Achieving Broader Impacts in STEM at 2-year Hispanic Serving Institutions

Cynthia Kay Pickering, Science Foundation Arizona

Cynthia Pickering is a retired electrical engineer with 35 years industry experience and technical leadership in software development, artificial intelligence, information technology architecture/engineering, and collaboration systems research.

In September 2015, she joined Science Foundation Arizona (SFAz) to lead the Girls in STEM initiative and translate her passion for STEM into opportunities that will attract, inspire and retain more girls in STEM to make it the new norm. She has also architected SFAz's enhanced Community College STEM Pathways Guide that has received the national STEMx seal of approval for STEM tools. She integrated the STEM Pathways Guide with the KickStarter processes for improving competitive proposal writing of Community College Hispanic Serving Institutions.

Throughout her career, Ms. Pickering has written robotics software, diagnostic expert systems for space station, manufacturing equipment models, and architected complex IT systems for global collaboration that included engagement analytics. She holds a US Patent # 7904323, Multi-Team Immersive Integrated Collaboration Workspace awarded 3/8/2011. She also has twenty-five peer-reviewed publications.

She has recently been accepted to the Human Social Dimensions PhD program in Arizona State University's School for the Future of Innovation and Technology in Society (beginning Fall 2020).

Caroline VanIngen-Dunn, SFAz Center for STEM, Arizona State University

Caroline VanIngen-Dunn is Director of the Science Foundation Arizona Center for STEM and Arizona State University, providing services for Maximizing the Educational and Economic Impact of STEM. Ms. VanIngen-Dunn oversees the programs and resources designed to assist community colleges, particularly rural and Hispanic Serving Institutions (HSIs), through a rigorous process leading to improvements in their capacity building, infrastructure, and proposal development efforts that support students in their STEM education and career pathways pursuits.

Ms. VanIngen-Dunn served as President of CVID Consulting, building on years of experience as engineer and project manager in human crashworthiness and safety design, development and testing, working for contractors in commuter rail, aerospace and defense industries.

VanIngen-Dunn has an MS degree in Mechanical Engineering from Stanford University and a BSE degree in Biomedical Engineering from the University of Iowa. She serves on the University of Iowa's College of Engineering Advisory Board, the Arizona Career and Technical Education Quality Skills Commission, and on the YWCA Metropolitan Phoenix Board of Directors whose mission it is to eliminate racism and empower women.

Ms. Anita Grierson, SFAz Center for STEM at ASU

Anita Grierson is a Program Manager, Research at the SFAz Center for STEM at ASU where she is Co-PI for several NSF funded programs that support STEM education at Hispanic Serving Institutions and at Rural Colleges across the nation. Prior to joining SFAz, she was the Director of the METS Center for Motivated Engineering Transfer Students in the Ira A. Fulton Schools of Engineering at Arizona State University. Ms. Grierson has over twelve years of corporate experience in Program Management, Business Development, and Biomechanical Engineering, with products as diverse as air bag systems for helicopters, body armor, and orthopedic implants. She received her Bachelor's degree in Mechanical Engineering from the University of Michigan in 1990, her Master's degree in Mechanical Engineering from Northwestern University in 1994, and a Master's in Business Administration from Arizona State University in 2000.

Anna Tanguma- Gallegos Gallegos

Anna Tanguma-Gallegos brings 10 years of STEM strategic planning and program management experience in higher education environments and initiatives. Anna has a history of promoting and increasing

enrollment in the programs she manages, as well as developing collaborative relationships with corporate and community members. Anna has provided successful direction to federally funded programs within the higher education field. Anna spearheaded the relationship with Health Pathways Grossmont-Cuyamaca Community College District, and University of California-San Diego Moore's Cancer Center to develop their first-ever nursing internship summer program and offering a value-added learning experience for the students.

In her role at Science Foundation Arizona (SFAz), Anna is working with Hispanic Serving Community Colleges as part of the National Science Foundation (NSF)-funded KickStarter Program. The goal of KickStarter is to enhance the enrollment of Latino students in STEM fields by helping colleges with their STEM planning and maximizing the competitiveness of their federal grant proposals to fund those plans. As a Program Officer for the Community College STEM Pathways Initiative, Anna works closely with all community college teams, guides them through the KickStarter process, and connects them to community and industry partners.

Anna brings a unique skillset to this position with Bachelor's and Master's degrees in Behavioral Science/Educational Counseling from National University; CA. Anna is pursuing her Ph.D. in Psychology with an Emphasis on Integrating Technology Learning. Prior to SFAz, Anna was the Manager of Alumni & Community Relations for National University. Anna developed partnerships within the community colleges and non-profit industry throughout San Diego and Los Angeles for National University.

Assemblywoman Lorena Gonzalez and State Senator Ben Hueso recently recognized Anna for her work in the MANA De San Diego Latina Success Leadership Program.

