

# Recruiting, Retaining, and Advancing Hispanics in Computing: CAHSI Annual Evaluation Report, 2012-2013

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Heather Thiry

Sarah Hug

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## INDIVIDUAL OUTCOMES

In the 2012-2013 academic year, CAHSI provided intensive, deep learning experiences for students through CS-0, PLTL, ARG, and MentorGrad. The majority of students served in these initiatives were Hispanic, and the proportion of female participants was higher than the national representation of women in CS undergraduate programs. ARGs and the CAHSI symposium at SACNAS increased students' interest in graduate school and helped them to feel more knowledgeable and prepared for graduate school and computing careers. Finally, BS graduation rates in CAHSI departments have dipped slightly, but the proportion of Hispanic degree recipients has increased for the past several years.

### Student Participation in CAHSI Initiatives

Assuming a 15 week semester, the original seven CAHSI schools provided 11,070 hours of introductory computing content to 246 students in 2012-13, nearly 75% were Hispanic or other underrepresented minority students. The PLTL initiative gave the equivalent of 9.975 hours of undergraduate-led instruction to 665 computing students; 2/3 of PLTL were Hispanic or other underrepresented minorities. Affinity Research Groups provided at least 6,000 hours of undergraduate participation in computing research (assuming a 10 hour commitment over 15 weeks), nearly 2/3 of these students were Hispanic or other underrepresented minorities. CAHSI focuses attention on Hispanics as well as female students—with the exception of ARGs, CAHSI's representation of women in the participation matrix below outpaces the national average of women undergraduates in computer science. Nearly one-quarter of the participants in CAHSI initiatives were women.

Initiative	Total Students	Total Women	Proportion Female	Total Hispanic	Proportion Hispanic	Total Other Underrep. Minorities (URM)	Total Other URM
<b>CS-0</b>	246	71	29%	158	64%	23	9%
<b>PLTL</b>	665	157	24%	369	55%	74	11%
<b>ARG</b>	40	4	10%	22	55%	4	10%
<b>TOTAL</b>	<b>951</b>	<b>232</b>	<b>24%</b>	<b>549</b>	<b>58%</b>	<b>101</b>	<b>11%</b>

## Future Aspirations and Professional Behaviors

Students' aspirations in computing were influenced by their participation in Affinity Research Groups. A full 94% of students reported that they felt more prepared for graduate school because of their ARG experience, and 94% of ARG students also felt more prepared for a career in computing. In addition, 82% of ARG students reported that they are more likely to attend graduate school because of their research experience. CAHSI students involved in Affinity Research Groups (ARGs) continue to outpace their national peers in NSF research experiences for undergraduates (REUS) in rates of academic presentation and publication. Most of the ARG students (73%) reported that they attended a professional conference, while only 23% of the national sample of REU students had done so. Using Fisher's Exact Test, this difference in attendance at professional conferences is a significant difference,  $p=0.00001$ . ARG students published in refereed journals at rates equal to the national REU sample: 5% of both ARG students and the national sample authored papers.

	Number of ARG respondents (n=40)	Percent of ARG respondents	Number of national REU sample (n=464)	Percent of national REU sample
In the past year, I have <u>attended a professional conference</u> .	29	73%	106	23%
In the past year, I <u>presented a paper or poster at a professional conference</u> .	21	53%	67	14%
In the past year, I have <u>authored or co-authored a journal paper</u> .	2	5%	25	5%

The CAHSI symposium at SACNAS also had a substantial impact on students' aspirations in computing. Two-thirds of student attendees reported that the symposium had increased their interest in research a "good deal" or "great deal." Additionally, 59% of students reported that their knowledge of career pathways increased "a good deal" or a "great deal" from the CAHSI

symposium. Also, 75% of students marked that the symposium had increased their interest in graduate school “a good deal” or a “great deal.” Annual meeting attendees had taken concrete steps to pursue graduate school. Fifteen out of 29 students (52%) reported that they had applied for a scholarship fellowship, or internship in the past year, and twelve of these students had successful applications. Some of the successful students included a fellowship from the American Association of University Women, a software engineering internship at Google, an internship at Lawrence Livermore national lab, a Methodist scholarship for Hispanic students, and NSF REU opportunities. Additionally, twelve students reported that they had taken the GRE in the past year, and thirteen students had applied to graduate school in the past year. One student received an NSF Graduate Research Fellowship, while another student received an honorary mention for the NSF GRFP award.

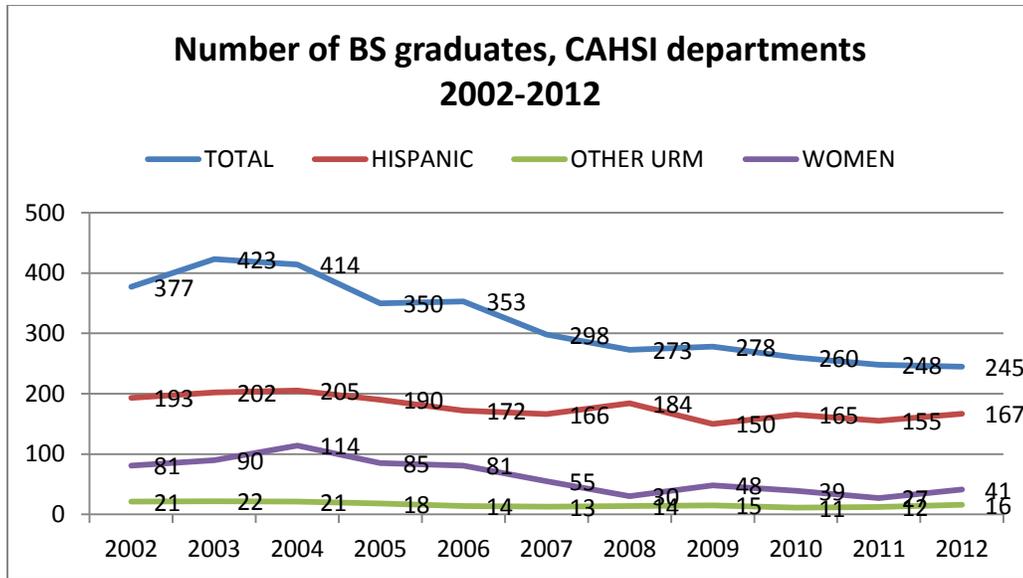
### **Growth in Students’ Knowledge and Skills**

Students gained the skills, knowledge, and confidence from ARGs that they will need in graduate school and the computing workforce. Students reported positive outcomes on all the Undergraduate Research Student Self-Assessment (URSSA) gains scales (between 3.0 and 4.0 on the 4.0 point scale, or between “good” and “great” gain). Students’ highest gains were in intellectual growth (mean=3.47 out of 4.0) and personal growth (mean = 3.54 out of 4.0). Students’ scores in personal growth indicate that they gained confidence in their abilities and a greater interest in computing. For instance, 94% of students gained confidence that they could do well in future computing courses, and 94% of students also reported that their interest in computing increased as a result of their ARG experience.

