

Report of CST Inspiration Study on HSI and STEM

In the spring of 2022, a team from the Colleges of Agricultural Sciences, Engineering, Natural Sciences, and Natural Resources met to study how the colleges and their departments should prepare for the prospect that Colorado State University would become a Federally recognized Hispanic Serving Institution (HSI). Our task was to develop this report, outlining how we think CSU's STEM programs should prepare.

Findings and Recommendations

We examined and discussed a substantial amount of data¹ about Hispanic students at CSU and in the state of Colorado. Some of what we learned surprised us and pointed us at opportunities.

Based on what we learned, we offer these findings and recommendations:

- **The majority of Hispanic high school students in Colorado live within about 30 minutes of CSU (Fort Collins) or SPUR.** (See Figure 1 on page 3). Contrary to popular view, CSU is not “on the wrong side of the state” to attract Hispanic students. This finding belies perceptions that because CSU is not in a Hispanic community, CSU cannot succeed with Hispanic students. The Hispanic community is all around us and our challenge is to engage with it.
- **Retaining Hispanic students at CSU is an academic challenge.** The difference between Hispanic students who stay at CSU through graduation and those who leave CSU is almost entirely determined by how each student experiences their first semester academically (and perhaps socially) at CSU. It is *not* a function of their high school preparation (see Table 1 on page 4) and only modestly affected by finances (as measured by Pell grants) or being in a first-gen family. That's an exciting discovery as it says retaining Hispanic students is not about counter-balancing social factors, but rather primarily about what CSU specializes in – namely teaching and the student experience!
- **The STEM colleges roughly mirror CSU in their enrollment and retention of Hispanic students.** STEM programs differ only modestly ways from CSU as a whole.
- **It will be several years before CSU is an HSI.** Demographic challenges make it difficult for CSU to become an HSI before the 2030s. While 30% of high school graduates in Colorado are Hispanic, Hispanics make up only 20% of Colorado's a four-year college or university population (see Figure 4 on page 6). Breaking through that 20% “glass ceiling” will require sustained effort.
- **Departments and colleges cannot delay improving the educational experience for Hispanic student until CSU becomes an HSI.** Hispanic students will shortly be 20% of CSU's enrollment. Retaining and graduating those students is important for CSU's

¹ Unless noted, data below is from the Institutional Research website.

mission and financial health. We cannot wait until CSU becomes an HSI and is eligible for Federal grant money to start better supporting our Hispanic students.

- **There is no easy-to-apply formula for better attracting and retaining Hispanic students.** The Building, Recruiting, and Inclusion for Diversity (BRAID) program revolutionized diversity efforts focused on women in Computer Science by offering a straightforward, implement any 3 of these 4 practices, formula for improving diversity. Much as we would like a similarly straightforward formula for serving Hispanics in STEM, there isn't one. One can see this as a hindrance or an opportunity for CSU to become a leader (or both). Educational scholarship does offer insights on individual practices that can make a difference, and these provide potential starting points for further initiatives at CSU.
- **Adapting formulas such as BRAID, we recommend colleges and departments focus on (1) improving introductory classes to be more inclusive; and (2) improving Hispanic students' sense of community by recognizing the central role of their parents and placing an emphasis on pathways for parents of Hispanic students to interact with the departments in Spanish.** The critical role of academic performance in the first semester highlights the need to make introductory classes more inclusive and that we teach students strategies for learning and reflection. While popular perception and Federal law assume that students at college seek to develop apart from their parents, in most Hispanic communities, the family remains the center of decision making. Better communication with the larger family will help our students.

CSU Lies Within a Hispanic Region of Colorado

There is a perception that CSU (Fort Collins) is in a region of Colorado that has few Hispanics. This perception is sometimes followed by the observation that Hispanic students prefer to study at institutions close to their family home and so CSU is challenged to attract Hispanic students.

It is true that most of the majority-Hispanic school districts are clustered in southern Colorado. But those school districts also have small total enrollments. If one looks at where the majority of Hispanic students reside, the picture is quite different.