Achieving Broader Impacts in STEM at 2-year Hispanic Serving Institutions

Abstract (optional)

Introduction

Hispanic Serving Institutions (HSIs) are defined by the United States Department of Education as institutions of higher education that enroll 25% or greater full-time equivalent Hispanic undergraduate students [1]. HSIs currently enroll 66% of the 3.5 million Hispanics in higher education, 39% of all Asian American and Pacific Islanders, 21% of all African Americans, 18% of all Native Americans, and 68% of all minority students [2]. Forty-seven percent of the existing 523 HSIs are 2-year colleges [3]. Over thirty additional institutions per year meet the HSI enrollment criteria, to more than double the number of HSIs since 2000 [2]. The opportunity to broaden participation of underrepresented minorities in Science, Engineering, Technology, and Math (STEM) at both 4-year and 2-year HSIs is promising and has the potential to supply qualified workers that meet current and future workforce demand.

Broadening participation and success of underrepresented minorities as students in STEM is but one form of broader impact. Broader impacts also include, but are not limited to: improved STEM education and educator development at any level; enhanced infrastructure for research and education; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and the community; and increased public scientific literacy and public engagement with science and technology [4] [5].

Broader impacts in STEM at 2-year HSIs continue to be achieved through NSF awards that these HSIs earned as an outcome of strategic STEM planning and proposal development technical assistance provided by the National Science Foundation (NSF)-funded KickStarter program (NSF HRD 1450661 and 1929686).

This paper will discuss and quantify the direct impacts and the broader impacts of the five-year KickStarter program, which aimed to increase the number of 2-year HSIs that successfully pursued federal STEM education grants, particularly from NSF. The grants pursued by the 2-year HSIs in KickStarter focused on enhancements to STEM curricula, industry and community partnerships, faculty professional development, preparing students for technical careers, and robust articulation pathways to four-year STEM programs to ultimately increase recruitment and retention of underrepresented students in STEM.

KickStarter Process

The KickStarter Process, shown in Figure 1, helps 2-year HSIs develop a college President-endorsed STEM plan with institution-wide goals, strategic objectives, and work plans for activities and programs to improve STEM student education. The institution's strategic vision, and a STEM self-assessment of its student support services, industry engagement, technology integration, and curricular alignment drive the STEM planning. Community of Practice theory is intrinsic to the KickStarter process, with a cross-departmental *STEM Team* that includes STEM and CTE faculty, student support staff, institutional research, grants staff, and community partners. The team is central to the activities during KickStarter and in sustaining the plan after KickStarter.

Figure 1: The KickStarter Process

During the initial phase of the KickStarter Process, **Recruit and Select**, 2-year HSIs responded to a Call for Applications through a written proposal. Expert reviewers who were external to the KickStarter program evaluated the applicants' proposals to assess the extent to which a college's "readiness" was sufficient to conceive, justify, and launch an NSF project during KickStarter. Applicants' proposal documents also needed to comply with stated page limits, font sizes, eligibility criteria, and include all sections required by the Call for Applications — an initial exposure to NSF-like expectations for proposal compliance.

Startup introduced the new Cohort members to the KickStarter program and provided virtual training sessions to prepare for the DC Workshop, perform STEM Assessment and Planning, and use the online KickStarter community and resources. The virtual sessions were recorded and posted to the online KickStarter community for future reference. During the face-to-face workshop in DC the participants met with NSF Program Officers and learned about NSF programs that are relevant to community colleges. The workshop also provided the opportunity to describe initial research project ideas to NSF Program Officers and obtain their inputs. In Cohorts 3 and 4, the order of startup activities was shifted so that the DC workshop occured after the STEM Planning. This change allowed participants a better opportunity to match research project ideas from their STEM plans with NSF programs through discussions with NSF Program Officers.

STEM Planning began with the STEM Assessment which was performed by the college STEM Teams identified in the application proposal to KickStarter. The STEM Pathways Model developed under NSF DUE-1003847 and 1400687 provides the framework for the STEM Assessment. Figure 2 shows the matrix structure for the model in which the three columns reflect STEM educational pathway components that the college owns, and the four rows reflect interactions that support students, engage industry, integrate with technology, and align curricula. The intersections of each row and column describe strategies and practices for improving STEM education capabilities, along with the attributes of a capability that is highly comprehensive (fully developed and broadly and effectively used). An expanded STEM Pathways Model refines the 12 strategies into 42 attributes backed by 32 examples of real programs from community colleges that have successfully increased STEM recruitment, retention, and/or transfer to the STEM workforce or a four-year institution. The 42 fine-grained attributes were used to create the items in the STEM Assessment.

