges and Universities [HACU], n.d., S. M. Malcom, 2000; Trent & Hill, 1994), because high-performing HSIs have been doing more with less. The substantial SAFRA appropriations for minority-serving institutions present an opportunity to begin rectifying the funding imbalance.

As shown in Table 3, just over 26% of self-supporters graduated from a research university, compared to 46% of those who were parentally supported and 42% of those with balanced support aid packages. Similarly, self-supporters were graduating from institutions of lesser academic prestige. Only 21% of self-supporters attended highly selective institutions compared to 32% of the parentally supported and 34% of those employing a “balanced support” college financing strategy.

<table>
<thead>
<tr>
<th>COLLEGE FINANCING STRATEGY</th>
<th>HISPANIC-SERVING DESIGNATION</th>
<th>CONTROL</th>
<th>CARNEGIE CLASSIFICATION</th>
<th>SELECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weighted Sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 12,049</td>
<td>n = 16,804</td>
<td>n = 32,380</td>
<td>n=61,233</td>
</tr>
<tr>
<td></td>
<td>HSI</td>
<td>28%</td>
<td>16%</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Non-HSI</td>
<td>72%</td>
<td>84%</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>74%</td>
<td>73%</td>
<td>62%</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>26%</td>
<td>27%</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>Research University</td>
<td>26%</td>
<td>46%</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td>Doctoral University</td>
<td>16%</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Master’s College/University</td>
<td>39%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>Liberal Arts College</td>
<td>14%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Specialized Institution</td>
<td>5%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Highly Academically Selective</td>
<td>21%</td>
<td>32%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>Less Selective</td>
<td>79%</td>
<td>68%</td>
<td>66%</td>
</tr>
</tbody>
</table>

Notes: ** May not sum to total due to rounding. Detailed information about the Carnegie basic classification scheme can be obtained from http://classifications.carnegiefoundation.org/details/basic.php. Highly Academically Selective institutions include those classified as “highly competitive,” “highly competitive plus,” and “most competitive” in the 2004 edition of Barron’s Profiles of American Colleges and Universities.

Source: Analyses of NSF 2003 National Survey of Recent College Graduates (NSRCG), using final survey weight (WTSURVY).

11 University of New Mexico (all campuses) and University of Texas, San Antonio—Health Sciences Campus were the only two HSIs listed among the 100 universities and colleges receiving the largest federal obligations for science and engineering in FY 2007 (NSF, 2009).
Tapping HSI-STEM Funds: Priorities for HSIs

The college financial aid system is complex—sometimes downright opaque. The stories of Armando Garcia, Laura Montero, and Ivette Torres (see sidebars) are based on the statistical analyses presented earlier (and in the Technical Appendix) and represent distinct approaches to juggling work, college, and debt while completing the baccalaureate and preparing for STEM careers.

Armando Garcia’s story illustrates the benefits of financial aid and college counseling. Many first-generation families may not realize that graduate study at major research universities is funded by research and teaching assistantships. The tuition waivers and stipends provided to top students allows those students to study and research free from the need for financial aid or to work.

Not only the lack of information, but the lack of trusted advisors can prevent talented Latinos, like Armando, from entering the top research universities, consequently limiting their opportunities to enter graduate school and the STEM professions. The story of Ivette illustrates what happens when things go “right” in terms of college financial aid and preparation for a STEM career.

The case of Laura Montero illustrates the academic and career barriers that students who rely on a self-support financing strategy encounter. For good reasons, such as raising a family or providing financial support to elders, self-supporters postpone college enrollment while they work full time. Continued workforce obligations during college limit students’ ability to participate in research opportunities when they are offered as special programs, outside the regular curriculum. Missing out on intensive and hands-on research is problematic because undergraduate research experience has been shown to increase preparation for, and enrollment in, STEM graduate programs. In addition, when students interact with faculty in doing research, they benefit from their apprentice role by becoming familiar with academic and professional networks and norms. It is essential to involve faculty in counseling students in formal and informal ways about their college financing and career opportunities.