PUPIL ENROLLMENT BY RACE/ETHNICITY: HISPANIC STUDENTS (NUMBER) - 2017

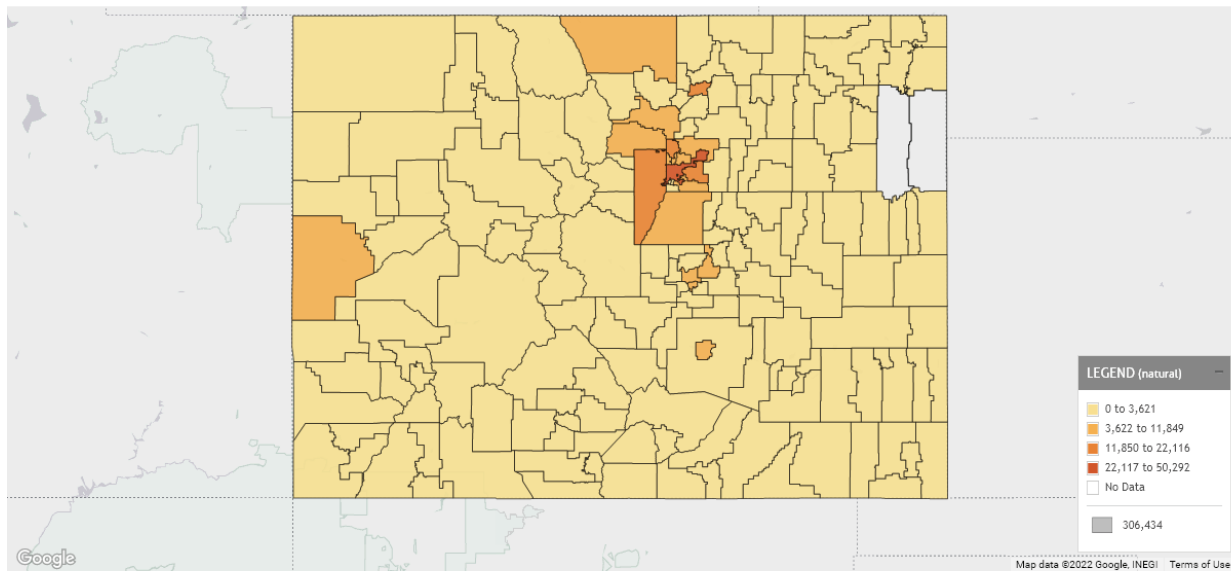


Figure 1: Hispanic Enrollment by School District

More than half of Hispanic students in Colorado are in school districts between the Cherry Creek (south Denver) and Poudre (Fort Collins) school districts (inclusive). If you include the SPUR campus, a **majority of Hispanic students in Colorado live within about 30 minutes of CSU Fort Collins or SPUR.**

Retaining Hispanic Students (At CSU) Is About Academics

Retention figures for CSU show Hispanic students are sharply less likely to persist through their 3rd and 4th Fall (72% of all CSU students enrolling in 2016, 2017, and 2018 vs. only 67% of Hispanic students). As we note below, STEM programs roughly track with CSU as a whole.

With help from Institutional Research (thank you Nicole Ross and Heather Novak) we dug a bit deeper to try to understand what differentiated a Hispanic student entering their first Fall who stays through to the third Fall from a Hispanic student who is not retained. Our working theory was we would find some difference in preparedness (e.g., lower test scores) or economic status (e.g., more Pell grant recipients).

The results surprised us.

The biggest difference was academic performance. Students who persisted to the 3rd Fall were far more likely to have earned at least 12 credits in their 1st Fall and had a markedly higher 1st Fall GPAs. It is important to note that virtually all (95+%) of the students who failed to earn at least 12 credits had enrolled for 12 or more credits in that first fall term. The shortfall in credits is due to failing or dropping a course. One point of worry is that students in the College of Natural Sciences are substantially more likely to fail to earn 12 or more credits in the first Fall semester.

We looked hard for external factors that might point to students at risk for failing. There were some differences. First gen Hispanic students and Pell students were somewhat less likely to be retained. Hispanic women were more likely to persist. But these differences were small (c. 10-12%) compared with the huge differences in academic performance. And test scores (indicative of K-12 preparation) are almost the same per the table below.