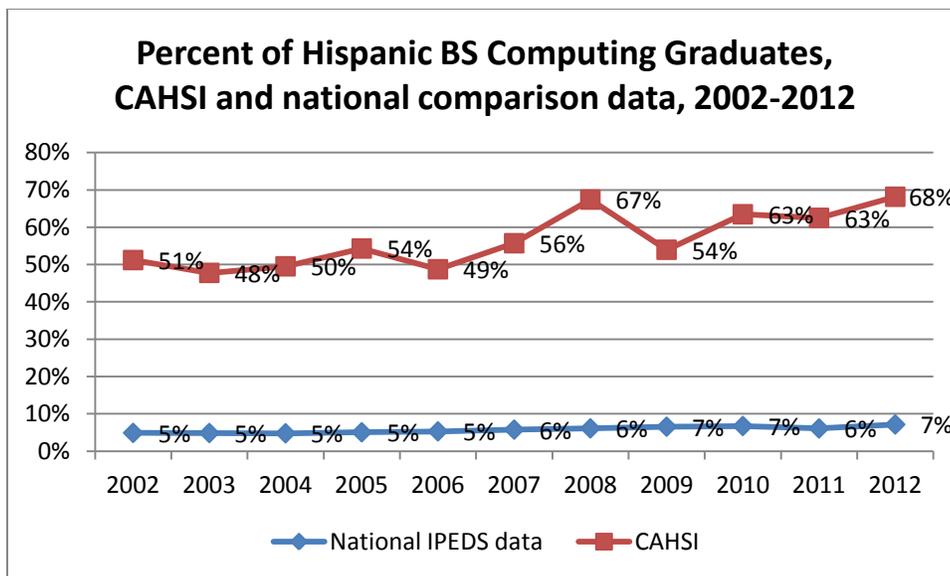
### **Degree Completion Rates**

#### **BS degrees**

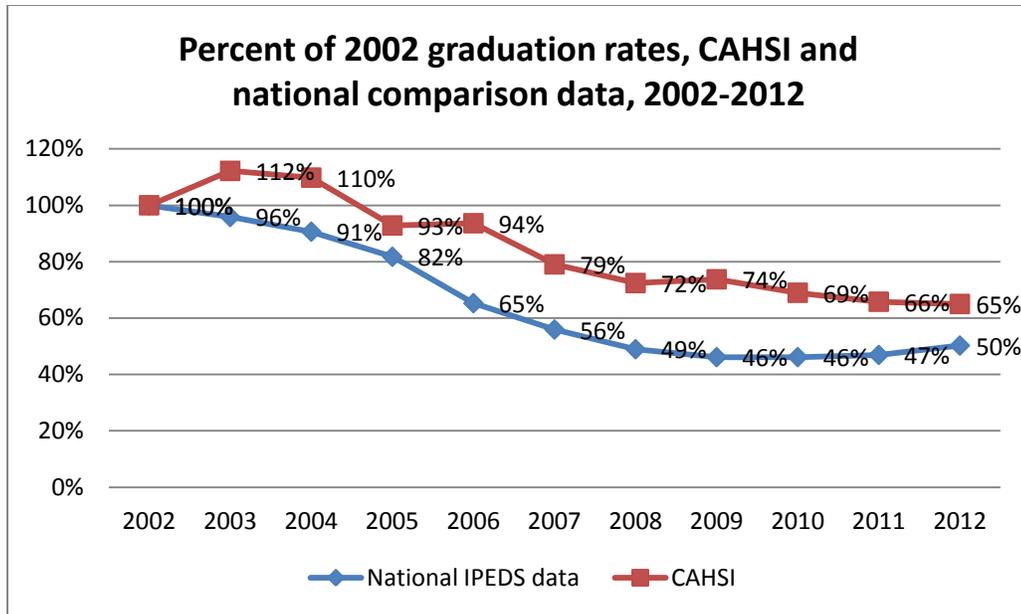
CAHSI has consistently graduated large numbers of Hispanic baccalaureates in computing. For instance, in 2012, there were 1319 Hispanic BS graduates in CS, CE, and CIS in the nation, 167 of those Hispanic BS graduates were from CAHSI departments (US mainland schools only). Thus, CAHSI graduated 13% of the CS/CE/CIS Hispanic baccalaureates in the US. CAHSI’s overall BS degree production has been on a slow, downward trend (e.g., 278 total BS degrees in 2009, 245 total BS degrees in 2012), but has stayed relatively even in the past several years.



Yet CAHSI graduation of Hispanics has slowly trended upward in recent years (e.g., 150 Hispanics BS degrees in 2009, 167 Hispanic BS degrees in 2012). After a low of 27 female BS graduates in 2011, CAHSI awarded 41 BS degrees to women in 2012. Overall, in 2012, 68% of bachelor's recipients in CAHSI departments were Hispanic and 17% were awarded to women. Nationally, 7% of BS computing degrees in CS/CE/CIS were awarded to Hispanics and 14% to women.

