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1. NEED: The project, ‘Oi Ka Na‘auao STEM, will address the following gaps and weaknesses detrimentally affecting the educational, economical, and growth of Native Hawaiian advancement: 1) Underemployment of Native Hawaiians, specifically in the fields of Science, Technology, Engineering, Mathematics & Computer Science (STEM); 2) Underrepresentation of Native Hawaiians in postsecondary education in the STEM fields by enrollment, persistence, and completion; and 3) At-risk and Opportunity youth.

STEM Underemployment

Native Hawaiians are significantly underemployed in the STEM workforce. The National Science Foundation, National Science Board reported the Native Hawaiian population in the Science & Engineering labor force with a college degree in 2015 was 0.2%. This ranks Native Hawaiian or other Pacific Islanders as the most underrepresented ethnic group in the nation, only tied with American Indian or Alaska Native (0.2%) and lower than Black (4.8%) or Hispanic (6%) groups [1]. Strada Education Network reports that only 3% of Hawai‘i’s STEM workforce are Native Hawaiian or Pacific Islanders [2].

A 2014 study by Kamehameha Schools reported that Native Hawaiians had the highest unemployment rate among the major ethnic groups in Hawai‘i - nearly one in ten Native Hawaiians in the civilian labor force was unemployed. Native Hawaiians were overrepresented in the typically lower paying agriculture, labor, and production jobs and underrepresented in the typically higher paying professional and managerial positions, with mean earnings of Native Hawaiians 8.0% less than the statewide average [3].

Underrepresentation in Postsecondary STEM Education

Education is considered to be the great equalizer in the creation of economic opportunity, intergenerational change, and upward mobility. Native Hawaiian families had the lowest mean

income, the highest rate of public assistance usage, and highest rate of poverty among the major ethnic groups in the state of Hawai‘i. Additionally, Native Hawaiian young adults had the lowest college enrollment rates among Hawai‘i’s major ethnic groups [3]. The Project focuses on education in the STEM degrees as advancement in areas of STEM in particular are associated with economic benefits and has been directly correlated to a higher living standard and improved quality of life [4]. For example, the NHEC (2015) reports college degree completion in the fields of science, engineering, and mathematics will increase the average earned income for a Native Hawaiian by \$20,000 per annum more than a Native Hawaiian who has sought a different type of trade/skill and 60.44% of STEM occupations are above the median income in Hawai‘i [5, 2].

The University of Hawai‘i (UH) Strategic Directions 2015-2021: Hawai‘i Graduation Initiative (HGI) focuses on the educational attainment gap through four HGI Action Strategies to increase the number of working age adults with two- or four-year degrees. Specifically, Action Strategy 3 is to, “Anticipate and align curricula with community and workforce needs” in areas such as STEM, data science, sustainability sciences, cybersecurity, and digital media. Table 1.1 indicates that in the STEM fields, Native Hawaiians continue to be underrepresented, comprising only 13% of the STEM undergraduate enrollment for all 10 UH System two- and four-year campuses.

Table 1.1 UH System Undergraduate Enrollment in STEM fields, Fall 2019

CAMPUS	ALL	NH	% NH
UH Mānoa	5131	456	9%
UH Hilo	801	140	17%
UH West O‘ahu	64	16	25%
Hawai‘i CC	186	70	38%
Honolulu CC	408	74	18%
Kapi‘olani CC	560	84	15%
Kaua‘i CC	131	29	22%

Leeward CC	924	187	20%
Maui College	226	46	20%
Windward CC	135	42	32%
TOTAL	8566	1145	13%

UH System Institutional Research & Analysis Office, Fall 2019 [6]

As shown in Table 1.2, 9% of UH Mānoa’s (UHM) Information & Computer Science department are Native Hawaiian (52 of 548 undergraduates). The UHM’s College of Engineering Native Hawaiian undergraduate enrollment is slightly higher at 13%, but is the same as overall Native Hawaiian STEM enrollment for the UH System.