Table 1: Hispanic student preparedness and persistence (students entering 2017-2019)

	New Hispanic Students		Hispanic Transfer Students	
	Did not Persist to 3 rd FA	Persisted to 3 rd FA	Did not Persist to 3 rd FA	Persisted to 3 rd FA
Headcount	747	1,896	169	452
GPA end 1st FA	2.17	2.99	2.26	2.95
Earned 12+ credits in 1st FA	64%	91.8%	52.1%	84.3%
HS/Transfer GPA	3.47	3.66	3.04	3.13
Took ACT (%)²	53.7%	51.7%	40.8%	44.7%
ACT Composite	22.9	23.6	21.9	21.8
ACT English	22.2	23.1	21.1	21.0
ACT Math	22.0	23.0	20.9	21.1
ACT Reading	23.9	24.4	22.5	22.6
ACT Science	23.0	23.5	22.2	22.0
Took SAT (%)	63.3%	66.4%	8.9%	11.7%
SAT Combined	1111.8	1134.7	1094.0	1102.3
SAT Verbal	560.8	570.0	552.0	563.4
SAT Math	550.9	564.7	542.0	538.9

STEM Is Similar to the College Overall

Another perception is that STEM is somehow uniquely awful at attracting and retaining Hispanic students or that Hispanic students disproportionately avoid or leave STEM.

While colleges vary in their retention/attrition rates for Hispanic students, as the chart below from 2016 to present shows, as a group they're **roughly comparable with CSU as a whole**.

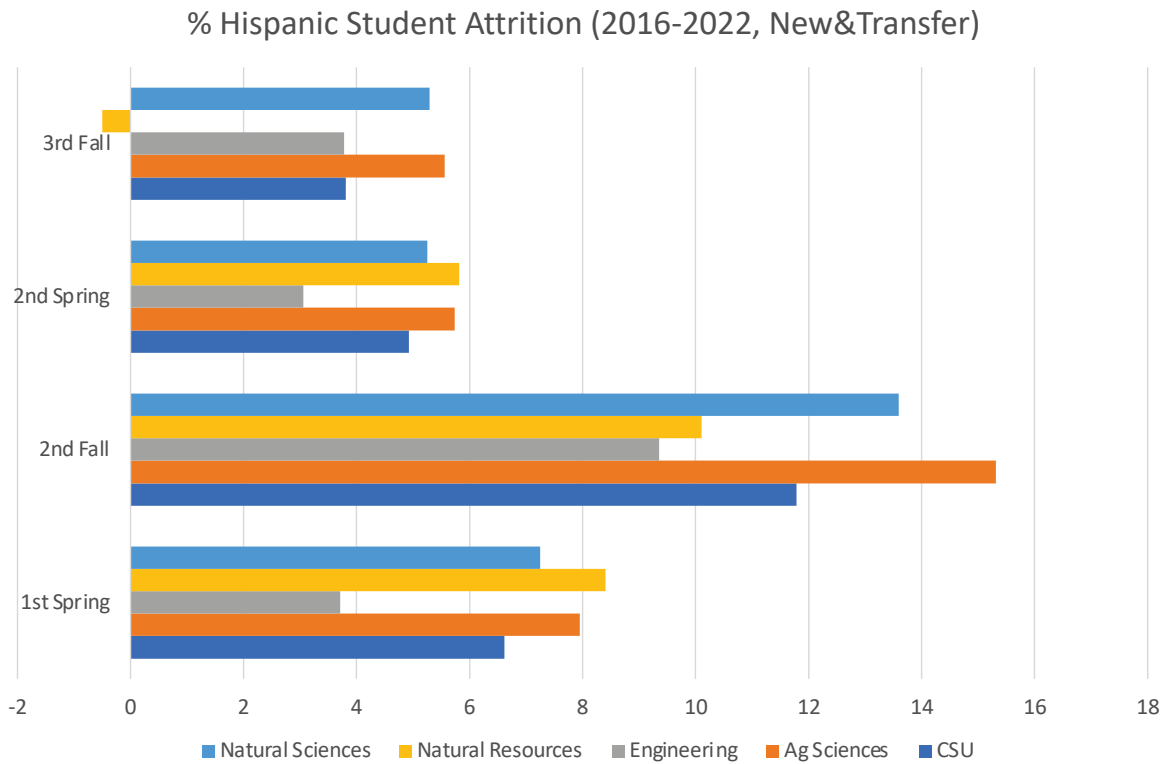


Figure 2: Hispanic Student Attrition by Semester

And while STEM programs have historically trailed in terms of the percentage of Hispanic students they enroll, with the exception of Natural Resources, **they're catching up or roughly the same as overall CSU enrollments**.