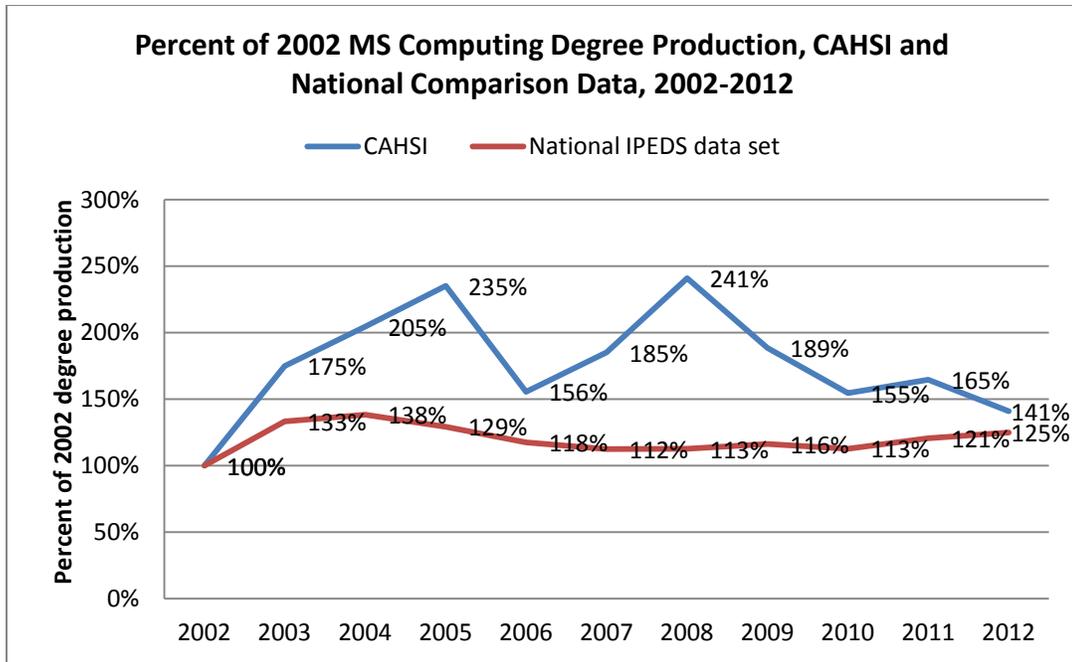


CAHSI's slight dip in graduation rates reflects national trends in these three majors. Nationally, the comparison set of departments graduated 50% of the number of BS students that they did in 2002; while, in contrast, CAHSI graduated 65% of its 2002 total.



### MS degrees

Master's degree completions in computing have risen steadily in the US since 2002. CAHSI has mirrored this trend, and CAHSI departments have consistently stayed above the national trend line in MS degrees in computing. For instance, 15,449 students in the US graduated with MS degrees in CS, CE, and CIS in 2012, representing a 25% increase from 2002. In 2012, 124 students in CAHSI departments graduated with MS degrees, representing a 41% increase from 2002. Additionally, 28% of these CAHSI graduates were women, and 23% were Hispanic (US mainland schools only). In contrast, 24% of national MS computing graduates were women, and only 3% were Hispanic in 2012.



### PhD degrees

Hispanics and women remain severely underrepresented in computing doctorates. However, CAHSI is contributing to the degree production of Hispanic computing PhDs. For instance, in 2012, 37 doctorates were awarded in CS and EE to Hispanics, and CAHSI produced 4 of those graduates. In other words, CAHSI produced 11% of the nation’s Hispanic doctorates in CS and EE in 2012 (US mainland schools only). Even more, in 2012, six doctorates were awarded to Hispanics in CS nationally, and CAHSI produced two of those graduates. Thus, CAHSI produced 33% of the Hispanic CS PhDs in 2012, although this largely reflects the extremely low representation of Hispanics in the national pool of computing doctorates.

### ORGANIZATIONAL CAPACITY OUTCOMES

CAHSI has remained relatively steady in organizational capacity indicators in the past year, defined as the extent to which CAHSI departments have:

- Replenished and fortified the pipeline at each stage through continuous improvement of initiatives and pedagogy (K-12 through graduate education),
- Trained new educators and hold training sessions at sites within and outside CAHSI.
- Developed staff and faculty engagement in new practices and understanding of the mission of CAHSI
- Engaged a cadre of staff and faculty who are aware of CAHSI’s goals and take up the new practices.

The table below details CAHSI’s organizational capacity outcomes for the past year.

<b>CAHSI Organizational Capacity Rubric: Orange color indicates school or department is achieving the goal, , yellow indicates partial fulfillment; light blue indicates rubric metric not measured this year; for sustainability: black indicates no additional funding, yellow indicates partial fulfillment via other means, and orange indicates fully “other” funded. Pink indicates the cell is N/A.</b>							
Indicator (colors used to show different types of indicators)	S1	S2	S3	S4	S5	S6	S7
<b>Healthy Pipeline:</b> K12 outreach using CAHSI initiatives (e.g., CS-0)	Orange	Orange	Orange	Black	Orange	Orange	Black
<b>Healthy Pipeline:</b> faculty staff or students have continued to innovate in course pedagogy (e.g., experimenting with new initiatives, finding new ways to study initiatives underway)	Black	Orange	Orange	Orange	Orange	Orange	Black
<b>Healthy Pipeline:</b> graduate school preparation (goal is 15% of departmental students)	Black	Yellow	Yellow	Yellow	Orange	Yellow	Orange
<b>Healthy Pipeline:</b> CAHSI graduate application (as defined by intent, measured across departments, above baseline for 2010 annual meeting rates)	Orange						
<b>Healthy Pipeline:</b> CAHSI graduate application (as defined by application to graduate school, measured across departments, above baseline for 2010 annual meeting rates)	Black						
<b>Resource Dev Train:</b> host training in 1 or more CAHSI initiatives	Black		Orange	Orange	Black	Orange	Black
<b>Resource Dev Train:</b> lead training in 1 or more CAHSI initiatives	Black		Orange	Orange	Orange	Orange	Black
<b>Fac/staff engagement:</b> undergraduate faculty CAHSI awareness measured every other year (75%)fac survey	Light Blue						
<b>Fac/staff engagement:</b> fac CAHSI participation (33%) fac survey	Light Blue						
<b>Fac/Staff engage:</b> undergraduate faculty CAHSI-trained continuously (e.g., every other year participate in training)(25%)PI report	Yellow	Yellow	Orange	Yellow	Orange	Orange	Orange
<b>CAHSI Alliance sustainability:</b> funds for CAHSI supplemented at the department/institutional level- <u>CS0 outreach</u>	Black	Orange	Orange	Pink	Orange	Yellow	Pink
<b>CAHSI Alliance sustainability:</b> funds for CAHSI supplemented at the department/institutional level- <u>CS0 undergrad</u>	Pink	Orange	Orange	Pink	Pink	Orange	Orange
<b>CAHSI Alliance sustainability:</b> funds for CAHSI supplemented at the department/institutional level- <u>PLTL</u>	Pink	Orange	Yellow	Pink	Yellow	Yellow	Orange
<b>CAHSI Alliance sustainability:</b> funds for CAHSI supplemented at the department/institutional level- <u>ARG</u>	Yellow	Orange	Yellow	Black	Yellow	Pink	Yellow
<b>CAHSI Alliance sustainability:</b> funds for CAHSI supplemented at the department/institutional level- <u>mentorgrad/fellownet/femprof</u>	Pink	Pink	Black	Black	Pink	Pink	Yellow