	A. STEM Education Outreach and Career Exploration	B. Foundational Knowledge and Skills	C. Transferable Cert's and Degrees
1. Student Support Strategies			
2. Industry Engagement			
3. Technology			
4. Curricular Alignment			

Figure 2: Matrix structure of the STEM Pathways Model

The STEM Assessment asked members of the STEM Team to simultaneously rate their institution to the extent that it exhibits the characteristics described in each assessment item using a 4-point rating scale of NONE, MINIMAL, ADEQUATE, COMPREHENSIVE, or to indicate "don't know." Participants also created notes about strengths, barriers, and improvements for the item they rated, adding examples and supporting data, as available. The Assessment allowed teams of up to ten people to simultaneously rate the STEM capabilities of their institution. The complete set of participant responses were rolled up for the college and an analysis was performed which recommends prioritized actions based on all of the team's inputs. The analysis calculates the average score for each of the 12 strategy areas and then applies a gradient color scale with green as the highest value, red as the lowest value, and yellow at the 50% median point as shown in Figure 3. The real value of the visual shown in Figure 3 was in its discussion with the STEM Team. We observed increased awareness across departments who often were not aware of each other's work and expertise. At many colleges, the Career Technical Education (CTE) faculty had strong partnerships with local industry in contrast to Science and Math faculty who often were not connected to industry. CTE experience opened doors to strengthen connections and partnerships with local industry across the entire college.

SUMMARY OF ALL RESPONSES MAPPED TO HIGH LEVEL PATHWAYS MODEL COMPONENTS			
	A STEM Education Outreach and Career Exploration	B Foundational Knowledge and Skills	C Transferable Certifications and Degrees
1 Student Support Strategies	2.5	1.7	2.0
2 Industry Engagement	1.5	1.0	1.2
3 Technology Integration	1.7	2.7	1.2
4 Curricular Alignment	1.6	2.1	2.3

Figure 3: Summary of STEM Team Responses to STEM Assessment

After completing the STEM Assessment, a 1.5-day Site Visit was held at each college to revisit and discuss the STEM Assessment responses, and to begin generating a STEM Plan based on priorities, strengths, and areas for improvement. A current state assessment (CSA) report captured local political, economic, social and technological factors, college demographics and strategy, a summary of the STEM Assessment visuals, and strengths, weaknesses, opportunities and threats (SWOT) analysis to provide external and internal inputs to the college STEM Plan.

The Site Visits included the College President who presented the college strategy at the beginning of the meeting to provide strategic direction and endorsement for the planning activities. The President also returned at the meeting close to hear about STEM plan goals and priorities. After the Site Visit, the STEM Teams continued to meet regularly to continue the KickStarter Process.

During the **Write Proposals** phase, Research Concepts were iteratively driven out of the STEM Plan and intensive technical assistance and coaching guided Competitive Proposal development. The Research Study Approach (RSA) Template, which is informed by the NSF Common Guidelines for Education Research and Development [6], was used to generate the problem statement, proposed solutions, research questions, hypotheses, literature search, and other mechanisms to gather prior evidence in support of the problem statement. Emphasis was placed on gaining a broader perspective of the state of the art in related research, and the importance of forming key partnerships to discover and advance knowledge. The RSA also included identification of internal data sources for gathering evidence to establish baseline data and help measure research outcomes and impacts. Often teams began developing a logic model of inputs/resources, activities, and outcomes and impacts for their proposed project in parallel with the RSA.The last section of the RSA used the prior sections to create a one-page summary overview of the proposed research project, intellectual merit, and broader impacts.

With a well-defined research concept, the colleges were ready to approach an NSF Program Officer (PO), discuss the fit to the PO's NSF program, and gain other valuable feedback. If the NSF PO agreed that the research concept aligned to their program, then before proposal writing commenced, the college PI must obtain approval from their STEM Planning Team and comply with the college grant writing process. Based on college needs, other technical assistance included identifying and assigning Expert Mentors and/or recommending Evaluators to 2-year HSIs early in the proposal-writing phase, providing them with experienced role models and extensive networks. At least one month prior to the submission due date, colleges submitted their proposal drafts to a "Red Team" Merit Review modeled after NSF's Merit Review performed by external experts. This introduction to the NSF review process provided constructive feedback to the 2-year HSI proposal teams for revising their proposals and gave them a good understanding of the importance of detail and development of rationale for their research.

The **Implement and Sustain** phase provided support to participating faculty and staff from 2-year HSIs at two stages of their professional development: 1) Post Award Start-up / Implementation and 2) Transitioning to Sustaining Mode after the college achieved the desired outcomes of the KickStarter Process. As colleges transitioned to sustaining mode, they were encouraged to continue their participation as KickStarter Alumni. In this sense, they became part of a growing community that continues beyond their direct involvement in the KickStarter Program.

