The Emerging Impact of Community College Hispanic-Serving Institutions (2-year HSIs) in Educating Technicians in Advanced Technologies – Defining the Opportunities and Addressing the Challenges

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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 (HSIs) and is currently a co-PI on the HSI ATE Resource Hub.

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-seven peer-reviewed publications.

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Elaine L. Craft (Florence-Darlington Technical College, Florence, SC-retired) holds a baccalaureate degree in chemical engineering from the University of Mississippi and a MBA from the University of South Carolina with additional graduate studies in mathematics. Her experience includes working as an engineer in industry as well as teaching and administration at community college and state levels. She served as Director of the South Carolina Advanced Technological (SC ATE) Center of Excellence from 1994-2017, leading initiatives and grant-funded projects to develop educational leadership and increase the quantity, quality and diversity of highly skilled technicians to support the American economy. Currently serving as Principal Investigator, Mentor-Connect: Leadership Development and Outreach for ATE-2 and -3; and Principal Investigator, Collaborative Research-HSI ATE Hub-Diversifying the ATE Program with Hispanic Serving Institutions Using Culturally Inclusive Mentoring and ATE Resources. The SC ATE Center is widely known for innovative initiatives impacting advanced technological education as well as developing and broadly sharing successful educational models and practices in technician education, with a particular emphasis on faculty development in problem-based learning, the first year of study for success in engineering and technology majors, and mentoring educators nationally.

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Caroline VanIngen-Dunn is Director of the Science Foundation Arizona Center for STEM at Arizona State University, providing services for Maximizing the Educational and Economic Impact of STEM. Ms. VanIngen-Dunn is the inspiration behind 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.

Prior to Science Foundation Arizona, 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.

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Introduction

Funded by the National Science Foundation Advanced Technological Education (NSF ATE) Program, the Hispanic-Serving Institution (HSI) ATE Hub is a three-year collaborative project being implemented by Florence Darlington Technical College (FDTC) and Science Foundation Arizona Center for STEM at Arizona State University (SFAz). The NSF ATE Program is a workforce development program within the National Science Foundation that focuses on 2-year colleges and the preparation of technicians in advanced technologies that drive the American economy. Since the ATE Program was created by the Scientific and Advanced Technology Act of 1992, it has consistently been an excellent funding source for community college technician education programs. Of particular interest to ASEE members are the many ATE funding opportunities that can advance engineering technology and related programs that have pathways and articulation agreements for students to transfer to baccalaureate Engineering Technology and Engineering programs.

The HSI ATE Hub collaborative came about when the principal investigators (PIs) of two successful projects already funded by NSF, Mentor-Connect (M-C) and KickStarter (KS), sought to combine complementary but distinct components representing their strengths. The PIs sought to explore whether a combined approach could improve the benefit to community college Hispanic Serving Institutions (2-year HSIs) that were seeking to advance engineering technologies and technician education programs. Now in its seventh year running, M-C has provided mentoring and technical assistance for developing and submitting competitive NSF ATE proposals to STEM faculty at institutions of higher education with 2-year technicians programs [1]–[3].

In its five-year history, KS has also provided technical assistance for developing and submitting proposals to NSF but has engaged 2-year HSIs exclusively. Prior to proposal development, KS facilitates a STEM self-assessment and strengths/gap heatmap discussion with a cross-departmental STEM team at each participating college [4] [5]. KS then facilitates the 2-year HSI STEM team in developing a STEM plan and prioritized research concepts that align with the College Strategy, leverage STEM strengths, and address STEM gaps. This approach by KS has generated a portfolio of potential research funding opportunities for STEM improvements at each 2-year HSI prior to proposal development.

The approach for the HSI ATE Hub is a 2-step intervention that combines the strengths of the KS STEM self-assessment, planning and research concept development by 2-year HSIs with the M-C mentoring, technical assistance, and resources to support ATE proposal development and submission. The HSI ATE Hub connects its 2-year HSIs with resources for faculty development and program improvements for advancements in technician education to better serve Latinx students who are currently underrepresented in STEM. The HSI ATE Hub is currently staged as an ATE Central microsite and features resources from ATE Central (a free online portal and collection of materials and services dedicated to highlighting the work of ATE projects and centers), EvaluATE (the evaluation Support Center for the ATE program), and M-C including ATE-related webinars provided by experts from these three NSF ATE-funded initiatives. The HSI ATE Hub also fosters growth of the HSI ATE Community by bringing together educators

from HSIs who seek to advance technician education at their institution to create a mutually-supportive community.

This paper presents the **need for improving Latinx student success in advanced technology and STEM** and describes why community colleges are well positioned to serve the need. **Goals and objectives** for the HSI ATE Hub to aid 2-year HSIs and **research questions and methods** to assess success in meeting the HSI ATE Hub goals follow. **Results and activities to date** for the three-year collaborative project are then presented and discussed followed by **lessons learned** and **implications for future research**. It is anticipated that this paper will set the stage for a series of annual papers that report new findings over the next three to four years.

Need for Improving Latinx student success in STEM

To remain competitive in the global economy, the United States needs skilled technical workers in occupations requiring a high level of domain-specific technical knowledge to meet the country's anticipated shortage of 5 million technically-credentialed workers [6] [7]. The National Skills Coalition reports that the demand for highly-skilled technical employees with more than high school but less than baccalaureate degrees will remain strong at 48% of the Job Openings in the United States between 2014-2024 [8].