Ivette drew on multiple sources of aid, resulting in a balanced financial aid package that only required minimal borrowing. The willingness of Dr. Sanchez to tap into his professional network to help establish industry contacts for Ivette illustrates one of the many ways in which STEM faculty can contribute to the success of STEM students outside of the classroom. The contacts that Ivette made with the help of Dr. Sanchez resulted in a research opportunity.

Without the concerns of a self-supporter like Laura who works to pay her way through college, Ivette was able to forgo summer earnings and accept the internship that eventually helped her secure a permanent position in STEM private industry as a scientist. The positive experience of Ivette illustrates a number of steps that can be taken to increase the number of Latinos in the STEM professions. Providing multiple, stable sources of financial aid, as well as formalizing the networking process through which Ivette received her internship, will benefit all STEM majors at HSIs.
As illustrated by the stories of Armando Garcia, Laura Montero, and Ivette Torres, to enter the STEM professions, students need financial support, good advising, a rich curriculum, research experience, connections to career networks, and the opportunity to complete graduate school. Yet many HSIs are teaching institutions that lack the capacity to provide and grant monies to fund the student research experiences widely available to STEM majors at research universities. The lack of research opportunities at HSIs is problematic because engaging in undergraduate research has been shown to increase retention and graduate school enrollment among underrepresented minority STEM majors.

Prior HSI-STEM funding supported a wide range of curriculum enrichment, transfer articulation, advising, outreach, and orientation programs at eighty community colleges and universities in California, Texas, Florida, and other states. But too often, these were special programs, such as Summer Bridge academies and add-on instruction in math labs and science learning centers.

A smaller number of HSIs used the funds to interject research opportunities into the core curriculum. These initiatives deserve to be emulated. When institutions inject research in the core curriculum, all students, including working adults, gain research experience without having to compromise their status in the workforce. When intensive research opportunities are offered as special programs, self-supporters’ are likely to miss out because they are spending a significant amount of time working and earning their way through college.

HSIs should also use HSI-STEM funds to strengthen the professional networks of STEM faculty, particularly when such efforts involve partnerships and consortia of community college and university faculty. These networks play a critical role in opening doors to graduate study, research opportunities, and STEM careers.

**Conclusion**

Latinos and Latinas face multiple barriers on the pathways to STEM bachelor and graduate degrees erected by financial circumstance, incomplete and confusing information about the complex financial aid system, and the relatively low levels of federal support for science and engineering research provided to Hispanic-Serving Institutions. HCERA, by providing funds to the HSI-STEM program makes substantial investments in increasing the number of Latinas and Latinos in the STEM workforce and professions.

Hispanic-Serving Institutions create critical pathways to STEM bachelor’s degrees for Latina and Latino students. One in five Latino STEM baccalaureates (20%) can be characterized as self-supporters. When utilizing HSI-STEM funds, Hispanic-serving community colleges and four-year HSIs should be sure to take the needs of working learners into account. In addition, institutions should be sure students are taking advantage of state

---

12 Prior HSI-STEM funding was distributed via the Hispanic-Serving Institutions Program authorized by Part J of the College Cost Reduction and Access Act of 2007 (CCRAA-HSI).

13 For a list of programs funded by CCRAA HSI in 2009-2010, see www2.ed.gov/programs/hsicrara
financial aid and financial aid advising services to reduce reliance on work hours and student loans as much as their work and family commitments allow. Other federal programs, such as those in TRIO and GEAR UP, provide additional resources to promote college access, which can supplement STEM-focused advising.

When applying for HSI-STEM funds, HSIs should propose programs that:

- Incorporate research opportunities into the core curriculum (rather than into special programs that may not be accessible to working adults).
- Increase support for intensive junior and senior year STEM research experiences.
- Develop prestigious, well-funded opportunities, such as symposia and teaching institutes, for community college and four-year university professors to collaborate to develop innovative coursework to ensure that the curriculum aligns and transfer students can select majors in any STEM field of study offered at the university.
- Involve research collaboration between community college and four-year college faculty, developing the professional networks that create opportunities for STEM transfer students to access research laboratories and scientific studies at universities.
- Support programs, such as having industry guest speakers on campus, to involve faculty in networking with scientists and engineers in the private sector.