KickStarter Cohorts

The four Cohorts of 2-year HSIs that have participated in KickStarter from 2015 to 2019 are located across six states, as shown in Figure 4. Ten HSIs were from California, five from Texas, four from Arizona, three from New Mexico, and one from each of Florida and Illinois. The participating institutions varied in their characteristics. Some colleges belonged to large districts in urban settings, that provided centralized infrastructure for grants and institutional data, while others were from small rural locations, with fewer central resources. Total student enrollments ranged from 400 to 40,000 and percentages of Hispanic student enrollment ranged from 29% to 97%. Colleges closer to the United States and Mexico border typically had higher Hispanic student enrollment. California colleges were also supported by a state-wide Community College system. Institutions in Arizona and New Mexico, depending upon their locations, also served Native American populations.

The structure of the KickStarter STEM teams at the 2-year HSIs typically included 1-2 principal investigators who were either STEM Faculty and/or Deans, a grants writer, other STEM faculty, CTE faculty, student support staff, institutional research, and local K-12, university and industry partners. Per the eligibility criteria in the KickStarter Call for Applications, participants had submitted one or more proposals to NSF that resulted in declinations or had never before applied to an NSF program.

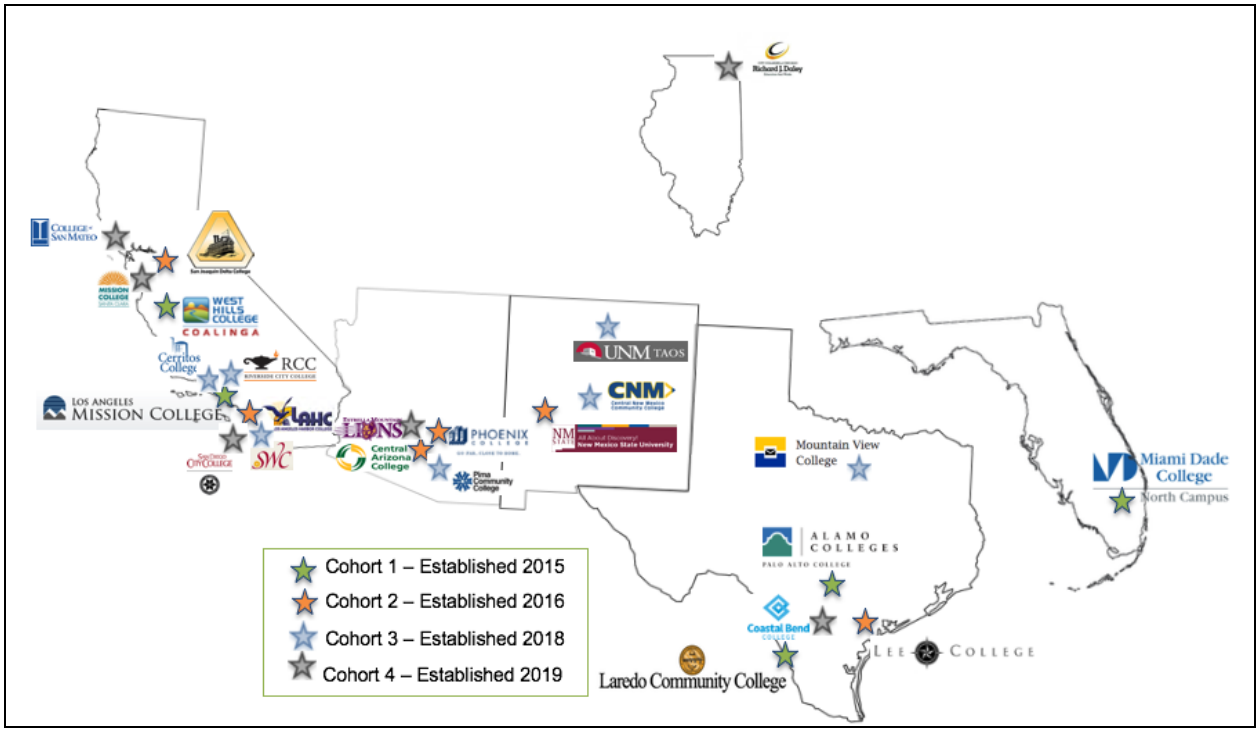

Figure 4: KickStarter Cohorts 1-4

Qualitative and Quantitative Results

KickStarter-facilitated STEM Assessment and Planning discussions have increased faculty engagement, leadership, collaboration, and visibility to college executives -- gaining their endorsement of the STEM plan. Undertaking the KickStarter process has positioned 2-yr HSIs to think more strategically about future ideas, including collection of relevant data and identifying research questions to proactively anticipate funding opportunities.

Qualitative Results

Qualitative feedback from KickStarter participants collected in regular surveys during the program indicate that the KickStarter process is highly valuable in building strategic STEM education research capacity at the 24 participating 2-yr HSIs. Participants have also reported improved ability to achieve other federal grants. Examples of qualitative comments include:

KickStarter has provided us with the infrastructure to develop a strong leadership team, evidence-based goals and a strategic action plan, and well-written proposals that reflect NSF's ambitions.