According to federal data, half the students earning a certificate in 2016-17 received credentials from community colleges [9] where the percent enrollment of Latinx students (56%) exceeds that of other post-secondary sectors [10]. If this enrollment rate persists, by 2050 over 25% of all students enrolled will be Latinx [11]. Hispanic Serving Institutions (HSIs) are defined by the United States Department of Education (DOE) as 2-year or 4-year institutions of higher education where Hispanic or Latinx students make up at least 25% of the full-time-equivalent (FTE) total enrollment [12]. HSIs are essential points of access as they already enroll 64% of all Latinx college students [9], and nearly 50% of all 523 HSIs are 2-year HSIs [13]. Census estimates predict Latinxs are the fastest-growing segment reaching 30% of the U.S. population while becoming the youngest group comprising 33.5% of those under 18 years by 2060 [14].

The demand for skilled workers in STEM fields will be met when workers reflect the diversity of the population [15], therefore more students—of all ages and backgrounds—must be brought into community colleges and supported through graduation: a central focus of community colleges everywhere [16] [17]. While Latinx students are as likely as Caucasian students to major in STEM, their completion numbers drop dramatically [18] as Latinx students often have distinct needs that evolved from a history of discrimination in the educational system [19] [20] [21].

HSIs do not by default support Latinx students in attaining equitable outcomes for retention, degree completion and transfers at the organizational level [22] because prior to becoming an HSI, their mission and culture evolved from the history of colonialism that permeates the United States educational system [23] [20] [21]. To improve Latinx student success, HSIs must actively embrace what it means to truly serve Hispanic students. Garcia's theoretical typology of HSI organizational identities suggests that an HSI as defined by the DOE can be further distinguished by the extent to which it focuses on organizational outcomes for Latinx students (i.e. retention,

degree completion, and transfers to the next stage of higher education or the workforce), and the organizational culture that facilitates such outcomes. Garcia's typology identifies four types of HSIs: Latinx-enrolling, Latinx-producing, Latinx- enhancing, and Latinx-serving, where Latinx-serving is the optimal type since it characterizes HSIs that move beyond simply enrolling Latinx students (focused only on the numbers who enter college) to producing equitable outcomes for them and maintaining an organizational culture that is supportive, welcoming, and enhances their educational experiences.

Addressing the STEM education challenges and opportunities associated with the growth of Hispanic Serving Institutions nationally, particularly among 2-year colleges, aligns with diversity priorities of the National Science Foundation and contributes to developing a skilled workforce to meet the country's shortage of technical workers.

Program Goals and Objectives

Financial constraints very often limit advancement and innovation in 2-year colleges. Grant funding is an important strategy for acquiring at least a portion of the necessary funding to move forward, and the National Science Foundation Advanced Technological Education Program (NSF ATE) is designed to support 2-year colleges and advanced technology programs.

The HSI ATE Hub project has two goals: 1) Increase capacity to assist more Community College Hispanic Serving Institutions (2-year HSIs) across the nation in developing competitive ATE proposals and 2) Encourage and elevate 2-year HSIs as the drivers of their community's economic success via technician education.

These goals are supported by the following program objectives:

1. Identify and engage four KS HSIs per year to participate in M-C to prepare ATE proposals.
2. Aggregate and disseminate HSI-relevant resources to complement the existing M-C resource repository.
3. All 2-year HSIs explore and/or utilize HSI ATE Hub HSI-relevant resources during their proposal preparation process.
4. Identify the unique barriers and challenges for 2-year HSIs related to STEM Program Development and Grant Writing, e.g. capacity, culture, and differences from Universities.
5. Convene representatives in the HSI ATE Community to stimulate network building and alliances that support more HSI proposals.
6. Create knowledge that leads to diversification of other projects and centers as they are engaging HSIs and generate recommendations for educators, other ATE Centers and mentoring initiatives, and NSF.
7. Collect data across KS and M-C for study of the HSI ATE Hub Cohorts.

Research Questions and Methods

A mixed methods research approach that integrates qualitative and quantitative data collection and analysis is being used to explore five research questions. Semi-structured interviews and surveys with HSI faculty and administrators are being augmented with quantitative data such as

number of STEM Plans completed, proposals submitted, grants awarded, and demographics at the 2-year HSIs. This information will be used to document Case Studies that capture the development of the faculty and STEM team over time and what factors enhanced or impeded successful ATE proposal development and submittal.

Qualitative and quantitative data from three annual HSI ATE Hub HSI Cohorts and prior KS and M-C 2-year HSIs will be examined to explore the following research questions:

1. What are the unique barriers and challenges for 2-year HSIs related to STEM program development and grant-writing endeavors?
2. How do we build capacity at 2-year HSIs to address these barriers and challenges?
3. How do mentoring efforts/styles need to differ?
4. How do existing ATE resources need to be augmented to better serve 2-year HSIs?
5. How do proposal submission and success rates compare for 2-year HSIs that have gone through the KS STEM planning process but not M-C, through the M-C cohort mentoring process but not KS, and through both interventions?

Results and Activities to Date

This section covers ***baseline data***, the ***2-step intervention*** being used in this project, ***preparation of mentors***, the ***initial HSI ATE Hub Cohort***, ***engagement with the HSI ATE community***, ***cultural relevance training and certification***, ***HSI ATE Hub technology***, and ***resource curation processes***. Additional results from the collaborative will follow as the project is implemented and completed in the coming years.

Baseline Data

The initial baseline data represents features and results from 2-year HSIs who have participated in either M-C or KS, but not both interventions. It provides initial inputs to research question 5, which will be further examined as similar data is collected about the twelve 2-year HSIs who participate in the 2-step intervention with both KS and M-C during the HSI ATE Hub collaborative. Another set of baseline data is the number of ATE awards to HSIs and to PIs and co-PIs in the HSI ATE Community.