% of Students Who are Hispanic (Grad and Undergrad)

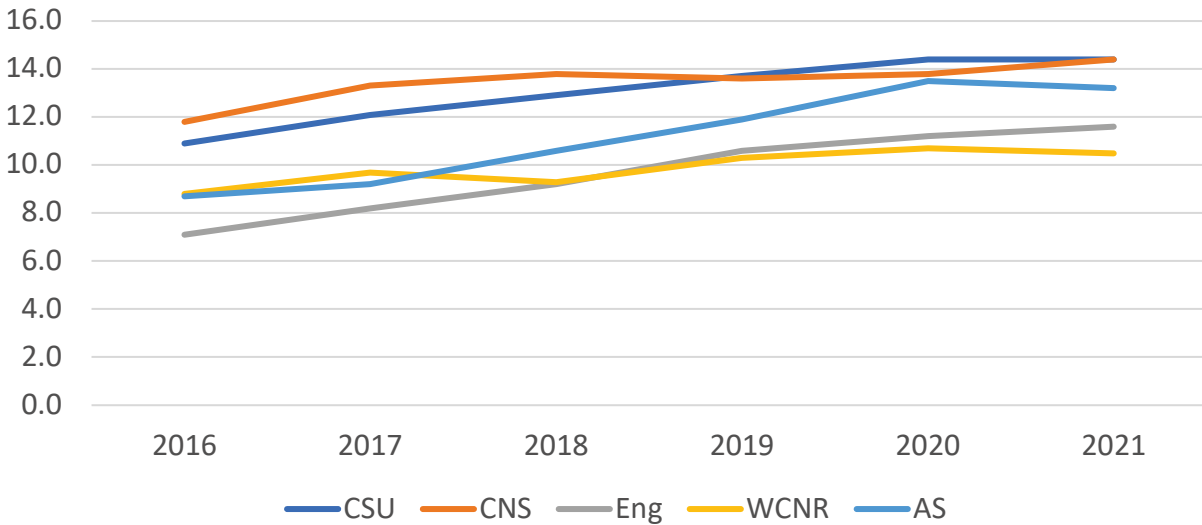


Figure 3: Percentage of Hispanic Students by College

When Will CSU Become an HSI?

The team looked at demographic trends. Our goal was to determine when CSU would become an HSI and to develop a timeline. The demographics proved to have a richer message.

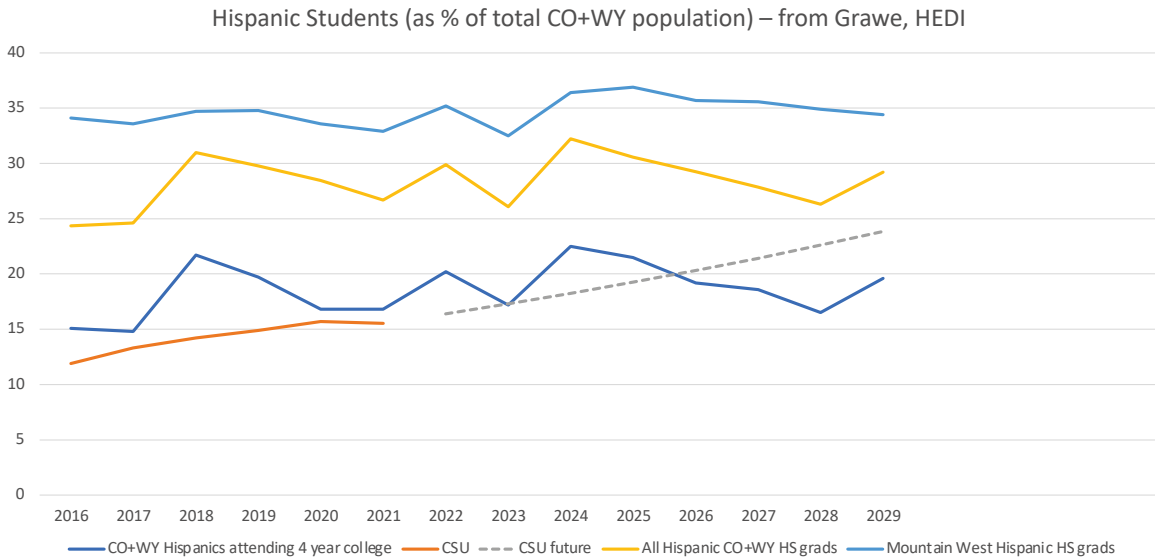


Figure 4: Hispanic HS Graduation and 4 Year College Attendance

The key information is shown in the table above, using data from CSU's Institutional Research data and from Nathan Grawe's HEDI data². For CSU's growth in Hispanic enrollment, we did a simple linear extrapolation from growth between 2016 and 2021. Note, however, that COVID has had a disproportionate effect on Hispanic enrollment at CSU and nationally³, causing a reduction in the growth rate in 2019 and 2020 that may or may not persist.