The current federal performance indicators required for evaluation of institutions receiving HSI-STEM funds do not include measures of the number of Latina and Latino students enrolling in critical gateway courses, reaching key milestones in the STEM curriculum, transferring, earning STEM degrees, or submitting applications for graduate study. This oversight can be rectified by adopting these curricular milestones as performance indicators and requiring grantee institutions to use evaluation data disaggregated by race and ethnicity. Institutions should also adopt equity benchmarks comparing the share of STEM degrees going to Latino students with the proportion of Latinos in the student body as a whole (Dowd, Malcom, & Bensimon, 2009).
Technical Appendix

College Financing Strategies

In order to characterize the underlying financing strategies employed by Latino STEM bachelor’s degree holders, a latent class analysis (LCA) of the manifest, or observed, financial aid variables in the NSRCG dataset was performed. Latent class analysis is a multivariate technique that aims to uncover clusters of individuals who are similar with respect to a set of characteristics measured by outcomes. In this application, the outcomes include the forms of financial aid used by the respondents, i.e., loans, earnings, work study, scholarships/grants, employer support, parental/familial support (gifts), parental/familial loans, and other sources of support. The latent classes represent the financing strategies employed by the respondents.

Three latent classes, or financing strategies, adequately (entropy=0.594) describe the eight dichotomous financial aid indicator variables in the NSRCG dataset. Results from the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (Muthén, 2001) for two (H0) versus three classes indicates that two latent classes do not adequately describe the data (p<0.001), while the same test for four (H0) versus three classes indicates that three classes are sufficient (p=0.539).

Based on the patterns of conditional probabilities of using a particular form of financial aid (see Table A.1), distinct college financing strategies can be interpreted: members of Class 1 financed college by being “self-supporters,” i.e., they received little to no parental support, instead relying primarily on loans, earnings, employer support and scholarships/grants. Members of Class 2 can be described as being “parentally supported”; i.e., they had a high probability of receiving parental/familial support not to be repaid, and mid-to-low probabilities of using loans, earnings, and scholarships/grants. Member of the final class, Class 3, financed college through “balanced support,” i.e., they had a high probability of using multiple forms of financial aid ranging from loans, work-study, earnings, scholarships/grants, and parental/familial support (not to be repaid).

For each respondent in the 2003 NSRCG dataset, conditional probabilities of belonging to each of the aforementioned latent classes were calculated based on his or her responses on the eight financial aid indicator variables. Each respondent was assigned to the class for which he or she had the highest probability of membership.

Table A.1. The Sources of Aid Used in the Self-Support, Parental Support, and Balanced Support Financing Strategies (Conditional Probabilities of Using Each Type of Aid)

<table>
<thead>
<tr>
<th>Source of Financial Aid</th>
<th>Parental Support</th>
<th>Self-Support</th>
<th>Balanced Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familial Support (not to be repaid)</td>
<td>99.9%</td>
<td>14.9%</td>
<td>63.2%</td>
</tr>
<tr>
<td>Federal and/or Private Loans</td>
<td>26.2%</td>
<td>60.9%</td>
<td>84.5%</td>
</tr>
<tr>
<td>Scholarships and/or Grants</td>
<td>44.9%</td>
<td>45.6%</td>
<td>87.2%</td>
</tr>
<tr>
<td>Student Earnings</td>
<td>47.2%</td>
<td>53.2%</td>
<td>67.9%</td>
</tr>
<tr>
<td>Work Study</td>
<td>3.3%</td>
<td>2.1%</td>
<td>48.4%</td>
</tr>
<tr>
<td>Employer Support</td>
<td>2.3%</td>
<td>23.5%</td>
<td>6.2%</td>
</tr>
<tr>
<td>Familial Loans</td>
<td>8.4%</td>
<td>6.4%</td>
<td>9.7%</td>
</tr>
<tr>
<td>Other Source</td>
<td>1.1%</td>
<td>5.8%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

References