For over six years, the M-C team has mentored and assisted teams of 2-year college technician educators in grant proposal writing and leadership growth. A nine-month cycle of mentoring and technical assistance is provided by successful ATE PIs who have been selected and prepared for this work. Prior to HSI ATE Hub, M-C has served 121, 2-year college teams including 246 faculty and 140 grant writers/administrators across 35 states and one US Territory. More than 30 (25%) of the M-C participants were 2-year HSI colleges. M-C's overall participant funding rates are quite high (55 awards of 87 proposals submitted or 63%, 69% for those colleges submitting proposals to the NSF Small Grants for Institutions New to ATE track) but, when considered separately, HSI colleges participating in M-C have not been as successful as the participants overall (55% for HSIs, 69% overall).

For over four years, the KS team has assisted faculty, grants writers and administrators at eighteen 2-year HSIs in a multi-year process that includes STEM planning and research concept development prior to proposal development and submittal to the NSF program that best matches

the intended research. The overall award success rates for KS are 44% across six NSF programs and 27 submittals, and an award rate of 83% for the eight proposals that were submitted in the Small Grants for Institutions New to ATE track.

To date, M-C and KS have collectively served 48 HSIs in nine states, with overall student enrollments ranging from 400 to 40,000 and Hispanic enrollment percentages ranging from 27% to 97%.

The existing HSI ATE Community is comprised of the PIs and co-PIs from HSIs with *active* ATE awards. As of August 2018, the HSI ATE Community baseline consists of 40 PIs and 59 co-PIs at 40 HSIs with start dates ranging primarily from 2016-2018. One award started in 2014. Sixteen of these ATE awards were generated either out of M-C or KS.

The 2-Step Intervention

Figure 1 shows the primary touch points and transitions between the two programs in the collaborative and the 2-year HSI audience being served. It also shows the "HSI ATE Hub" portal that stages resources relevant to the HSI ATE Community. The list on the right side of Figure 1 describes the desired outcomes for the HSI ATE Hub project: 1) Improved technician and related STEM education programs at 2-year HSIs; 2) Increased capacity at 2-year HSIs to prepare and submit competitive grant proposals to the NSF ATE program to improve their programs; 3) Develop a mutually-supportive ATE community of 2-year HSIs; and 4) Enable, encourage and support leadership development and scholarship among project participants.

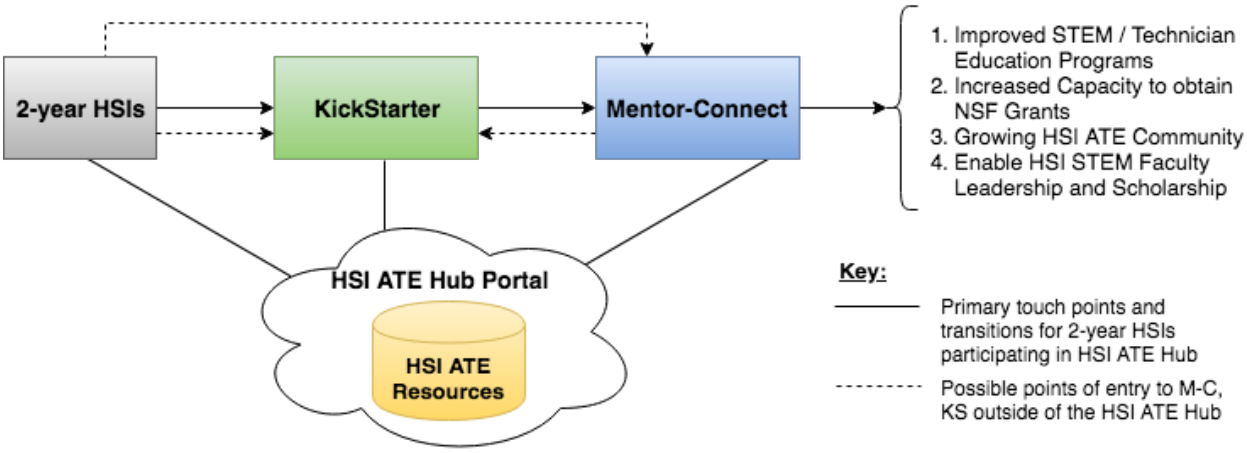

Figure 1: HSI ATE Hub Architecture

Moving from left to right on the diagram, 2-year HSIs participate in the KS Project (Step 1) to develop STEM plans and research concepts. Through the HSI ATE Hub project, a subset of the KS HSIs transfers to M-C at the point where they choose ATE as the funding source that best matches a research concept developed under KS.

Continuing to the right, M-C provides mentoring and technical assistance specific to the ATE Program (Step 2), teaching STEM faculty how to develop projects and prepare competitive grant proposals for ATE. Although not an emphasis of HSI ATE Hub, the dotted lines on the diagram

represent possible points of entry by 2-year HSIs to either KS or M-C that have occurred and will continue to occur.

The last component of the diagram is the HSI ATE Hub portal and resource repository. The portal represents a gathering place that provides support for the broader 2-year HSI ATE and STEM community. The resource repository is a curated collection of resources specific to HSIs and technician education. Formats include documents, webinars, videos, and websites. Both KS and M-C contribute and curate resources for the resource repository. Other resource providers include seminal authors, selected experts from leading STEM centers at HSIs, and the broader HSI and ATE communities. In addition to ATE proposal development aids, the resources provide supporting data, theory, and evidence-based practices that others have used to better serve Latinx students in STEM. Resources are accessed by participating faculty at 2-year HSIs and help them to develop ATE proposals and improve cultural awareness, equity mindset, and skills to provide culturally relevant interventions that enhance the learning of underrepresented students. The faculty at 2-year HSIs are encouraged to contribute resources based on outcomes and successes of ATE projects resulting from the technical assistance and mentoring provided during their participation in the HSI ATE Hub.