Everyone at the college involved in STEM agrees about the goals in the STEM plan. Making the goals more tangible and focused is helping us to anchor proposals in a way we haven't previously been able to do.

We are in the preliminary stages of rolling this out to other projects through the Grants Office. This (the Research Study Approach (RSA)) is a really helpful tool in getting organized information from (internal HSI grant) PIs at a deeper level before we begin writing a proposal. For the Grants Office, this is going to increase capacity tremendously!

Kickstarter has provided us with a replicable path to organize and strategize on NSF and other federal grants. With such a large institution, it has been very easy to have projects and goals living in silos, but developing a cross-departmental team has alleviated some of the former fragmentation on goals and grant proposals.

Our institution has elevated the grants department and fully included the RSA into their grants development infrastructure. The STEM plan is being used to assess, respond, and measure requests for proposal work (which usually are very short lead time requests for responses to solicitations).

Following the cultural relevance presentation at a cross cohort meeting, we organized and held a cultural relevance panel at our full faculty and staff professional development day. The panel included 3 Native American and 3 Hispanic speakers.

Quantitative Results

The anticipated outcomes for the KickStarter project stated that each participating 2-year HSI will have submitted a minimum of two proposals to NSF during the project period, with a goal of having at least one of those proposals funded directly or as a result of the HSI's partnership with other institutions/organizations. The original number of 2-year HSIs expected to participate was twelve.

An NSF award rate of 50% has yielded $10.14M funding to the eighteen participating 2-yr HSIs in Cohorts 1-3. Cohort 4 colleges were not asked to submit proposals because of their short time in the program, although one Cohort 4 college did submit a proposal that remains under review with NSF and a second submitted as a partner with a four year university.

Figure 6 shows direct impacts data for NSF proposal submittals, declinations, subawards, and awards for HSIs in KickStarter Cohorts 1-3. Cluster A shows proposals up to five years prior to involvement in KickStarter. The submissions also include any reported subawards. There were no awards where the participating 2-year HSI was the lead institution prior to KickStarter. Cluster B shows the data up to and including the first 2 proposals submitted with KickStarter technical assistance. Note that the awards are nearly equal to the declinations, and the gap difference between declinations and submittals is smaller. Cluster C shows self-service competitive proposal development after learning the KickStarter process. Note that the awards are slightly higher than the declinations in cluster C. The total KickStarter results shown in cluster D reflect the 50% award rate.