Table 1.2 UH Manoa Undergraduate Enrollment, Fall 2019

CAMPUS	ALL	NH	% NH
UH Mānoa	5131	456	9%
College of Engineering	1377	175	13%
Computer Science	548	52	9%

UH System Institutional Research & Analysis Office, Fall 2019 [6]

67% of all new STEM jobs in the nation are in computing and there are currently 1,272 open computing jobs in Hawai‘i [7]. Thus the project seeks address the underrepresentation of Native Hawaiians in STEM higher education, including computer science, with regards to access, enrollment, and completion.

At-Risk and Opportunity Youth

The ‘Oi Ka Na‘auao STEM project design will deliver outreach, community engagement, K-12 opportunities, and utilize academic and community partners to address the target population referred to in Kamehameha School’s 2014 Native Hawaiian Educational Assessment as, “opportunity youth, sometimes referred to as idle youth or disconnected youth and typically characterized by being neither employed nor in school” (246). The assessment further states that opportunity youth represent a serious challenge to the well-being of themselves and their

families, as well as the economic challenge to their communities through health, crime-related, and other “social and tax-payer burdens.” The Annie E. Casey Foundation: Kids Count Data Center 2014 report estimated opportunity youth ages 16-19 represented 7% of the age population, however the statistics for underrepresented groups were even higher (with Black/African American youth at 11% and Native American youth at 13%) [8]. Data from the U.S. Census Bureau suggest that Native Hawaiian youth in the 16-24 age range represent a significantly higher percentage of opportunity youth who are neither employed nor in school at 20.1%, as compared to opportunity youth statewide at 14% [2]. Therefore, Native Hawaiian youth, with a particular focus on at-risk opportunity youth, can greatly benefit from engaging in educational recruitment, retention, and workforce training opportunities.

2. PROJECT DESIGN

“‘Oī Ka Na‘auao”: derived from ‘ōlelo no‘eau 328, “E lawe i ke a‘o a mālama, a e ‘oī mau ka na‘auao” [9]. This Hawaiian proverb translates into “He who takes his teachings and applies them, increases his knowledge” and provides the backbone for the project’s activities and design. ‘Oī Ka Na‘auao STEM focuses on the following components from Kindergarten-Postsecondary education, creating a successful pathway for Native Hawaiian students pursuing STEM academia and workforce: a) STEM Engagement; b) Bridge to Undergraduate Success; c) Retention & Experiential Learning; and d) Cultural-Based Learning & Indigenous Hawaiian Knowledge. The Native Hawaiian Science & Engineering Mentorship Program (NHSEMP) at the UHM College of Engineering will administer and oversee senior personnel to collaborate on the proposed activities that provide opportunities at each level of the STEM educational pathway. The conceptual model and rationale guiding the objectives, activities, and potential short-, medium-, and long-term outcomes is presented on page 14. The relationships between the

components and outcomes shown in the ‘Oi Ka Na‘auao STEM conceptual model is further discussed in this section.

Native Hawaiian students do not often pursue a degree in the STEM fields because they often lack exposure to and awareness of these opportunities. Additionally, preparation and guidance for postsecondary education in the STEM fields is not readily available to underrepresented and at-risk opportunity youth, many of whom will be/are the first in their families to pursue a college education.

The proposed K-12 initiatives offer students, families, and community members the opportunity to get involved in hands-on learning and gain access to information about STEM fields, college-readiness, and academic support that is crucial to a successful pathway to postsecondary education. The Undergraduate Scholars program offers experiential learning by providing student support, research internships, and mentorship opportunities for Native Hawaiian University and community college STEM students, including non-traditional students.

STEM ENGAGEMENT: K-5th Grades

The project will work with Nā Pua No‘eau (NPN) Statewide outreach centers to offer STEM Tech Days and STEM College Explorations. *Tech Days* are half-day events filled with hands-on STEM activities for students, their ‘ohana (family), and the community and are designed to foster awareness and understanding of the STEM fields and postsecondary opportunities through engagement and investigative hands-on workshops. Native Hawaiian college students help to create and lead these workshops, providing mentorship and leadership opportunities as well as serving as role models for the younger children by sharing personal stories and successes along their academic journeys. *Tech Days* are primarily focused on the elementary school level, but these events are open for students in grades K-12; ‘ohana and

community members are also highly encouraged to participate. Allaire found that for first-generation Native Hawaiian students, many emphasized the importance of parents “being there” and “being present” in their lives as a major supportive influence [4]. The project will host two Tech Days each year.