Initial internal adjustments to the two programs have been made to implement the first HSI ATE Hub Cohort. These adjustments include added mentoring capacity, expectations management, and tailored technical assistance to the HSI audience. It was also necessary to synchronize the timing and transition between the STEM planning and research concept development activities in KS to ATE proposal development interventions in M-C. These adjustments will be discussed next as accomplishments including lessons learned along the way that are being used to optimize the processes for future Cohorts of 2-year HSIs over the next three years. Specific adjustments include: *identification, selection and preparation of Hispanic/ Latinx ATE PIs as mentors*, successful transitioning of two, 2-year HSIs from KS to M-C to establish the *first HSI ATE Hub Cohort*, *engagements with the HSI ATE Community*, staff member *training and certification on cultural relevance*, and the initial *HSI ATE Hub technology* and *resource curation processes*.

Identification/Selection/Preparation of Hispanic/Latinx ATE PIs as Mentors

To date M-C has engaged two Hispanics in the mentoring process: one mentor and one Mentor Fellow (mentor-in-training). They are the only two mentors who identify as Hispanic in the overall M-C pool of 28 qualified ATE Mentors (7.1%). This level of engagement should grow, but growth will be slow since only 11 of 238 ATE PIs (4.4%) responding to the 2018 ATE Survey identified as Hispanic/Latinx [24]. Thus, the pool of experienced ATE PIs who could become mentors is quite small.

Initial mentors in M-C were selected by the project team leadership based on their experience and reputation in the ATE Program. Experience with and input from the original mentors led to the development of qualifications for becoming an ATE mentor for 2-year colleges pursuing a Small Grant for Institutions New to ATE from the NSF ATE Program. To become a mentor now, one must first be selected for and then complete an internship as a Mentor Fellow. Qualifications for selection as a Mentor Fellow include, but are not limited to, serving as a PI, Co-PI, or other role where the individual made significant contributions as part of a grant project team for

at least two successful ATE projects, experience writing or contributing heavily to the preparation of ATE grant proposals, preparation for mentoring, and willingness and desire to give back to the community. To prepare for becoming a mentor, Mentor Fellows engage in all project activities for both mentees and mentors. Each Mentor Fellow "shadows" an existing Mentor throughout M-C activities for one year to gain first-hand understanding of the difference between the roles of an ATE PI and an ATE Mentor. The project provides numerous aids and technical support throughout the process as knowledge from the more experienced mentor is transferred to mentee teams and to Mentor Fellows. Mentors become masterful in helping mentees learn ATE project and proposal development skills, develop STEM faculty leadership skills, and understand the grant submission process. Mentors learn to balance giving suggestions with letting mentees drive their projects [2].

The HSI ATE Hub leadership team is encouraging ATE PIs from HSIs or ATE PIs who are Hispanic to apply to the Mentor Fellows program. The project is assuming that Hispanic mentors or mentors from HSIs will better understand the culture and context of an HSI and be able to provide the required coaching. At the same time, the mentees may feel more comfortable working with a mentor who has a similar background, shares common characteristics, and understands the situation that the mentee is facing at their institution and as they are developing their ATE proposal. Hispanic mentors are provided with specific guidance regarding resources available to support HSIs, particularly with grant proposal development.

Establishing the Flagship HSI ATE Hub Cohort

All KS HSIs who identify ATE proposal prospects in research concepts developed during KS are encouraged to apply for the next HSI ATE Hub cohort within M-C. At least four of the KS HSIs that submit complete applications to M-C will be accepted each year, for a total of twelve HSIs by the end of the project. The M-C application cycle begins in July/August each year with an orientation webinar that explains M-C and its value in growing leadership, developing ATE proposals, how to apply to M-C, expectations, and due dates. The KS team sent an email to all eligible KS HSIs in early July explaining the HSI ATE Hub opportunity, expectations, and due dates. Eligible KS HSIs were those that did not already have an ATE award or were not submitting an ATE in Fall 2018, and they had an item in their STEM plan that potentially fit the ATE program. Meetings were held with nine eligible HSI's Faculty/KS leads shortly thereafter to answer any questions, and to ensure ATE concept definition was progressing. A KS group meeting across all cohorts was held in early August where the HSI ATE Hub was presented as the main topic. The meeting was recorded so that Cohort members could review it later if they missed the session. Links to the meeting slides and recording were emailed to all KS participants along with links to the September 18, 2018 M-C orientation webinar. Individual meetings continued with eligible HSI's Faculty/KS leads to monitor progress and assist in the ATE concept development and the M-C Application. All communications from M-C about the application cycle were also relayed to KS HSIs.

As of August 2018, based on a communication of the opportunity in the KS cross-cohort meeting, and in separate conversations with the KS team, six colleges had explicitly indicated interest in applying to the M-C 2019 Cohort in October of 2018. By mid-September two colleges disengaged, due to lack of faculty commitment when they discovered that M-C required

two faculty to participate, rather than one faculty and one administrator. Later, two additional KS colleges redirected to pursue the new NSF Hispanic Serving Institution program instead of ATE. Of these, one faculty participant expressed the desire to continue in the KS relationship if they later pursued an ATE, rather than switching to the M-C project, which involved a different set of people and the need to form new relationships. Overall there was a perceived sense that the HSI faculty felt they were too busy to meet the deadline for the M-C 2019 Cohort application in early October 2018, towards pursuing an ATE proposal deadline in October 2019. It is also interesting to note that the two KS colleges who successfully applied and transitioned to M-C also attended the M-C orientation webinar about applying for the M-C 2019 Cohort and its value, whereas none of the other eligible KS colleges attended the M-C orientation webinar, although it was communicated and encouraged that they attend.