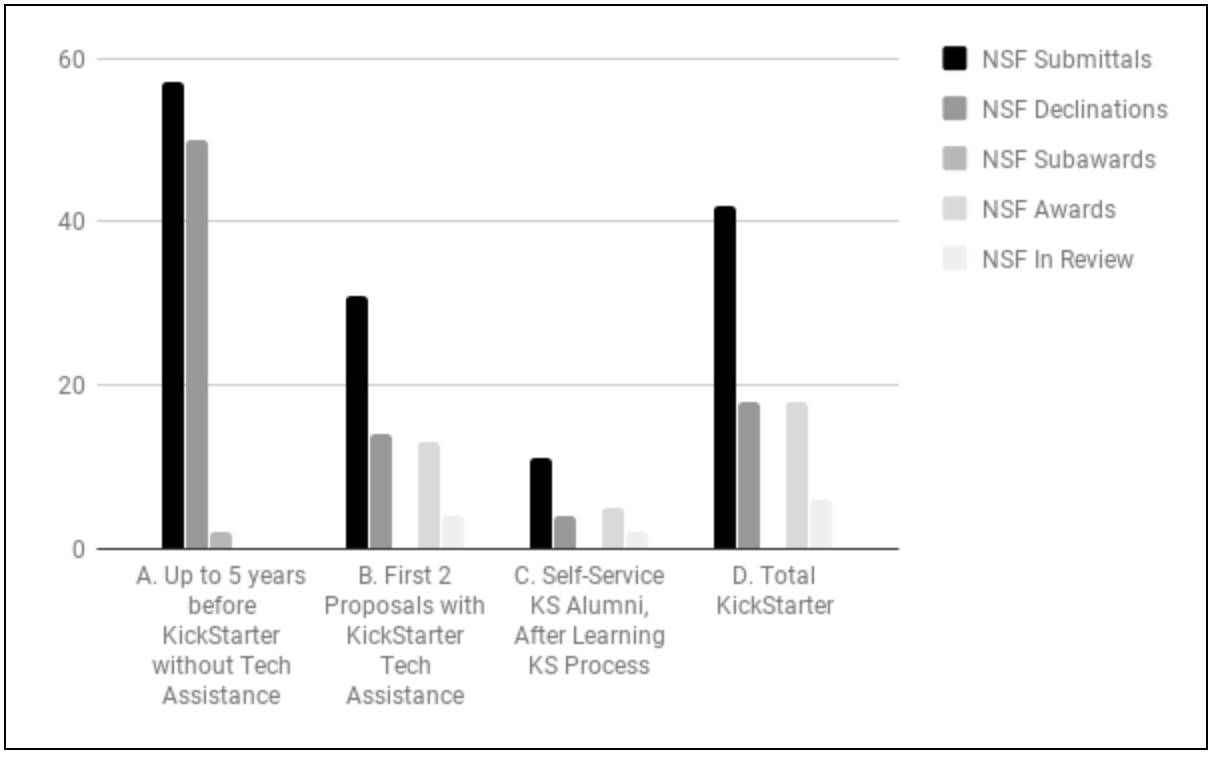

Figure 6: Cohorts 1-3 NSF proposals before, during, and after KickStarter, and Total KickStarter

Table 1 indicates that of the eighteen colleges who participated in Cohorts 1,2, and 3, twelve colleges (67%) submitted two or more proposals and all submitted at least one proposal. The proposal types appended with F19 were submitted during fall 2019 and remain under review with NSF at this writing. The asterisks indicate eighteen projects that received NSF funding. Twelve of the eighteen HSIs have attained awards, and an additional four HSIs with no previous award through KickStarter may attain awards as they have proposals under review in the NSF programs with the highest award rates for KickStarter. Two remaining HSIs will not attain awards through KickStarter.

Table 1: NSF Submit and Award* Data by KickStarter HSI

Cohort	*College Name*	*Proposal 1 Type*	*Proposal 2 Type*	*Proposal 3 Type*	*Proposal 4 Type*
1	LA Mission College	S-STEM	ATE*	S-STEM	HSI*
	Laredo College	IUSE	AISL	HSI*	ATE
	Miami Dade College	S-STEM	S-STEM*	ATE*	
	Palo Alto College	IUSE	S-STEM*	ATE*	
	West Hills CC	S-STEM	ATE*	S-STEM	S-STEM*
2	Central Arizona College	ATE*	HSI*		
	LA Harbor College	S-STEM			
	Lee College	IUSE	HSI-F19		
	NMSU Grants	ATE	HSI*		
	Phoenix College	DRK12	HSI*	HSI-F19	
	San Joaquin Delta	S-STEM	S-STEM	ATE-F19	
3	Central NM	HSI*			
	Cerritos College	IUSE-GEOPaths	S-STEM	HSI-F19	
	Mountain View	ATE*			
	Pima CC	HSI*			
	Riverside City College	ATE-F19			
	Southwestern CC	S-STEM*	HSI-F19		
	UNM Taos	HSI*			

It is interesting to note that the HSIs in Cohort 1 HSIs required at least 2 proposal attempts under KickStarter to attain their first award from NSF. In Cohort 2, one HSI won an NSF award on the first proposal submittal and in Cohort 3 five HSIs won an NSF award on their first proposal submittal. This is likely due to the recently established (2018) NSF HSI program which was specifically targeted to HSIs, and its new to NSF track which was targeted to HSIs with no prior NSF awards. Another possible contributing factor was that by the third cohort, the KickStarter

program team had optimized the KickStarter process and was more experienced in coaching competitive proposal writing for particular NSF programs. Additionally Cohorts 1 and 2 attended a project kickoff in Washington DC at the very beginning of their KickStarter journey, before they had thought about STEM priorities and potential research projects. In Cohort 3, the STEM Assessment was completed prior to the DC visit which became a workshop to discuss initial research priorities with NSF POs. By Cohort 4, the STEM Assessments, Site Visits, and STEM Plans were completed prior to the DC workshop and the initial research ideas were more developed. Cohort 3 and 4 participants found it helpful to be able to connect their ideas to potential NSF research opportunities through face-to-face question and answer sessions with NSF POs and came prepared for these types of dialogs with specific questions.

Broader Impacts

As project awards to Cohort 1 and 2 began to yield results, the direct impact to faculty and staff leadership was demonstrated for competitive proposal development. Next the KickStarter team encouraged the project leads at the 2-year HSIs to disseminate their results at conferences. Additionally, data was collected to document the broader impacts to STEM students and partners across the program. A survey was designed and administered to discover the impacts to students and the role of equity and inclusion in those impacts, as well as faculty development areas and contributing partnerships. The data revealed broader impacts to over 1,611 students, 451 faculty, 39 industry partners, 23 K-12 partners, 3 public agency partners, and 30 post-secondary partners. Broader impacts to students included STEM scholarships, undergraduate research experiences, and certificate and course completions in Biotechnology, Biology, Math, Physics, Chemistry, Logistics and Supply Chain, Cybersecurity, Welding, and Advanced Manufacturing. Faculty development included culturally relevant pedagogy and instructional practices and acquiring discipline-specific knowledge and equipment operation knowledge. Strong emphasis on workforce experience in one Biotechnology program has resulted in eighteen students employed at local biotech companies, two student transfers to a 4-year university biology major, and fifteen students continuing in the program. Notably there was also a 27 times increase in Lab Technician degrees awarded, three times increase in Research Lab Technician degrees awarded, and four times increase in Associate in Science degrees awarded between May 2017 and October 2019 with six months remaining in the three year project.