‘Oi Ka Na‘auao STEM will invite students from Lana‘i Island and Molokai Island to the UHM campus through *STEM College Explorations*: a weekend residential opportunity in conjunction with *Tech Days*. *College Explorations* will provide an additional opportunity for students from Statewide rural areas to visit a University campus, tour STEM labs, and meet students & guest speakers from various Native Hawaiian organizations and STEM departments. Neighbor island students will reside in on-campus dorms overnight in order to participate in *Tech Day* events the following day.

Rationale - Tai, Liu, Maltese, and Fan suggest the likelihood that life experiences before eighth grade and in elementary school may have an important impact on future plans and to attract students to the sciences and engineering, we should pay close attention to children’s early exposure to science at the middle and even younger grades [10]. Family participation is also encouraged; if parents are informed about the benefits of higher education and the process of applying for college, they can gain more comfort in the decision about their child going to college [11]. ‘Oi Ka Na‘auao STEM anticipates that these proposed activities will foster excitement for and increase awareness and level of comfort within the STEM fields for 150 students from the Islands of Lana‘i, Molokai, O‘ahu and other Statewide locations.

BRIDGE TO UNDERGRADUATE SUCCESS: 6th-11th Grades

NPN will coordinate *STEM Summer Series (S³)*: summer residential programs hosted on the UHM campus with strong foundations in cultural values, identity, and practices for Native

Hawaiian students in grades 6-11. 75 students Statewide will learn about the STEM fields through hands-on and place-based curricula that utilizes the engineering design process and scientific discovery. Specific tracks will be designated for science, engineering, and computer science and will also provide an introduction to skills training and professional development. Students will explore a University campus, meet various Native Hawaiian and STEM organizations, and learn about college opportunities. *S³* will culminate in a ho‘ike (exhibition) where students will present their STEM projects and cultural activities to their ‘ohana and community members. ‘Oi Ka Na‘auao STEM will provide this opportunity to students Statewide and from rural areas where opportunities for hands-on STEM enrichment are limited.

OKN Skills Academies are multi-week summer programs for high school sophomore- and junior-level students to investigate the STEM fields. Pathways offered will be in 1) computer science or 2) engineering & science. The *CS Skills Academy* will utilize concepts such as the Computer Science Principles for All (CSP4ALL) framework: more than a traditional introduction to programming, it is a rigorous, engaging, and approachable course that explores many of the foundational ideas of computing so all students understand how these concepts are transforming the world we live in [12]. The program will provide technical & 21st century skills and incorporate the following principles through weekly hands-on learning projects: algorithms, website, internet, innovation impact, data & abstraction, and programming. Development workshops will also be offered to provide college preparation, employment opportunities, and networking with professionals in the computer science field. The *STEM Skills Academy* will provide hands-on learning in industry. Every week, a new cohort of students will be introduced to STEM companies and gain firsthand knowledge of STEM professions. Students will be housed at the company, follow a typical work week schedule, and will be provided with cross-

training from industry professionals such as budgeting, design, marketing, and program management. Additionally, students will learn technical skills such as 3D printing and architectural design and develop interpersonal skills through problem-solving, group work, and public speaking. Each week will culminate with a site visit to a current company project to observe the project's life cycle. HDR Engineering's Honolulu location will be the first industry site (see Letter of Support in Section 6: Other Attachments); 'Oi Ka Na'auao STEM intends to invite additional industry partners every grant year and serve up to 40 OKN Skills Academies students.