## Healthy Pipeline

The majority of schools participated in some form of outreach work that built on CAHSI initiatives, primarily CS-0, to deliver computing content to K12 audiences (5 of 7, 71%). Of the two that did not, one institution has plans to do so next year through a new grant opportunity, and the other has a history of outreach but was impacted by faculty retirement and turnover during the 2012-2013 year. The same proportion of schools have seen innovation in pedagogical practice in the past year (5 of 7, 71%). These innovations involved adding new languages to the CS-0 course, developing new lessons for PLTL, and experimenting with new learner-centered pedagogies, such as flipped classroom work, supplemental instruction, and paired programming. These innovations could be developed for implementation across CAHSI, once they are deemed effective in the HSI computing department settings, and the evaluators will work with interested faculty in evaluating new initiatives in the coming year. Ensuring students have access to graduate school preparation has been declining in recent years- only 2 schools have fulfilled the 15% student preparation goal (29%) and 4 (57%) have partially fulfilled this goal. Ensuring larger numbers of students attend SACNAS in the coming year to receive such professional development may increase CAHSI's success in this area, as would a resurgence of local workshops to improve student knowledge of graduate school options. While a larger portion of undergraduate students have intentions to attend graduate school in the future (61% versus 44%) fewer had applied at the time of the CAHSI annual meeting survey (11% versus 22%). The timing of the annual meeting (and thus, the annual meeting survey) may have skewed results- the fall meeting schedule of SACNAS is much earlier than the 2010 meeting held in April of 2010, giving students less of an opportunity to apply for graduate opportunities.

## Faculty/Staff Engagement and Training

Over half of the CAHSI institutions held a training in the past year (4 of 7, 57%) with just under half hosting such a training (3 of 7, 43%). Training funding (e.g., travel for training, materials, space) may need to be pursued separately, especially as CAHSI faculty experiment with new pedagogical approaches across multiple campuses. CAHSI institutions do retain trained faculty within their departments, and more than half (4 of 7, 57%) boast at least 25% of their undergraduate faculty participate regularly in CAHSI initiatives and training, while the other 3 have partially fulfilled this goal. Having a cadre of involved faculty is essential for sustainability beyond the years of the CAHSI grant.

Fourteen faculty members, including CAHSI and non-CAHSI faculty, participated in an ARG fundamentals workshop delivered at Miami-Dade College on June 11-12, 2013. Attendees reported substantial increases in their understanding of the ARG model from the workshop. Attendees reported substantial increases in their understanding of the ARG model from the Fundamentals workshop. Prior to the workshop, participants rated their understanding of the ARG model as a 2.57 on a 5-point scale (between "a little" and "some" understanding). After the workshop, participants rated their understanding as a 4.57 on a 5-point scale (between "good" and

“a lot of” understanding). Before the workshop, no attendees rated their understanding of the model as “good” or “a lot.” However, after the workshop, 100% of attendees rated their understanding of the model as “good” or “a lot.”

Faculty attendees were very positive about the workshop overall. In fact, 100% of attendees reported that the workshop “met” or “exceeded” their expectations. The vast majority of participants (86%) mentioned guided practice and constructive feedback within the workshop as the most helpful aspects of the workshop. Six of the participants plan to use the ARG model in their research group, while one participant planned to use the model in a graduate research class. In total, participants plan to engage 39 students in ARGs—25 undergraduates and 12 graduate students.

### **Funding Sustainability**

Most of CAHSI’s outreach efforts are funded via other means such as institutional funding and grants from the National Science Foundation and other agencies—one institution has CS-0 outreach to K-12 funded completely via CAHSI (1 of 5, 20%), and another institution received supplemental monies to augment grants that support outreach (1 of 5, 20%). CS-0 has been fully institutionalized at all CAHSI schools, indicating it will live beyond the CAHSI granting cycle as long as faculty members across schools are trained in its implementation. Peer-led Team learning has been institutionalized or incorporated as a volunteer (zero cost) effort at two schools (40%), and is partially funded at the three remaining PLTL schools through CAHSI funding (60%). ARG funding is augmented by most institutions (4 of 6, 67%) though one school remains fully CAHSI funded (1 of 6, 17%) while another is funded completely through other granting organizations (1 of 6, 17%). Mentorgrad remains difficult to support through new means- of the 3 schools that continue to provide the initiative for students, two rely on CAHSI for all of the funding (67%) and one receives partial CAHSI support.

### **ALLIANCE IMPACT OUTCOMES**

CAHSI has continued to make strides in recognition as a national resource and policy voice for Hispanics in computing. The alliance is rated as “moderate/needs some improvement” or “proficient” on almost all Alliance Impact rubric categories, with the exception of cyberinfrastructure. Additionally, interviews with CAHSI collaborators and national policy experts suggest that CAHSI is noted for its national reputation and its dissemination of effective initiatives for Hispanic computing students. The Alliance Impact ratings for the past academic year are described in the table below.

IMPACT INDICATOR	Beginning/needs substantial improvement	Moderate/needs some improvement	Proficient
1. CAHSI Alliance impact: CAHSI annual meeting resourced through other organizations/ funding sources	Travel scholarships for some students covered; else CAHSI funded	Site collaborations lead to shared costs for annual meeting site, some travel covered by scholarships, funding from industry, related grants	Annual meeting speakers, faculty and student travel scholarships, and site costs covered by non-profits, industry support, endowments, or institutional funds
2. CAHSI Alliance impact: social science engagement	Evaluation report data focusing on social science elements of CAHSI disseminated (baseline practice)	One to two social scientists well versed in higher education, Hispanics in education, and or STEM education collaborate with CAHSI and produce 1-3 disseminated works	Three or more social scientists well versed in higher education, Hispanics in education, and or STEM education collaborate with CAHSI and produce 4 or more disseminated works
3. CAHSI Alliance impact: policy voice [annual activity]	1-2 national or regional venues	Less than 5 national or regional venues	Multiple CAHSI PIs served as CAHSI delegates to higher education and STEM education organizations in leadership roles in 5 or more national or regional venues across a spectrum of organization types. PIs discuss lessons learned from CAHSI rather than focusing on own institution specifically
4. CAHSI Alliance impact: faculty dissemination – education	0-4 engaged PIs/faculty publishing or presenting in 1-2 venues	5-9 engaged PIs faculty publishing or presenting in two or fewer venues	10-15 engaged PIs/faculty publishing or presenting in more than 3 total venues