As mentioned previously, community of practice is inherent to the KickStarter process within the colleges in the form of a STEM team. The extent of the community developed during KickStarter is shown in Figure 7. Not only does the community consist of the HSIs in KickStarter Cohorts 1-4, it also has the potential to extend to the larger community of 253 HSIs through existing partnerships with Hispanic-promoting organizations including ESCALA, HACU, AHSIE, Excelencia in Education, SACNAS, and the NSF-sponsored HSI STEM Hub and the HSI ATE Hub programs. For example, in 2019, the KickStarter process was disseminated at a 2-day Association of HSI Educators (AHSIE) NSF Grantsmanship Institute to 20 attendees from 14 HSIs across 6 states. And, as college STEM team members involved in KickStarter have moved to new positions at their college or at new institutions, they have taken the knowledge gained through this program with them, increasing the spread of this program.

Notably, we have been contacted by several who used their knowledge to perform additional STEM planning and to write proposals with their new organizations.

As a community of practice, KickStarter Cohort members meet monthly to share learnings and hear from guest speakers on topics such as culturally relevant faculty professional development from ESCALA, Inc., and legislation policies and HSI funding from Hispanic Association of Colleges and Universities (HACU). Two peer-reviewed publications have been published IEEE CTS 2016 [7], ASEE 2018 [8]. More recently a panel discussion featuring three principal investigators (PI) from KickStarter HSIs with Advanced Technological Education (ATE) grants from NSF was held during the NSF Annual ATE PI Conference, October 24-26, 2019.