In November of 2018 two 2-year HSIs from KS who had completed STEM planning and research concepts for ATE successfully transitioned to M-C for developing and submitting their ATE proposal as the flagship HSI ATE Hub Cohort. Of thirty-two total applicants to M-C, twenty-two were accepted to the M-C 2019 Cohort. During a blind review of applicants, one of the KS HSIs placed at the top of the M-C applicant ranking and the other placed mid-range.

Moving forward, KS plans to set the expectation for transitioning to M-C for ATE proposal development at the beginning of new Cohorts. KS will also more proactively recommend that eligible candidates attend the M-C orientation webinar and have M-C leaders speak at KS Cohort Meeting(s) to describe the opportunity.

In 2018, a pilot was conducted with one KS college participating in the M-C 2018 Cohort. The pilot helped to improve the coordination of timelines between the two programs in the collaborative and as a result the applications for the M-C 2019 Cohort were on time and complete.

HSI ATE Community Engagement

Initial engagements with the HSI ATE Community included a synergy discussion and a breakfast roundtable at the 2018 ATE PI Conference sponsored by the American Association of Community Colleges and NSF. NSF expects PIs with active ATE awards to attend the conference with up to a total of five Co-PIs or others per project. Comparing the Department of Education's list of HSIs with the list of active ATE awards posted on the NSF award search website produced a list of ATE PIs from HSIs who were then personally invited to attend the synergy discussion and the breakfast roundtable.

Approximately 25 people at the synergy session engaged in small group discussions about the demographics of their colleges' students and faculty; the challenges that students at HSIs face and institutional responses to the challenges; and resources that could help to address unmet needs. As people around the tables learned that their institutions shared similar challenges despite their locations in disparate parts of the country and different-sized enrollments, participants shared more details about successes and impediments they had encountered in building STEM technician programs on their campuses.

The groups identified the following strategies for positive project outcomes:

- Bring relevant business and industry people onto advisory teams while planning an initiative.
- Involve advisory team members in internships, mentoring and other experiential programs that introduce students to career paths.
- Make sure students have financial aid in addition to Pell grants as well as non-academic support options to meet basic needs such as food, housing, and transportation.
- Proactively develop a plan to sustain the effort before grant funding ends.

One representative of Palo Alto College in Texas emphasized that identifying students' needs and then providing academic and non-academic services to address them is also critical to their retention and perseverance in programs. In a college survey, Palo Alto students identified their challenges as food insecurity, housing, auto expense emergencies, and stress management. College leaders responded by creating an advocacy center with a food pantry and a closet with business-attire clothing. Leaders staffed the center with a mental health counselor and a caseworker. The caseworker helps students apply for low-cost loans or grants up to $300 for emergency expenses and works with students to address issues that threaten to derail their academic plans.

A representative of Norco College in California shared that workshops that inform school counselors about the growing opportunities in the STEM technical workforce are raising community awareness and boosting enrollment. She also reported that word-of-mouth endorsements from the parents and spouses of people who earned supply chain technician certificates during a Department of Labor program have helped student recruitment at the college.

The issue of STEM faculty members not reflecting the demographics of their student populations emerged in numerous discussions; it was cited by one group as a major problem. Building trust with students can help to alleviate racial, ethnic, and gender gaps. This is key because changing the faculty demographics will take time due to shortages of underrepresented groups in the faculty pipeline and a tenure system that "protects" the current state. Professional development to change faculty's cultural understanding of the student population is an interim alternative that can improve student recruitment, retention and successful completion and/or transfer irrespective of faculty gender and race.

A second community-building activity provided by the HSI ATE Hub project at the 2018 ATE PI Conference was a breakfast roundtable entitled, Resources Specific to HSIs: Help Build Your HSI ATE Hub, that encouraged participants to "*Give a little, get a lot!*" Eleven resources targeted to HSI faculty, administrators, and Latinx students were shared with a full table of seven participants (four faculty, three administrators) from seven institutions. Participants were invited to share a strategy, best practice, or resource with other ATE HSI's. Motivational table Tents prompted participant discussions around "*Help Build the HSI ATE Hub*," "*Share your ATE Successes*, and "*Grow ATE Leadership at HSIs.*" A printed handout was also provided with step-by-step instructions for adding resources to the online resource library to share with the broader HSI ATE Community. In addition to a hearty breakfast, participants benefited from the

shared discussion and new contacts. They agreed that sharing resources in the HSI ATE Hub is a positive step towards growing ATE leadership and community at Hispanic Serving Institutions.

Additional informal encounters were experienced at the ATE PI conference showcase booth, raising awareness of the HSI ATE Hub, interest in applying to M-C and/or KS in the future, and sharing HSI challenges and successes.

Cultural Relevance Training and Certification

In 2018/19, a Latinx co-PI for the HSI ATE Hub completed the ESCALA Educational Services, Inc. certificate in *College Teaching and Learning in HSIs (CTL-HSI)*. ESCALA Educational Services, Inc. is the only professional development organization in the U.S. that focuses solely on providing instructional support and coaching for faculty in Hispanic Serving Institutions [25]. More than 140 HSI faculty have earned the CTL-HSI certificate and several now serve as peer coaches and facilitators in the certificate program. The HSI ATE Hub co-PI earned the CTL-HSI certificate by completing a 27-hour course in a cohort of 65 faculty from 15 HSIs. The course involved immersive participation in a combination of Summer Institute workshops, online programming, and coaching follow-up.