<p>5. CAHSI Alliance impact: cyber infrastructure to support broader educational impact via web dissemination [CS0 PL/TL ARG mentorgrad fellownet =5 initiatives]</p>	<p>0-40% of initiatives available for deployment in new settings (0-2)</p>	<p>41%-99% of initiatives available for deployment in new settings (3-5)</p>	<p>100% of initiatives available for deployment in new settings</p>
<p>6. CAHSI Alliance impact: cyberinfrastructure national impact via web dissemination</p>	<p>0-32% of all website downloads/views occur outside of original CAHSI regions</p>	<p>33-49% of all website downloads/views occur outside of original CAHSI regions</p>	<p>50% or more of all website downloads/views occur outside of original CAHSI regions (website analytic data)</p>
<p>7. CAHSI Alliance impact: cyberinfrastructure to support collaboration</p>	<p>Cyberinfrastructure metric to be determined: focus is on research collaboration, usability, and quality of communication – survey of users to be developed</p>		
<p>8. CAHSI Alliance impact: cross institutional funding-technical/scientific research</p>	<p>1-3 CAHSI institutions</p>	<p>4-6 CAHSI institutions</p>	<p>Each CAHSI institution is involved in a collaborative research grant/grant proposal that supports continued contact and scholarship among students and faculty</p>
<p>9. CAHSI Alliance impact: cross institutional funding-educational initiatives</p>	<p>1-3 CAHSI institutions</p>	<p>4-6 CAHSI institutions</p>	<p>Each CAHSI institution is involved in a collaborative research grant/grant proposal that supports continued contact and scholarship among students and faculty</p>
<p>10. CAHSI Alliance impact: leveraging CAHSI for new institutional funding</p>	<p>1-3 CAHSI institutions</p>	<p>4-6 CAHSI institutions</p>	<p>Each CAHSI institution is involved in a research grant/grant proposal that leverages CAHSI results, outcomes, and/or initiative strategies to develop new programs</p>

11. CAHSI Alliance impact: alignment of initiatives (for this indicator, CS0, PLTL, ARG, mentorgrad, fellownet =5 initiatives)	0-40% of initiatives	41%-99% of initiatives	All CAHSI initiatives have documentation fit for wide distribution showing how they align to national and local goals in education
12. CAHSI alliance impact: promoting CAHSI in policy arenas	0 meetings	1 meeting (e.g., CAHSI collaborates with Excellencia at their conference (fall 2011))	CAHSI established more than 2 meetings or summits with multiple national stakeholders and local leaders to describe and promote this alignment
13. CAHSI Alliance impact: collaboration beyond original 7 CAHSI institutions	8 or fewer departments with documented implementation of initiatives (baseline is 6 in 2010)	9-15 departments with documented implementation of initiatives (baseline is 6 in 2010)	16 or more departments with documented implementation of initiatives (baseline is 6 in 2010-2011)

**#1. CAHSI annual meeting:** Regarding sustainability of the CAHSI annual meeting, the CAHSI alliance scored in the “moderate/needs improvement” category (2 of possible 3). The organization is entering its second year of a five year agreement with SACNAS to share site space, receive administrative support in processing CAHSI student travel, and get access to content in exchange for providing computer science leadership, technical content, and faculty mentors for the SACNAS conference. CAHSI has used other grant funding to send students to the conference, but student travel scholarships are still largely funded by CAHSI, which must be addressed in coming years.

**#2. Social science network:** Little progress has been made towards reviving a social science network that moves beyond the evaluation team (score 2 of 3). One grant proposal was developed with another social scientist outside of CAHSI. It is unclear at this point whether this goal is a priority for CAHSI. It may be appropriate to focus attention on research-based educational practice and advisement from social scientists, including the evaluation team, rather than on developing research collaborations at this stage in CAHSI’s lifespan. A barrier has been a lack of funding for social scientists to explore questions of interest to the CAHSI community.

**#3. Policy voice:** Leadership and support of CAHSI in higher education and STEM education organizations is spreading across CAHSI leadership. Four CAHSI faculty from four institutions serve as CAHSI delegates to national and regional organizations interested in improving and

diversifying the computing workforce. CAHSI scored 3 out of 3 on this metric, having representation within 5 venues.

**#4. Faculty dissemination - Education:** While faculty turnover has impacted the amount of faculty dissemination that occurs regarding education, CAHSI departments boast eight staff and faculty members who have produced peer-reviewed, published or presented work regarding computer science education in the past year. Faculty members are trying new efforts beyond the CAHSI initiatives (e.g., game development assignments, flipped classroom experiences, online PLTL) indicating a new set of practices might be culled for future CAHSI dissemination across partners. Education-related works were found in SIGCSE, ASEE, Journal of Computing Education in Colleges, Grace Hopper, IEEE Fuzzy Systems conference, and SACNAS. CAHSI scored in moderate/needs improvement, though missed the highest rubric score by a small margin.

**#5. Cyberinfrastructure to advance educational dissemination:** Creating initiative materials that would support direct download and implementation of CAHSI initiatives has been an ongoing challenge. In part, this is due to the hands-on, collaborative nature of CAHSI's training practices within the organization—most implementation across campuses has occurred over time with face-to-face relationships built among collaborators. Another issue has been in developing a documentation format that would work across institutions so that each school could import their sample lessons and materials in a coherent way. Nearly all (**4 of 5**) CAHSI initiatives have materials available online that would support at least initial implementation of CAHSI initiatives in new locations, though the default has been to include materials primarily from the lead institution. Materials include lesson plans, sample workshop resources and reference manuals; however, diversifying these materials across institutions is needed to showcase the multitude of approaches to the initiatives. CAHSI scores with 2 out of 3 on this metric. As progress is made in Cyber infrastructure, we anticipate greater dissemination of materials online.