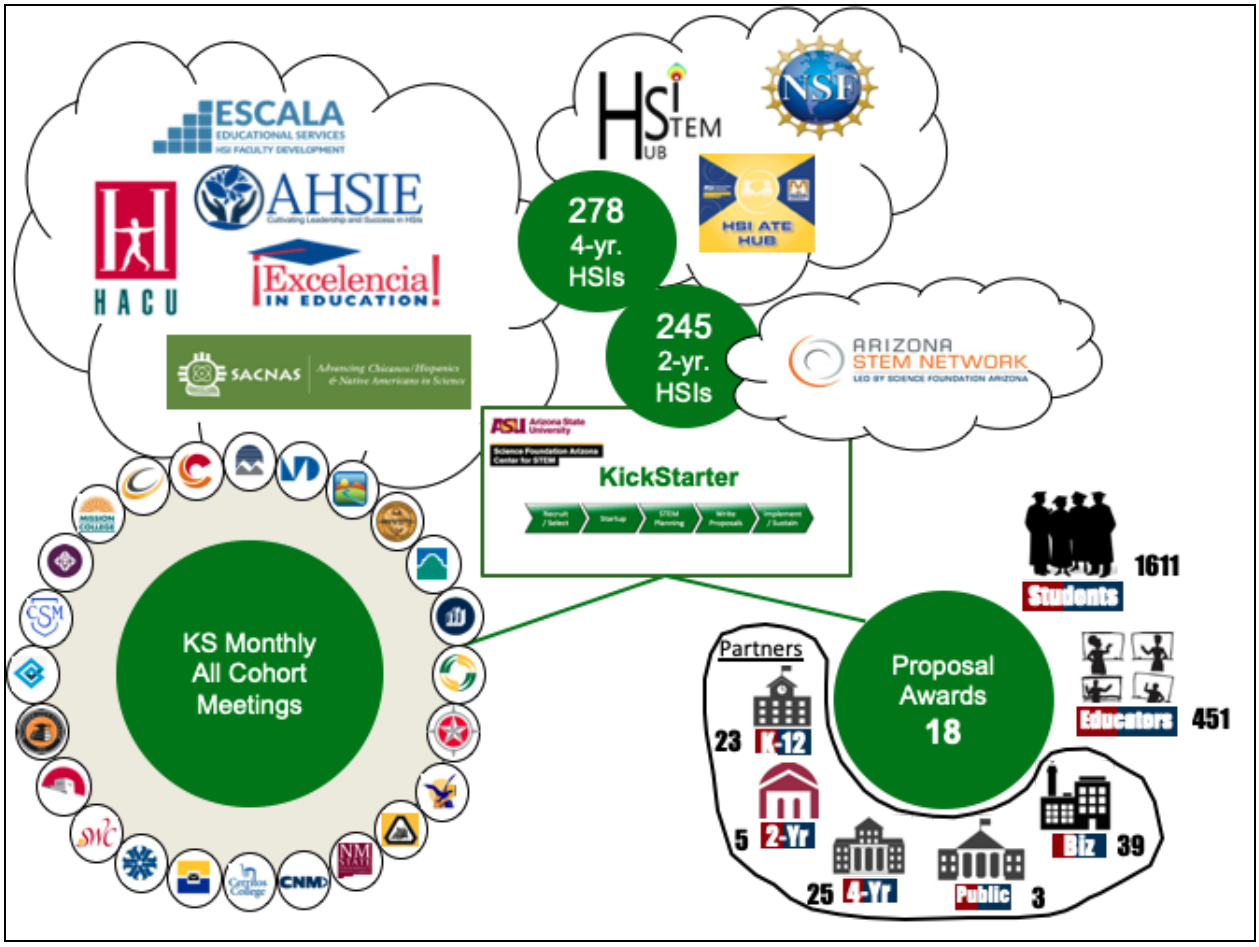

Figure 7: Broader Impacts through Connectedness

Future Research

The STEM Model in Figure 2 is currently being updated to more broadly support institutions working to accelerate Latino student success in STEM. The new **STEM Evidence-based Student Serving (STEM-ESS)** framework will integrate the KickStarter STEM Assessment and processes with Excelencia in Education's Seal of Excelencia (Seal) data, practices and leadership components [9], the four key practices found by Gomez in 4-yr HSIs with equitable outcomes for

Hispanic students in STEM [10], and the National Academy of Science and Medicine's Diversity, Equity, and Inclusion Indicators for Monitoring Undergraduate STEM Education [11].

The STEM-ESS framework and assessment tool will be used in future research projects to assess the current status around serving Latino students in STEM on a per institution basis using diversity-, equity- and inclusion-oriented indicators. Based on needs identified in the assessment, technical assistance will be provided to develop a strategic plan that aligns data, strategies, and evidence-based practices to better serve Latino students in STEM.

Conclusion

The original number of 2-year HSIs expected to participate in KickStarter was twelve. The anticipated outcomes for the KickStarter project were achieved for twelve 2-year HSIs that submitted at least two proposals to NSF during the project period, with at least one of those proposals funded. An NSF award rate of 50% has yielded $10.14M funding to the eighteen participating 2-yr HSIs in Cohorts 1-3.

Broader impacts in STEM at 2-year HSIs continue to be achieved through the NSF awards that these HSIs have earned as an outcome of strategic STEM planning and proposal development technical assistance provided by the NSF-funded KickStarter program.

References

[1] United States Department of Education, “Title V Developing Hispanic-Serving Institutions Program - Definition of an HSI,” 14-Apr-2016. [Online]. Available: https://www2.ed.gov/programs/idueshsi/definition.html. [Accessed: 01-Feb-2019].

[2] HACU, “Hispanic Association of Colleges and Universities - HSIs,” Apr-2017. [Online]. Available: https://www.hacu.net/hacu/HSIs.asp. [Accessed: 31-Aug-2017].

[3] G. A. Garcia, A.-M. Núñez, and V. A. Sansone, “Toward a Multidimensional Conceptual Framework for Understanding ‘Servingness’ in Hispanic-Serving Institutions: A Synthesis of the Research,” *Rev. Educ. Res.*, vol. 89, no. 5, pp. 745–784, Oct. 2019, doi: 10.3102/0034654319864591.

[4] “The Current State of Broader Impacts: Advancing Science and Benefiting Society,” National Alliance for Broader Impacts, 2019.

[5] *America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act*. 2010.

[6] Institute of Education Sciences, DOE and National Science Foundation, “Common Guidelines for Education Research and Development,” Aug. 2013.

[7] C. VanIngen-Dunn, C. Pickering, L. Coyle, A. Grierson, S. Frimer, and V. Fick, “Community College STEM Pathways Guide: A Collaborative Online System for Design and Implementation of STEM Pathway Programs,” in *Collaboration Technologies and Systems (CTS), 2016 International Conference on*, 2016, pp. 158–164.

[8] C. K. Pickering, C. VanIngen-Dunn, A. Grierson, and A. Tanguma, “KickStarter: Providing Hispanic Serving Community Colleges with Technical Assistance to Improve their Federal Funding Competitiveness (Experience),” in *2018 ASEE Annual Conference & Exposition*, 2018.

[9] Excelencia in Education, “Introduction to the Seal of Excelencia,” *Excelencia in Education*, 11-Oct-2018. [Online]. Available: /intro-seal-excelencia. [Accessed: 10-Dec-2018].

[10] A. Gomez, Krystle Cobian, and S. Hurtado, “Improving STEM Degree Attainment Rates: Lessons from Hispanic Serving Institutions,” *Am. Educ. Res. Assoc.*, Apr. 2018.

[11] National Academies of Sciences, Engineering, and Medicine, *Indicators for Monitoring Undergraduate STEM Education*. Washington, D.C.: The National Academies Press, 2018.