While the Latinx fraction of Colorado HS graduates is nearly 30%, only about 2/3s (aka 20%) of those graduates go on to a four-year university. The 20% number may cap CSU's ability to grow as CSU has slightly lagged statewide Hispanic/Latinx enrollment levels. Accordingly, the line may overestimate growth (if the 2019 and 2020 enrollment trends persist or CSU hits a ceiling at 20%) or underestimate (if the 2016-2018 trends resume).

Within the limitations of the data, we concluded ***it will be several years before CSU is an HSI***. If we simply follow the CSU growth curve, CSU will not reach the 25% enrollment standard before 2030.

Furthermore, ***departments and colleges cannot delay improving the educational experience for Hispanic student until CSU becomes an HSI***. Currently one undergraduate in six at CSU identifies as Hispanic/Latinx. That ratio will soon be one undergraduate in five. Students who identify as Hispanic/Latinx are the second-largest ethnic group (behind whites) on campus and three times larger than the next-largest group (multi-racial). Their share of the student population will continue to grow. While it is tempting in a time of tight budgets to wait to become an HSI, and then tap Federal funding to better serve our Hispanic/Latinx students, the size and importance of the Hispanic/Latinx student body means we need to put effort into better serving them *now*.

What Can the STEM Colleges and Their Departments Do Now?

As noted above, the committee determined that we need to do more to serve our Hispanic students. We focused our attention on metrics for attracting and retaining Hispanic students in STEM.

College and Department Resources are Limited

Recognizing that individual college and department resources are limited, we sought to find low-cost interventions. Interventions that cost a few hundred dollars per student (comparable to the roughly \$500 it costs to recruit a new student at peer schools⁴) or required one-time investments were preferred.

We recognize that this approach has limitations. We recognize the outstanding work of the residential programs such as Key that have been shown to sharply improve retention, but which cost more than we felt appropriate to recommend.

² <https://ngrawe.sites.carleton.edu/demographics-and-the-demand-for-higher-education/>

³ Pandemic Caused Black and Latino Students to Cancel their College Plans at a Disproportionate Rate, *The Root*, 28 March 2022.

⁴ We did not seek out CSU costs and simply relied on the results from RNL (<https://www.ruffalonl.com/papers-research-higher-education-fundraising/cost-of-recruiting-undergraduate-student-report/>)

There Is No Formula

The committee consulted with outside experts and read works on becoming an HSI and concluded that, unlike programs such as BRAID to bring more women into computing, there is no agreed-upon turn-the-crank formula that we can simply implement to better serve our Hispanic students.

Adapting BRAID (Building, Recruiting, and Inclusion for Diversity)

The committee found it made progress by considering ways to adapt the BRAID principles (developed by AnitaB.org to attract and retain women in Computer Science) as a broad template for thinking about what we might do to attract and retain Hispanic students.

The BRAID program has four thrusts:

1. Modify introductory courses to make them more appealing and less intimidating to underrepresented students.
2. Lead outreach programs for high school teachers and students to build a diverse pipeline of students.
3. Build confidence and community among underrepresented students.
4. Develop and/or promote joint majors that are attractive to underrepresented students.

We were particularly drawn to the first (modifying introductory courses) and third (build confidence and community).

Modifying Introductory Courses and Actively Teaching Strategies for Learning and Reflection

Given the importance of 1st Fall academic achievement, the committee felt finding ways to improve academic success in that first semester was critical and suggested some form of following the BRAID guidelines on introductory courses was likely to be fruitful.

Modifying Introductory Courses: The central idea in modifying introductory courses is to ensure how the topics the students are studying fit with the problems the students are interested in solving. As an example, one team member mentioned a student who questioned why they had to take thermodynamics – until the student spent a summer internship working on providing solar power to impoverished communities. This insight also extends to ensure problem sets reflect student backgrounds: a problem set that uses a jet aircraft as its central example may be completely alien to a student who struggles to find money to take a bus home for the weekend.

This basic principle works across the introductory courses. A math course for computer scientists should use examples from computing rather than physics. Similarly, an introductory course in engineering should explain how math is relevant to engineering problems, such that when the engineering student takes calculus, the relevance is obvious.

Note that this kind of modification *does not change the concepts taught in the courses*, rather it provides context to allow students how the course relates to the problems the student wishes to study.