**#6. Cyberinfrastructure to advance national impact:** Over a ten month period, we analyzed website visits for which we had metro area analytic data to better understand website use. Only visits from the 50 states were included in the analysis, as Google analytics does not provide sufficient detail regarding visits from Puerto Rico, thus it is difficult to tell if website visits come from UPRM or one of the new adopting schools. In our analysis, we count all visits that come from a metro area served by one of the original 7 schools as “CAHSI visits”, though it is possible that this conservatively estimates non-CAHSI visits, particularly when considering large metro regions like Los Angeles and Miami as “CAHSI”. With these conservative parameters, we found that from September 2012 through June 2013, 32% of the 2,577 visits we analyzed were from outside of CAHSI areas. Monthly averages ranged from 22-40%. An issue with the data is the large number of visits that could not be classified, from 56-124 visits per month, with most months showing around 70 unknown visitors. This change may be due to privacy setting concerns of users.

From September 1 through June 30th of 2013, the CAHSI facebook page became a major source of information dissemination, with 191 discrete messages posted, averaging one post every 1.5 days. While the page was mostly unilateral (CAHSI staff and faculty posting to the group), the site drew interaction in the form of “likes” and “comments” for 70% of the posts, and an average of 133 individuals were marked as reading each post. A content analysis of the facebook postings revealed the following: 23% (n=43) undergraduate summer and spring internships and REUs; 15% (28) professional development for advanced professionals (post baccalaureates to faculty) 12% (23) articles and resources related to computing and/or underrepresentation; 12% (23) CAHSI successes (articles promoting CAHSI, etc.); 12% (22) other (unrelated activity, jokes, local events, logistics); 10% (20) computing conference announcements, 10% (19) undergraduate student professional development; 9% (17) advanced professional opportunities; 5%(9) scholarships.

**#7. Cyberinfrastructure to support collaboration: NOT EVALUATED THIS YEAR**

**#8. Cross-institutional funding – technical research:** All but one of the seven initial CAHSI institutions engaged in cross-institutional educational initiative proposal writing/grant implementation during the 2012-2013, nearly completing the target of all institutions proposing or receiving funds for educational initiatives (6 of 7, “moderate/needs improvement” score on the rubric). The school not completing a cross institutional proposal did leverage CAHSI locally to promote educational initiatives at the institution.

**#9. Cross-institutional funding – educational initiatives:** Five of the seven CAHSI founding members had research proposals/projects developed across CAHSI schools, a “moderate/needs improvement” score on the rubric. Interview and survey data indicate faculty would like additional opportunities to pursue this type of collaboration, which is typically not part of SACNAS or CAHSI all-hands meetings. Carving out time to create research proposals that span multiple CAHSI schools may improve sustainability in ARG funding for students as well as create opportunities for faculty and student collaboration beyond the years of the CAHSI grant.

**#10. Leveraging CAHSI for new funding:** Nearly all schools had developed a research proposal that leveraged CAHSI, for a total of 16 proposals across institutions. In some cases, proposals would extend CAHSI initiatives like PLTL to other departments within an institution, would promote student researchers through ARGs, or introduce proven mentoring strategies to undergraduate and graduate education environments. Many of the grants are still pending review, so the impact beyond the CAHSI alliance is difficult to predict at this time.

**#11. Alignment of initiatives with national, state and local efforts:** CS-0, PLTL, ARG, and Fellownet (4 of 5, moderate to needs improvement on the rubric) are crossing

departmental barriers at CAHSI schools, as STEM faculty, deans, and, in some cases, university presidents see the value in CAHSI initiatives for STEM students at HSIs. Four schools have evidence of institutional support that extends beyond the CAHSI department in which CAHSI initiatives are leveraged for student success across campus. These changes offer direct impact for students from CAHSI institutions beyond computer science, yet they do not translate into a comprehensive policy statement that can be easily leveraged with multiple audiences.

**#12. Promoting CAHSI in policy arenas:** CAHSI is considering a partnership with a group intent on changing the demographics of engineering graduates over the next decade- they held one meeting during the 2012-2013 year to consider collaboration options (moderate/needs improvement on rubric). While the consortium is relatively new, it would provide a higher education policy voice in that its members are deans of engineering schools across the country. While CAHSI prides itself on its “grassroots” origins and practice at the departmental level, organizing an alliance with a more powerful, engaged group of like-minded academics could support CAHSI’s mission in new ways. In addition to political power, the consortium is engaging industry support that builds on dean’s previous relationships with supporters, potentially widening the funding pool for CAHSI’s future sustainability.

**#13 New collaborators, partners, and adopters:** Three new institutions have become CAHSI collaborative sites in the past year, bringing the total number of adopting institutions to 24, beyond the goals established for CAHSI growth (3 of 3 on the evaluation rubric). New institutions engaged in CAHSI initiatives include Texas State, Prairie View, and Los Angeles Southwest Community College. Faculty from the Texas institutions have been trained in ARG in early summer, and students from LA Southwest College are involved in ARG at CSUDH. This new model of engaging community college students in research at a four year university holds promise for supporting retention, improving transfer to the four year degree, and deepening scientific knowledge development. The initial use of university and CAHSI resources rather than an expectation of community college resource use may support sustainability, given relative faculty workloads, pay, and responsibilities at the two types of institutions. We intend to evaluate community college students’ retention and advancement from this program in the coming year to measure its potential as a new CAHSI promising practice.

In the past year, 15 out of 62 CAHSI new adopters responded to a survey about their practices and outcomes in the reporting period. All of the survey respondents had adopted ARG, and one expressed interest in also adopting PLTL, and another expressed interest in CS-0. Three adopters were using ARG in the classroom, one was using it for student development workshops, and 13 adopters were using it in research groups. Two respondents were no longer using the ARG model because of changes in job duties.

ARG adopters continued to broaden CAHSI's impact beyond the original alliance. In all, ARG adopter survey respondents had impacted 134 students in research experiences, 350 students in coursework, and 80 students in workshops in the past year. Adopters also came from six different disciplines as well as university administration. Besides Computer Science and Computer/Electrical Engineering, adopters were from Geoscience, Nursing, Nutrition Science, and Psychology departments. Seven adopters (47%) had used ARG resources and materials to support the adoption process, and five adopters (33%) had personal contact with ARG developers to support their adoption process. ARG adopters were employing most aspects of the ARG model into their students' research experiences or workshops. However, none of the adopters seemed to be using all aspects of the model. Eight out of 15 respondents (53%) felt that they could use ongoing support in their adoption of the ARG model. Their suggestions for support from ARG developers include online videos of ARG orientations, workshops or trainings, webinars, conference calls or meetings with ARG adopters to share ideas or trouble-shoot, or ongoing in-person trainings.