Benefits of the CTL-HSI certification to the co-PI of the HSI ATE Hub project and its HSI participants include: 1) Applying CTL-HSI knowledge to HSI resource identification and review; 2) Offering CTL-HSI related resources and mentorship to faculty participants in the HSI ATE Hub for what to introduce in their classroom to improve inclusivity and cultural awareness of their students; 3) Encouraging intact faculty teams to participate in the full ESCALA curriculum; and, 4) Mentoring faculty who are early adopters of practices learned from the CTL-HSI to lead other faculty at their institution in adopting these evidence-based practices.

HSI ATE Hub Technology

The HSI ATE Hub contains resources that are identified, augmented, and/or created to support the HSI ATE Community. The HSI ATE Hub resource repository supplements the existing M-C online resource library of ATE-grant-specific proposal guidance documents and webinars. To address the distinct needs of Latinx students in STEM, resources representing evidence-based practices and frameworks for cultural inclusivity, as well as faculty development are being included. The HSI ATE Hub also fosters the community-based tradition of ATE with particular emphasis on forming, nurturing, and serving participating 2-year HSIs. The system technology is based on the open source Collection Workflow Integration System (CWIS) and the ATE Central Microsite service, both from the Internet Scout Research Group [26] [27].

HSI ATE Resource Curation Process

Figure 2 shows a high-level process diagram for curating HSI ATE Resources over their complete lifecycle of use. Candidate resources for the HSI ATE Hub are identified by the HSI Community and Researchers, NSF ATE Centers & ATE PIs, HSI ATE Hub Team, Mentors, Selected Experts from Leading STEM Centers at HSIs and the HSI ATE Hub Advisory Council. Resources may be contributed directly by their author/owner or indirectly by people who want to

recommend a resource. Candidate resources are either sent in email to the HSI ATE Hub Team or preferably by completing a simple online "Add Resource" form, for registered users with an account in the M-C resource library.

Once a resource is reviewed and approved, it may or may not be augmented to enhance its applicability to the HSI Resource Hub audience, but all resources are further characterized to improve searchability and finding before being made visible in the HSI ATE Hub resource library. When resources are not accepted, their contributors are notified accordingly. Other activities in the lifecycle of the resource after it has been added to the HSI ATE Hub include dissemination and usage, assessment of usefulness, and managing and maintenance activities such as archiving or removing a resource that has become obsolete.

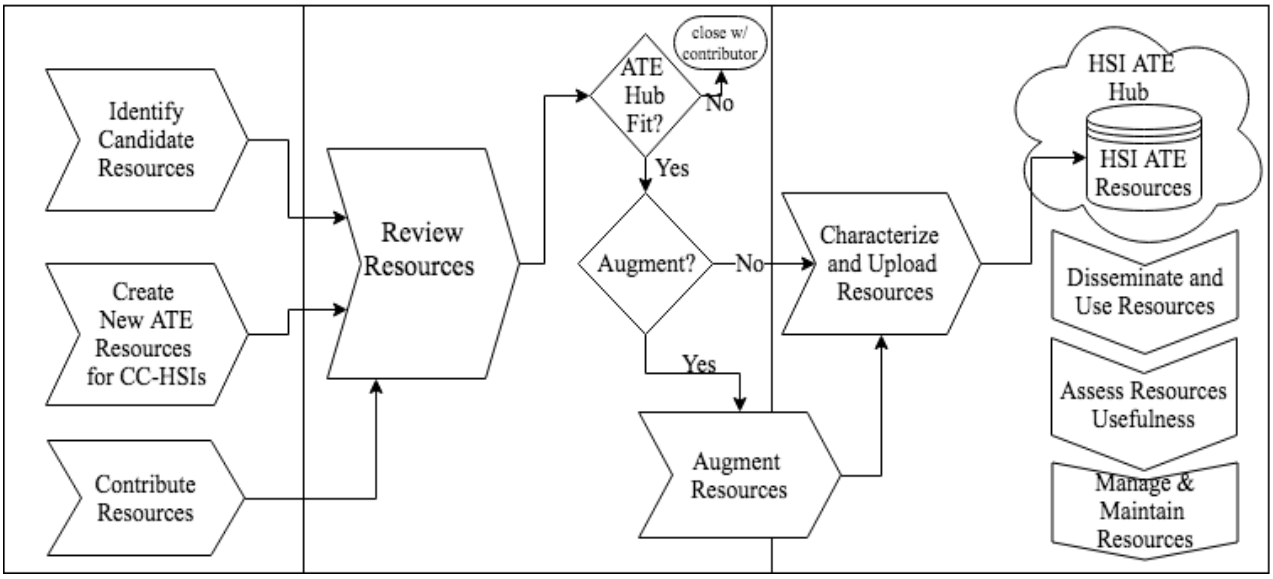

Figure 2: HSI ATE Resource Curation

Four categories of resources of interest to the HSI ATE Hub audience were initially identified to streamline curation of HSI ATE resources:

1. Research papers and scholarly articles with data, theory, challenges, practices about HSIs and/or Latinx in STEM
2. Success stories and/or examples of ATE programs involving HSI, Latinx, or underrepresented groups and institutions
3. Aids for ATE Proposal Development and Award Management
4. HSI Faculty Professional Development to enhance their cultural competence and leadership

Different decision trees were created to review each category as seen in Figure 3.

The resource review form shown in Figure 4 is used to capture notes, decisions, and the outcome of the review process. The form has a table organized by the four resource categories. Each category has links that can be used in deciding the appropriateness of the resource for the intended audience. Category 1 has links to pre-approved publishing sources and seminal authors. Category 2 links to a list of ATE PIs and co-PIs from HSIs, to check whether the

submitter is on the list. The M-C Resource Library and NSF regularly produce quality resources in category 3 to guide ATE proposal development and award management. If evidence indicates that the ATE HSI community could benefit from additional guidance or examples to address challenges that are unique to faculty from HSIs or to the HSIs themselves, an Augmentation Plan will be prepared. The Augmentation Plan captures the current usefulness or value of a resource in category 3, the PI/HSI Challenges, proposed augmentations, along with their usefulness and value, and a feasibility analysis that looks at cost, availability of human resources to perform the augmentation, and whether the program budget can cover the costs. Resources in category 4 are assessed using a list of qualified experts and organizations that provide professional development services to HSI faculty and staff; currently ESCALA Educational Services, Inc. is the primary source for category 4.