Several committee members noted they knew faculty eager to make courses more inclusive and who would likely be receptive to these changes. Departments that have already made

these changes noted that effecting the change often takes multiple semester: examples that seem appropriate sometimes fail to connect with students for various reasons, so instructors have to do a certain amount of trial-and-error adaptation.

Teaching Strategies for Learning and Reflection: We could seek to ensure every 100-level course participates in early performance feedback. We could encourage more faculty to learn and implement the First Four Weeks Program. We can also create first semester booster sections, which have been shown in selected courses to take at-risk students (60% DWF rate) and enable them to succeed (0% DWF and above C grades).

Creating Confidence and Community

A repeated theme was that the usual paradigm that college is a time for students to develop their independence from their families is alien to most Hispanic cultures. Rather, decisions are made collectively in the family. A student's decision to return to CSU in the fall will be a family level discussion.

Federal law limits what information about the student we can share with the families. But there are still obvious things we can do.

First and foremost, we need to provide communication and interactions with parents (and extended family) in Spanish. We need to make campus easy to navigate for parents whose English skills are limited. We need to provide Spanish explanations of our department and college programs, either in text or video form.

We heard multiple stories of parents excited to find someone in their child's department who could speak Spanish and help them understand what their child was studying. So too, we heard the importance of providing Spanish language tours when students and their parents come for department or college orientation.

More Ambitious Thoughts

The team discussed more ambitious (and likely more expensive) ideas for attracting Hispanic students. They are not part of our recommendations. They are noted here, however, as possible opportunities.

Investing in Programs at SPUR To Create a Hispanic Pipeline

A substantial fraction of the Hispanic high school students in Colorado graduate from school districts in and adjacent to Denver. We had two ideas.

First, CSU and the colleges could invest in making SPUR a gateway for Hispanic students. We could host information sessions about studying and applying to CSU in Spanish. We might host some SPUR spinoffs of Fort Collins campus events for families.

Second, we could host activities by some of the college's current outreach programs at SPUR. For instance, the College of Natural Science's Education and Outreach Center, which focuses on creating unique STEM experiences for 4-12th grade students, could host events at SPUR in Spanish. The EOC, while hosted by CNS, supports NSF-funded outreach for multiple STEM colleges.

On a related note, the university (or colleges) might create a showcase day in Fort Collins focused on Hispanic families, where families can come to campus and see what their scholars are doing.

Investing to Improve Local High School Preparation for STEM

The team looked at the roughly 25 high schools near Fort Collins (within 40 miles) that had Hispanic enrollments of 20% or more and discussed possible ways to attract more Hispanic students from those schools to Fort Collins. The schools graduate about 4,500 Hispanic students each year.⁵

We used math scores on the PSAT being at grade level as an indication of whether students were university STEM ready. We recognize that is an imperfect metric, but it was the one available and this was a back of the envelope exercise. Only about 1,750 of those Hispanic were university STEM ready.

Suppose we worked with the local school districts to increase math readiness among Hispanic students, such that 50% more Hispanic students graduated math-ready (so 1,375 students) and we recruited half of those to CSU STEM programs (687 students per year) and 70% stayed to graduate within 5 years. That would give us about 2,400 more Hispanic STEM students at CSU. It would increase the Hispanic share of the CSU student population by about 8% and make CSU a Hispanic Serving Institution.

Working with 25-odd high schools may be too ambitious. Perhaps working with a few would make sense. Three Greeley high schools (Central, West, and Northridge) graduate nearly 1,000 Hispanic students a year and have math proficiencies of 19%-27%.

The team has no sense of how hard it would be to help improve math scores in local high schools but the yield is tempting.

Definitions

Hispanic Serving Institution (HSI): Per 20 US Code section 1101a (5), the term “Hispanic-serving institution” means an institution of higher education that—

- a. is an eligible institution; and
- b. has an enrollment of undergraduate full-time equivalent students that is at least 25 percent Hispanic students at the end of the award year immediately preceding the date of application.

A university must apply to the US Department of Education to be an eligible institution (per item a. above) and CSU has done so and is an eligible institution. Once deemed eligible, there is no bureaucratic paperwork required to become an HSI. The Department of Education tracks enrollments and will add CSU to the list when we meet the enrollment requirements.

Minority Serving Institution (MSI): HSIs are one type of Minority Serving Institution.

⁵ Data in this section came from *US News* high school profiles.

Emerging HSI: a marketing term for schools moving towards achieving HSI status. Has no regulatory significance.

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