Rationale - Nestor-Baker and Kerka (as cited in Kendricks, 2011) defined seven challenges regarding recruitment and retention of underrepresented students: lack of academic preparation, low confidence levels, the imposter syndrome (e.g., everyone understands but me), unrealistic expectations (e.g., passing with little effort), lack of community, environmental alienation, and financial need [13]. *S³* and *OKN Skills Academies* are important stepping stones through the STEM pathway to additional Project services & STEM programs and will address these challenges through experiential learning with academic and professional mentors, a dedicated network of peers and community, and cultural identity.

BRIDGE TO UNDERGRADUATE SUCCESS: Pre-College

Freshman Bridge is a 10-week summer program for incoming college first-year Native Hawaiian students interested in studying the STEM fields. *Freshman Bridge* addresses the most important barriers for traditional first-year students: transition from high school to college, level of mathematics preparation, and financial burden. The program provides intensive University-level mathematics preparation, faculty-driven STEM research internships, and professional development opportunities to 15 participants each summer. Students will also attend industry site

visits, participate in cultural workshops, and present a formal research presentation. Bridge students will be co-enrolled in University required courses, attend mandatory two-hour recitation sessions five days/week led by Bridge Mentors (upperclassman peer mentors who have successfully completed the calculus sequence required by UH STEM departments), and perform 15-20 hours of research each week.

Rationale - The strongest and most consistent predictor of changes in students' interest in science majors or careers is the students' entering level of mathematical and academic competency [14]. For the graduating class of 2018, ACT determined that 5,753 of 1,914,817 students tested were Native Hawaiian or Pacific Islander (0.3%), the lowest % of race groups identified and only 32% of Native Hawaiian or Pacific Islander students were identified as meeting 3 or 4 College Readiness benchmarks by Core College Curriculum Status [15]. Existing studies also suggest successful bridge programs provide personalized attention for students and establish trusting relationships with them; provide adult mentors/counselors/advisors; facilitate peer support; and provide long-term and strategically timed interventions that coincide with the timing of college-readiness steps such as curriculum choices, college application and financial aid processes, and college survival skills [11]. Upon completion of Freshman Bridge, students will be equipped to start their first year of college, have earned 5+ college credits and an additional 100 hours of math course preparation and study, have learned how to navigate the University campus and its resources, and will begin to create their own academic community through interaction with peers, current University students, and faculty. Bridge students will also have the opportunity to participate in the Undergraduate Scholars program for continued student support.

College Prep Workshops will be offered for families of student participants at STEM Tech Days & College Explorations and Freshman Bridge and will offer information about

college preparation, strategies for college success, and opportunities for employment in the STEM fields. Topics of interest will focus on: financial aid & scholarships, academic timelines, and student support services at the University. In collaboration with the University, *Orientation Workshops* will be held 1-2 times per year to provide resources for parents of traditional incoming first-year students as well as a Q&A session for parents to ask questions or raise concerns. Areas of focus will include: course registration & advising, first-year student & educational resources, and STEM employment opportunities.

Rationale - In a study performed by Allaire, students with no familial background in higher education face a steeper learning curve in adjusting to life at the university level. Their families were unprepared to support them logistically, mentally, or emotionally for college [4]. However, results from a multiyear longitudinal study by Harackiewicz suggest that a relatively modest intervention with parents can influence important academic outcomes for their teens [16].

UNIVERSITY RETENTION and WORK-BASED LEARNING

A strong academic community and continued student engagement are important and vital to the success of Native Hawaiian students. The *Undergraduate Scholars Program* is centered around providing opportunities to increase University retention and placement in STEM industry or graduate school of Native Hawaiian students and will provide a suite of activities focused in the following four areas:

<p><u>Academic Support:</u></p> <ul style="list-style-type: none"> ● Freshman learning communities; ● Tutoring for gateway STEM courses; ● Mandatory advising each semester; ● Peer mentor support; ● Research internships. 	<p><u>Financial Support:</u></p> <ul style="list-style-type: none"> ● Educational awards; ● STEM travel & presentations; ● Scholarship advising & budgeting; ● Tutor, Mentor, Research opportunities.
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Social Interaction:

- Student general meetings;
- ‘Oi Ka Na‘auao (OKN) Professional Development & Cultural workshops;
- STEM conferences, hackathons, & networking.