To date 18 HSI/Latinx relevant resources have been curated and added to the HSI ATE Hub resource repository. Included are eight peer-reviewed papers and scholarly articles (category 1), five ATE proposal development aids (category 3), and five resources that provide guidance about faculty professional development to enhance cultural competence and leadership (category 4).

Early Lessons Learned

Based on the first year of operation, the HSI ATE Hub project team has learned the following lessons:

- Establish expectations about the 2-step process early in KS step 1 for transitioning to M-C for step 2
- Ensure that the faculty in KS step 1 who have identified a research concept that aligns with ATE understand that they will own the M-C proposal development activities in step 2 but can work with others on their KS STEM Team, e.g. grant writer and administrators to write the ATE proposal.
- Improve the quality of the M-C application / project description for step 2 through planning and data-driven concept development in step 1.
- Adopt an iterative approach to developing a repeatable process. Make sure everyone on the team understands their roles and buys in. Learn and optimize during implementation.

Implications for Future Research

Research on the impact of the 2-step intervention on grant proposal development and success in funding at 2-year HSIs will be ongoing. Successful practices will be identified and reported in future papers as the project progresses. In addition, data on resource use and analysis of most frequently accessed topics will lead to a better understanding of topics that community college HSIs find most relevant and helpful. User surveys will identify gaps in resources and data that need to be developed or captured. Findings will be shared with ATE Central and ATE Centers, and other mentoring programs to increase awareness and potentially to better serve the HSI community.

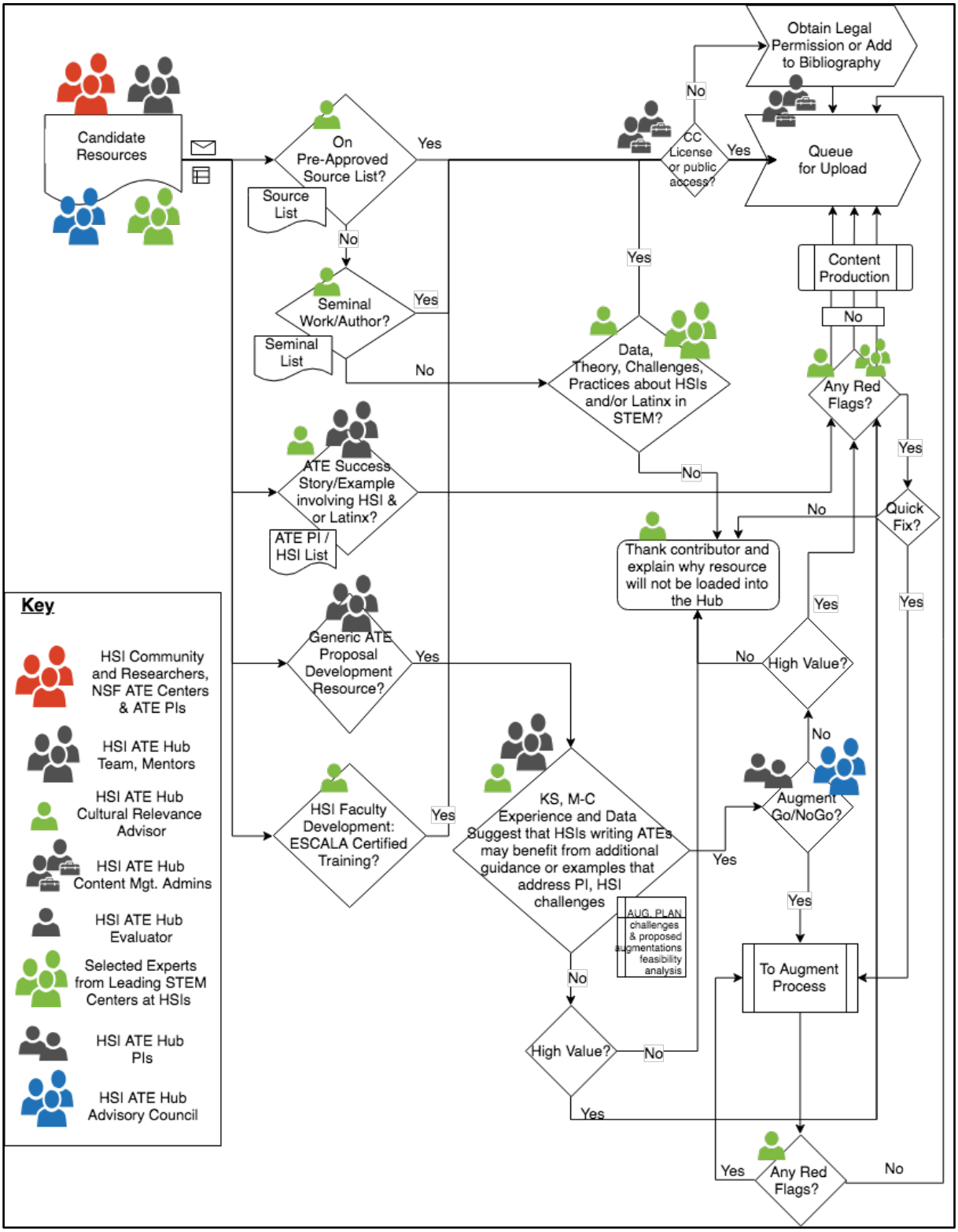

Figure 3: HSI Resource Curation Process

HSI Resource Review Record
<record name/title>

Reviewer Name: _____
Link to Resource:_____ Link to vetting record: _____

Date Resource Added to Resource Library Form: _____
Date Started: _____
Date Completed: _____