### **Measuring Alliance Impact from an Outsider Perspective**

Alliance impact depends upon an organizations' reputation, a sense of trust that develops between partners, and the extent to which partners and future partners see value in the target program (Laperriere, Potvin, & Zuniga, 2012; Padanyi & Gainer, 2003). For the 2013 reporting year, the CAHSI evaluation team extended data collection beyond the internal members of CAHSI to understand how CAHSI partners perceive the organization. Data were collected from industry, non-profit, policy, and institutional collaborators and potential collaborators in interviews and through participant observation at collaborative meetings. The focus of data collection was to represent a cross-sector, diverse set of perspectives, rather than to "cover" all potential partners. Interview guides were developed from the literature on effective organizational collaborations (Frey, et al. 2006; Varda, et al. 2008) and observational notes and interviews were coded for themes that emerged.

### **Assessment of collaborators' shared goals**

Given CAHSI's practice of revisiting the organization's core purpose for partner alignment, it was important to understand how CAHSI's outside partners perceived their alignment with CAHSI's goals. Partners aligned in four main ways—in their focus on improving student achievement (80%), diversifying the STEM (or more specifically, computing) workforce (60%), in their commitment to Latino/a populations (60%), and regarding goals to expand and improve the technical workforce (100%).

### **CAHSI's assets: perceived strategies and attributes**

Professionals interviewed were asked about their impressions of the CAHSI organization, including strengths of the organization as a whole. Data from interviews and collaborative meetings indicate CAHSI employs scalability effectively, has a strong network with a learning culture, and

exhibits care for students. Non-profit organizers, industry representatives, and institutional delegates alike saw the value of CAHSI as one of scale (60%)—the intentional cross-training of CAHSI members in multiple initiatives to bolster impact was viewed as a best practice that could be developed further across new schools and disciplines. An institutional leader who plans to collaborate with CAHSI said the following: “the reason for CAHSI was to figure out what is working (in computing education) and what is not- they were able to get that going across members; that is the impact that can work-now let’s broaden that out to all of engineering.” Interviews with CAHSI partners and potential partners from multiple sectors describe what they view as a “learning culture” in CAHSI’s approach to computing education (40%). A non-profit leader said: “What we’ve seen with CAHSI is their willingness to come together to share what they’re doing, not so much to compete and say they’re better than (another institution) but to learn from each other in ways that they can all do more and do better and serve students better. ... I think that engenders good will, or a willingness to learn from each other, and it is more unique than we would’ve originally thought.” Partners found CAHSI to exhibit care for students (40%) in their organizational activities and communications. For example, an industry representative who is just beginning a relationship with CAHSI described her impression of CAHSI in this way: "I really liked (the CAHSI delegate’s) presentation. I was inspired. I thought that she was very sincere and very competent. That was a nice combination. It just made me feel good about the fact that there are people out there working for the groups that we need to have in STEM that are so underrepresented.”

### **CAHSI’s assets: partnership deliverables**

In interviews, partners were asked to describe what tangible and human resources were exchanged within the collaborations developed, and potential partners were asked to describe potential tangible and human resource exchanges. What is notable about the list that developed was the diversity of resources CAHSI provides and receives based on partnerships. Resources received included the following: administrative support, space for meeting as a group, exposure via distributed policy materials, and travel scholarship funds. Resources provided by CAHSI were: leadership and professional development, technical content, and serving as “thought leaders” for educational and policy change. Potential collaborators envisioned cooperation for funding opportunities, opportunities to scale CAHSI to new disciplines and institutions, and new types of student experiences developed with industry.

### **CAHSI’s assets: reputation**

Partners and potential partners of CAHSI interviewed described CAHSI as a “proven model of success” (60%) and CAHSI leadership and faculty as experts regarding computing education for underrepresented populations (80%). Partners and potential partners describe CAHSI as an organization that has established credibility (60%) as well. They referred to CAHSI practices as “best” or “proven” practices for increasing Hispanic student success in computing. In some cases, partners were looking forward to learning from CAHSI’s experiences to improve their own student

success, while others viewed CAHSI as a good candidate for industry funding based on a strong track record. A set of potential partners describe their strategy for organizational growth as one that builds upon the success of CAHSI to expand in new disciplines and develop new, testable promising practices. An institutional leader from a non-CAHSI school described it this way: “My sense is that they’ve worked hard over the last several years to increase participation and success of Hispanics in computing. My initial impression (following a presentation by CAHSI leadership) was very positive. It’s an interest of mine ...I was interested in the organization to see what we could learn from them in terms of best practices.” An industry representative stated the following regarding CAHSI’s efforts: “For CAHSI in general, I think they have a track record. I think that shows really well to industry. ...For that group to have demonstrated that they can produce Hispanic software engineers and women engineers, that speaks volumes because it gives you a different kind of credibility. You can more easily tie corporate resources to a success story than an idea.” An institutional leader with intentions to partner with CAHSI said the following: “CAHSI has established those best practices—we need to expand them to more institutions and disciplines; at the same time we want to bring industry in to develop new best practices in engineering/industry.”

### **Fall 2012 SACNAS Session Data Summary**

CAHSI leadership produced four computing content sessions at the fall 2012 SACNAS conference. These sessions served at least 101 faculty, staff, and student attendees at the conference, as 101 surveys were collected from these sessions. Unfortunately, SACNAS surveys do not indicate which participants were CAHSI members and which were SACNAS participants at large. Two of the sessions focused on health informatics, one was for faculty to learn how to provide support for undergraduate researchers (ARG training), and the final session was related to cyber security. The majority of survey completers at each event were students (60-76% of respondents), except for the ARG workshop, which is designed primarily for faculty professional development (50% students, 50% scientists and other professionals).

CAHSI sessions fared well when session attendees compared their experience of CAHSI sessions with similar professional development they received in other venues. For those who had attended related sessions in the past (whether at previous SACNAS conferences or other venues), participants rated the CAHSI sessions “somewhat more helpful” than past sessions (mean range from 3.93-4.09, on a scale where 4.0=somewhat more helpful). Approximately a third to a half of participants mentioned they had attended 2 or more sessions like the CAHSI sponsored SACNAS sessions.