Service:

- Student projects;
- STEM outreach events;
- Service to the community.

First-year STEM students will have the opportunity to register for Science or Engineering University *Freshman Learning Communities (LCs)*. New LCs will be created specifically for students interested in studying Computer Science and will provide degree- and graduation-required courses (such as Calculus, Chemistry, Introduction to Computer Science, Integrating Seminar, Hawaiian Studies). LCs provide additional student support and academic resources for first-year students. Recitation sessions for the LC STEM courses are integrated into the course curriculum and led by upperclassman Undergraduate Scholars.

‘Oi Ka Na‘auao STEM upperclassmen will serve as Peer Mentors for the first- and second-year students and will provide mentoring, tutoring, and other resources for continued student success. All ‘Oi Ka Na‘auao STEM students have the opportunity to participate in STEM outreach events, which often include creating hands-on activities, leading workshops, and speaking about their college experiences. Additionally, ‘Oi Ka Na‘auao STEM students can serve as kumu (teachers) or Peer Mentors for the K-12 Tech Days & College Explorations, STEM Summer Series, and Freshman Bridge programs.

Native Hawaiians continue to have limited access to workforce training and thus, are highly underrepresented in and prepared for the STEM industry. Undergraduate research experiences and industry internships are vital to the success and increase in percentage of Native Hawaiian students entering the STEM workforce or graduate school. Students gain technical

skills, receive mentorship from faculty, and connect with leaders in industry and community. The *Sophomore Success Teaching and Research Action Clusters (SS TRACs)* academic and summer programs will provide accelerated learning and skills training for 20 mid-level UH undergraduate and transfer students every grant year. All SS TRACs participants will be paired with a University faculty, STEM company, or State/Federal agencies to engage in a STEM research project or internship. Summer participants will also enroll in degree-required STEM courses for credit, attend weekly advising, participate in a formal research presentation, attend OKN professional development & cultural workshops, and site visits.