Names of Experts consulted during the review, if applicable: _____

Summary of Review and Decision *(add to Resource Form Comments)*:
I recommend / do not recommend this resource for inclusion in the HSI ATE Resource Hub for the following reasons: *Short paragraph w/ rationale and usefulness context*

Keywords: _____

Details: *Mark N/A any items that do not apply*

Criteria	**Decision and Notes**
1. Research Articles, papers, and books	
On Pre-approved Source List?	
Seminal Author?	
Data, Theory, Challenges, Practices about HSIs and/or Latinx in STEM?	
Add context about usefulness of content. When, why, how.	
2. ATE Success Story/ Example w/ HSI/Latinx	
Contributor on list of ATE PIs from HSIs?	
Any red flags?	
3. Generic ATE Resources Already in the System	
Consider Augmenting?	See Guidelines, Augmentation Plan Template, and Example. Initially recommend, then complete Plan Template as appropriate
Any red flags?	
4. HSI Faculty Development	
ESCALA Certified Training, Permission to Use?	
Other Training	

Figure 4: HSI Resource Review Form

References

[1] E. L. Craft, L. Ritchie, and S. Mikolaski, "Leadership Development for Engineering Technology Faculty: Becoming an Educational Leader through Knowledge Generation, Application, and Contribution," 2013.

[2] E. L. Craft, M. Wiejenaike, and D. M. Faber, "Mentoring Faculty for Leadership Development: From IBM to Academia: A Model for Knowledge Transfer Through Mentoring," presented at the 121st ASEE Annual Conference and Exposition, Indianapolis, IN, 2014.

[3] E. L. Craft, K. Wosczyna-Birch, and C. B. Forrest, "Gaining the Competitive Edge in Proposal Submission to the National Science Foundation Advanced Technological Education Program (NSF-ATE): Mentor-Connect," presented at the AAEE, 2017.

[4] 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.

[5] 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.

[6] Committee on the Supply Chain for Middle-Skill Jobs: Education, Training, and Certification Pathways *et al.*, *Building America's Skilled Technical Workforce*. Washington, D.C.: National Academies Press, 2017.

[7] American Association of Community Colleges, *AACC 2018 State of the Association*. 2018.

[8] National Skills Coalition, "Middle-Skill Jobs - United States." National Skills Coalition, 06-Feb-2017.

[9] The National Center for Education Statistics, "AACC analysis of Integrated Postsecondary Education Data System (IPEDS) 2016-17 Completions." U.S. Department of Education, Aug-2018.

[10] J. Ma and S. Baum, "Trends in community colleges: Enrollment, prices, student debt, and completion," *Coll. Board Res. Brief*, 2016.

[11] G. A. Garcia, "Challenging the 'manufactured identity' of Hispanic Serving Institutions (HSIs) Co- Constructing an organizational identity." ULCA Electronic Theses and Dissertations., 2013.

[12] 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].

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

[14] J. Kim-Han, "Leadership and Innovation: Social Networks for Change," The Claremont Graduate University, 2016.

[15] R. Tapia, "Hispanics Wanted in STEM Careers." Richard Tapia Center for Excellence and Equity, 2013.

[16] J. Juszkiewicz, "Trends in Community College Enrollment and Completion Data, 2017," *Wash. DC Am. Assoc. Community Coll.*, p. 10, Nov. 2017.

[17] L. E. Malcom, "Charting the pathways to STEM for latina/o students: The role of

community colleges," *New Dir. Institutional Res.*, vol. 2010, no. 148, pp. 29–40, Dec. 2010.
[18] J. M. Krogstad, "More Hispanics, blacks enrolling in college, but lag in bachelor's degrees," *Pew Research Center*, 24-Apr-2014. .
[19] A.-M. Nunez, G. Crisp, and D. Elizondo, "Mapping Hispanic-Serving Institutions: A Typology of Institutional Diversity," vol. Vol 87, no. 1, Feb. 2016.
[20] V. MacDonald, *Latino Education in the United States: A Narrated History from 1513–2000*. Springer, 2004.
[21] V.-M. Macdonald, J. Botti, and L. H. Clark, "From Visibility to Autonomy: Latinos and Higher Education in the U.S., 1965–2005," *Harv. Educ. Rev.*, vol. 77, no. 4, pp. 474–504, Dec. 2007.
[22] A. Gomez, Krystle Cobian, and S. Hurtado, "Improving STEM Degree Attainment Rates: Lessons from Hispanic Serving Institutions," *Am. Educ. Res. Assoc.*, Apr. 2018.
[23] G. A. Garcia, "Decolonizing Hispanic-Serving Institutions: A Framework for Organizing," *J. Hisp. High. Educ.*, vol. 17, no. 2, pp. 132–147, Apr. 2018.
[24] L. Becho and L. Wingate, "ATE Annual Survey 2018 Report." Kalamazoo, MI: The Evaluation Center, Western Michigan University, Oct-2018.
[25] M. L. Salazar, "Faculty as Change Agents: Why Faculty Development is Crucial for Hispanic-Serving Institutions," 2015.
[26] "CWIS Overview | Internet Scout." [Online]. Available: https://scout.wisc.edu/cwis. [Accessed: 16-Jan-2019].
[27] "ATE Central | Internet Scout." [Online]. Available: https://scout.wisc.edu/ate-central. [Accessed: 16-Jan-2019].