Across sessions, presenters received strong evaluations of their knowledge and ability to communicate—96-100% of respondents marked CAHSI speakers as good (3) to excellent (5) on these two items and mean scores ranging from 4.2 to 4.9 on a 5 point scale. Participants ranked their developed skill and knowledge overall in the session—this average rating was a bit lower yet still well

positioned in the positive side of the spectrum, with mean scores of 3.7-4.25 and the majority of respondents indicating the session was good to excellent in this area (79% to 100% rating the session good to excellent). Session relevance for one's current position was rated highly, though to a lesser degree than skills and knowledge ratings (72-100% rated good to excellent, means range from 3.1 to 4.5). Written comments indicate for a few respondents that health informatics was not related to their current field of study, but was an applied field of general interest. Relevance to career advancement fared similarly (69-100% rated the session good to excellent, means range from 3.1 to 4.25). Participants were also asked to describe whether they had ideas or resources to bring "home" with them, and responses indicated the majority of participants were satisfied in this area (83-100% indicate good to excellent, means range from 3.6 to 4.6).

Session: disease			
Item	Mean (1-5)	%Excellent (5)	% Good to excellent (3-5)
Presenter's ability to communicate	4.2	44%	96%
Presenter's knowledge of the subject	4.5	58%	100%
Relevance to success at your current position	3.8	23%	88%
Relevance to helping you advance your career	3.7	19%	85%
Ideas/resources you will use when you go home	3.7	23%	96%
Knowledge and skills acquired overall	3.9	19%	92%

Session: Healthy World			
Item	Mean (1-5)	% Excellent (5)	% Good to excellent (3-5)
Presenter's ability to communicate	4.3	45%	100%
Presenter's knowledge of the subject	4.7	69%	100%
Relevance to success at your current position	3.1	10%	72%
Relevance to helping you advance your career	3.1	14%	69%
Ideas/resources you will use when you go home	3.6	24%	83%
Knowledge and skills acquired overall	3.7	35%	79%

Session: Cyber Attacks			
Item	Mean (1-5)	%Excellent (5)	% Good to excellent (3-5)
Presenter's ability to communicate	4.24	52%	100%
Presenter's knowledge of the subject	4.58	64%	100%
Relevance to success at your current position	3.94	46%	88%
Relevance to helping you advance your career	3.85	46%	79%
Ideas/resources you will use when you go home	4.15	55%	91%
Knowledge and skills acquired overall	3.91	33%	91%

Session: ARG			
Item	Mean (1-5)	%Excellent (5)	% Good to excellent (3-5)
Presenter's ability to communicate	4.9	92%	100%
Presenter's knowledge of the subject	4.9	92%	100%
Relevance to success at your current position	4.5	67%	100%
Relevance to helping you advance your career	4.25	58%	100%
Ideas/resources you will use when you go home	4.6	67%	100%
Knowledge and skills acquired overall	4.25	42%	100%

## CONCLUSION

In the past year, CAHSI has continued to make progress in producing Hispanic computer scientists and engineers, encouraging fellowship applications, and shaping students' aspirations and preparedness for graduate school and careers. CAHSI has made small strides in building and developing organizational capacity to sustain its initiatives, and is beginning to be seen as a resource for "best practices" for Hispanics in computing by members of national organizations advocating for Hispanics and/or STEM education. The data also point to several areas for CAHSI to focus on in this point in its lifespan, as it aims to sustain and expand its efforts.

## Recommendations:

- **Focus on branding all CAHSI initiatives and activities.** As CAHSI continues to disseminate its practices and raise its national profile, it is important that all initiatives, activities, and trainings are clearly branded as CAHSI. For example, new adopters displayed varying degrees of awareness of CAHSI as a national resource. If CAHSI is to continue to broaden its reach and impact, marketing and branding of CAHSI efforts will be vital to attaining national recognition.
- **Develop more coordinated K-12 efforts across CAHSI.** With more CAHSI departments undertaking K-12 outreach efforts, CAHSI should consider how to best

coordinate those efforts to share resources and strategies, and to learn from one another. CAHSI departments should not only develop more coordinated efforts among CAHSI members, but should also engage more deeply with outside stakeholders invested in K-12 CS education, such as the Computer Science Collaboration Project (CSCP).

- **Continue to innovate with new Promising/Effective Practices.** Nearly all schools have continued innovation in pedagogical practice in the past year (5 of 7, 71%). These innovations involved adding new languages to the CS-0 course, developing new lessons for PLTL, and experimenting with new learner-centered pedagogies, such as flipped classroom work, supplemental instruction, and paired programming. These innovations could be developed for implementation across CAHSI, once they are deemed effective in the HSI computing department settings. After evaluating these new pedagogical techniques, faculty interested in spreading their work to other CAHSI and non-CAHSI institutions could add to CAHSI's repertoire of promising and effective practices.
- **Develop and expand Cyber infrastructure for disseminating CAHSI initiatives.** As the CAHSI community of adopters and partners grows, it will be particularly important to develop tools for distributing resources, supporting dissemination and adoption of CAHSI initiatives, and communicating among and between different types of CAHSI stakeholders. As CAHSI cements its status as a national resource for Hispanics in computing, CAHSI should examine the diversity of materials available for its initiatives to ensure that they highlight the multitude of approaches it employs to enhance student success, including differentiation by topic, author, and institution. Cyber infrastructure could provide additional methods for serving students across CAHSI—particularly in departments where reduced funding has made training opportunities less frequent. For example, providing Fellow Net or graduate school workshops in a webinar or video format could ensure that more CAHSI students have access to vital information.
- **Bolster graduate school training.** Providing students with training opportunities that focus on graduate school has been declining in CAHSI departments. As stated above, using technology to connect to content may support more students in their graduate school and fellowship applications, and sharing of content (e.g., slides of content for use in such workshops) may also support reinvigoration of this activity. As many students plan to finish at the BS degree, these trainings could expand to focus on job readiness and career planning in industry.
- **Provide structured opportunities for faculty collaboration on new projects that support CAHSI.** Sustaining relationships across institutions is needed to extend CAHSI beyond the years of the final grant. Crafting competitive proposals often

involves long periods of face to face and online conversation and collaboration. In order to support CAHSI faculty development and continued association, faculty across CAHSI departments (including but not limited to P.I.s) need time at CAHSI events and meetings to work on cross-institutional proposals. Brainstorming and planning meetings may be necessary before and after face to face meetings. This could serve as professional development for Hispanic faculty as well as an opportunity to maintain strong relationships across schools.