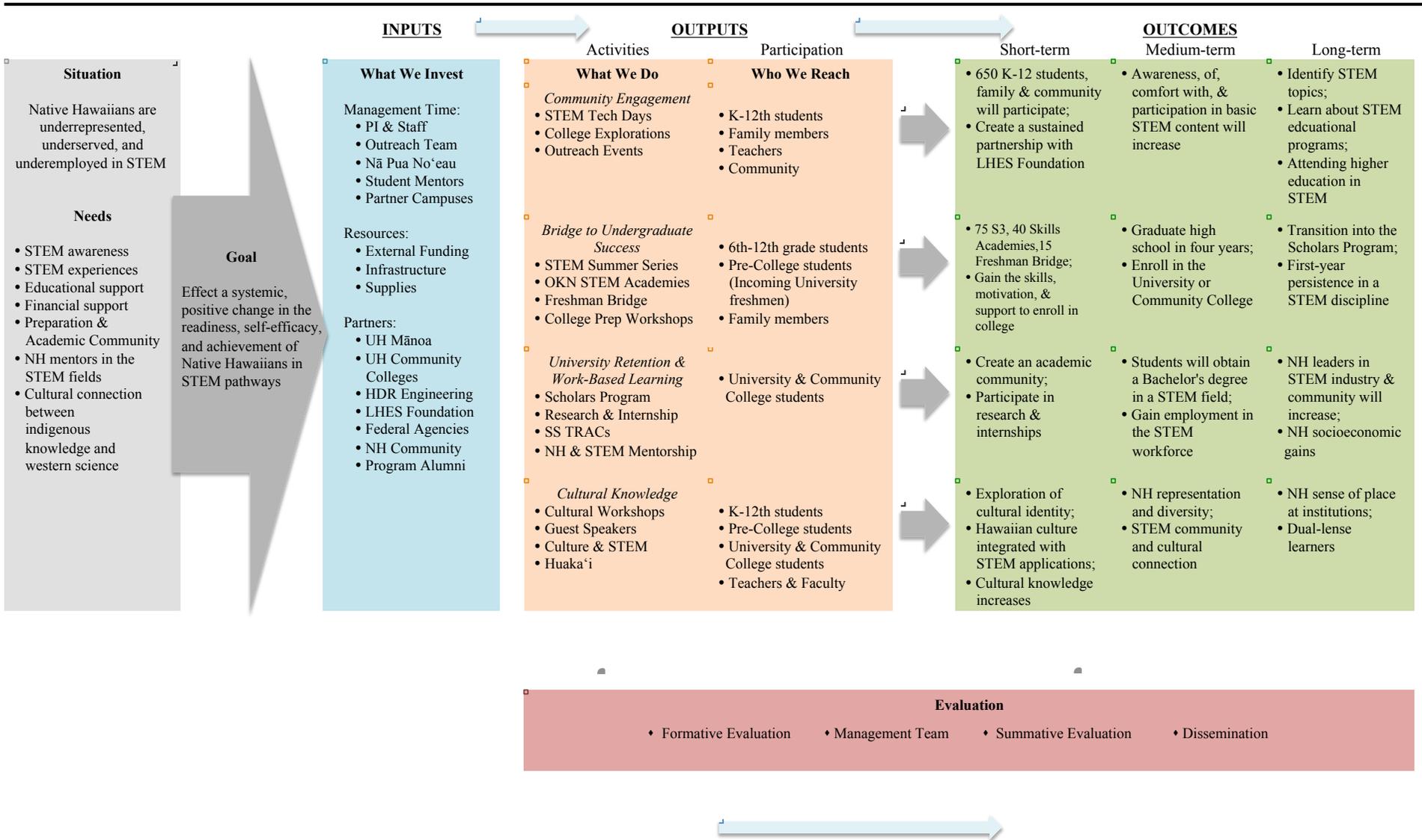
Additional resources for undergraduate students include workforce mentorship and peer & professional networking through NHSEMP's STEM Resource Center, indigenous STEM societies, and NHSEMP alumni. The Project will directly serve 100 students at UHM and 10 students each at Honolulu CC, Kapi'olani CC, and Leeward CC each year. 'Oi Ka Na'auao STEM intends to offer indirect support to STEM students at other UH campuses Statewide throughout the life of the grant.

Rationale - Studies have found evidence that research experiences help students confirm, strengthen, and clarify their interest in STEM careers, as well as prepare them for graduate school endeavors [17]. Additionally, students who participate in research were not only better prepared but were also more confident in their abilities as scientists [18]. Lopatto, Seymour & Hewitt (as cited in Pender, 2011) also found that research increases students' motivation to learn and provides them with better strategies to become active learners, which is especially important for minority students who are more likely to face academic and cultural isolation and low expectations for performance [17].

CULTURE-BASED LEARNING and INDIGENOUS KNOWLEDGE

Many Native Hawaiian University students lack Native Hawaiian self-concept and identity as a result of cultural loss due to historical trauma. Exposure to Native Hawaiian knowledge through values, culture, and practices will be infused into all programmatic activities and will provide the platform for students to investigate and revitalize their Native Hawaiian identity. *STEM Tech Days & College Explorations* will connect Native Hawaiian knowledge with introductory modern STEM concepts. *STEM Summer Series and STEM Skills Academies* participants will expand their understanding of Native Hawaiian history and culture through traditional hula (dance), oli (chants in Native Hawaiian language), and mo'olelo (legends) and will investigate the role of culture and STEM. *Freshman Bridge* participants will enroll in a formal University-level Hawaiian Studies course for college credit. *Freshman Bridge, Sophomore Success, and Undergraduate Scholars Program* students will participate in the 'Oi Ka Na'auao Workshop Series (OKN) during the summer and academic year. OKN Workshops will be designed to integrate STEM and cultural knowledge to enhance the learning and application of both traditional and modern techniques, practices, and thought. Undergraduate students will also practice cultural protocol through OKN Workshops, monthly service projects, and annual huaka'i (Statewide visits to significant cultural sites) in partnership with NH academic & community organizations, leaders, and sites. Increasing Native Hawaiian self-concept of 'Oi Ka Na'auao STEM students will aid in the development of culturally-sensitive University STEM practices and workforce.

Figure 1. Logic Model - 'Oi Ka Na'auao STEM Pathways for Success



3. PROJECT SERVICES

‘Oī Ka Na‘auao STEM is designed to ensure equal access and treatment for eligible Project participants who are members of groups that have been traditionally underrepresented based on race, color, national origin, gender, age, or disability. As the main service provider, the University of Hawai‘i follows written procedures and policy of nondiscrimination on the basis of physical and mental disability. UH strives to fulfill its legal obligations with facilities in compliance with the American Disabilities Act (ADA), Section 504 of the Rehabilitation Act, and other applicable rules and regulations such as: ADA coordinators for employees/students at each campus; Disability support services such as KOKUA program; Assistive technology resources; Transportation assistance (KOKUA Van, Disability Parking Permit, ADA-compliant Rainbow Shuttle, etc.); and Providing reasonable accommodation. Accommodations may include audio recordings of printed material, braille transcription, E-text conversion, computer access with or without assistive technology software, time extension, note taking, and other provisions. The services provided reflect up-to-date knowledge from research and effective practice.

The primary focus of ‘Oī Ka Na‘auao STEM is to address the participation of Native Hawaiians in STEM postsecondary education and STEM workforce, a group that has been traditionally underrepresented and underemployed in these fields. Thus, the structure, programmatic activities, and implementation of the project are designed to encourage the highest participation of Native Hawaiians. Participants of the ‘Oī Ka Na‘auao STEM Program will be recruited and provided opportunities via best practice methods. A collaborative approach based on long-standing partnerships, a longitudinal STEM pathway to postsecondary education, reducing barriers to access and participation, and promoting opportunity for cultural identity and

community will make the greatest impact on Native Hawaiian students and at-risk opportunity youth.

NPN Center for Gifted & Talented Native Hawaiian Children has a Statewide network of educators, counselors, and community partners that recruit and provide access for Native Hawaiian students and ‘ohana to participate in culture-based educational enrichment programs. Building trust and connection in STEM for Native Hawaiian students begins with family and community and is an important factor in supporting education, college-readiness, and career pathways. NPN has been successful at providing enrichment opportunities to the Native Hawaiian community for 30 years and has partnered with the PI’s Native Hawaiian Science & Engineering Mentorship Program (NHSEMP) to promote STEM for K-12 and ‘ohana for over 15 years. Project partners, Honolulu Community College (HonCC), Kapi‘olani Community College (KapCC), Leeward Community College (LCC), and UH Mānoa (UHM), each have strong Native Hawaiian student support programs to provide additional assistance and opportunities. Po‘i Nā Nalu at HonCC, KCC STEM at KapCC, the Native Hawaiian Center at Pu‘uloa at LCC, and NHSEMP at UHM provide tutoring services, academic advising, mentoring, student projects, transfer pathway programs, and student community. The ‘Oi Ka Na‘auao STEM partnership will also include community education organizations on Lana‘i Island (LHES Foundation) and on Molokai Island that will promote, recruit, and connect Native Hawaiian K-12 students in rural, neighbor island communities to STEM & Computer Science activities on O‘ahu and their respective islands.

A longitudinal model for students to progress in STEM from Kindergarten to postsecondary will eliminate gaps in the pathway and provide continued access and support from a community that participants have become familiar with. David Evans, executive director of the

National Science Teachers Association, expressed that, "young kids are, all on their own, completely committed to being excited and interested in STEM topics. The sad thing is, if there isn't good support in schools, they lose that by the time they get to middle school" [19]. 'Oi Ka Na'auao STEM's proposed activities follow best practices as demonstrated by the successful Alaska Native Science & Engineering Program (ANSEP) in Alaska and will provide opportunities from Kindergarten to postsecondary to placement in the STEM workforce or graduate school. Activities are created to challenge the student while providing mentorship and guidance from college and graduate students, staff, and faculty.

Targeting Native Hawaiian postsecondary students at UH may have the greatest impact on the Native Hawaiian community with limited resources because UH has the population, networks, and systems in place to make long-lasting potential improvements. UH is the primary pathway to postsecondary education in Hawai'i, with 83.7% in-state student enrollment and 23% Native Hawaiian student enrollment [6]. UH policy also provides in-state tuition to Native Hawaiian non-Hawai'i residents, which may attract these students to pursue postsecondary education at UH. The UH System provides access to higher education through Education Outreach Centers on the more remote islands of Lana'i, Molokai, and rural areas of Maui. UH Maui College offers classes that are taught on-site, and via cable, interactive TV, and the internet. 'Oi Ka Na'auao STEM will also utilize the following practices in order to minimize barriers for participation and retention: use of common scholarship applications (a student can submit one application and be eligible for 40+ scholarships) and scholarship resource workshops; communication via print, electronic, and social media; and increased individual advising or counseling meetings for all University participants.

In conjunction with academic success lies the importance of cultural identity and indigenous knowledge. When asked if students thought learning about their culture would assist them in being successful in college, a study by Hokoana suggests that Native Hawaiian students do perceive culture to be an important determinant of college success [20]. Thus, ‘Oi Ka Na‘auao STEM incorporates indigenous knowledge and cultural awareness into all proposed activities as described in Section 2: Project Design.

4. PROJECT PERSONNEL

The success of a program begins with a qualified and effective management team. The ‘Oi Ka Na‘auao STEM leadership team consists of six senior personnel who will support and implement project activities on day one of the award.

Table 4.1 ‘Oi Ka Na‘auao STEM Leadership Team

TITLE	NAME	UNIT
Project Director	[REDACTED]	UH Mānoa-NHSEMP, College of Engineering
Senior Personnel	[REDACTED]	UH Mānoa, Information & Computer Sciences
Senior Personnel	[REDACTED]	Nā Pua No‘eau
Key Personnel	[REDACTED]	Honolulu CC, Po‘i Nā Nalu CTE Program
Key Personnel	[REDACTED]	Kapi‘olani CC, KCC STEM
Key Personnel	[REDACTED]	Leeward CC

50% of the team are Native Hawaiian and all team members have been directly involved in administration of University student support & professional services, advising, have sustained

strong working relationships, and are committed to serving our Native Hawaiian and STEM communities. [REDACTED] is the Project Director for this team and program director for NHSEMP; [REDACTED] is the program coordinator for Po‘i Nā Nalu Career & Technical Education Program at Honolulu Community College; [REDACTED] is a physics faculty and program director of the KCC STEM program at Kapi‘olani Community College; and [REDACTED] is a STEM college counselor at Leeward Community College. Resumes for all Project team members are included in Section 6: Other Attachments.

Project Director

[REDACTED] will serve as Project Director (PD) and Principal Investigator and will have ultimate responsibility for the overall project direction, execution, and management of the project. [REDACTED] is a Native Hawaiian who has over 13 years of experience working directly with Native Hawaiian and underrepresented students in the STEM fields, managing overall administration and coordination of Native Hawaiian student services & scholarship programs. She has also designed and directed bridge programs since 2006; provided advising & mentoring services to undergraduate and graduate Native Hawaiian STEM students, managed procurement & fiscal activities; created partnerships with federal agencies & STEM industry, coordinated large outreach events Statewide; and assisted with coordination & implementation for first-year Learning Communities and an Introduction to Engineering freshman course. [REDACTED] has a full-time appointment as Educational Specialist with UH.

Personnel

The PD and senior personnel are UH and State employees and are not charging their time to ED/the project per UH personnel regulations. The goals and activities of the proposed project

coincide with the duties and responsibilities of the project team as employees. Therefore, no funds are requested for members of the leadership team.

One full-time (1.0 FTE) Project Coordinator position and two half-time (0.50 FTE) Graduate Assistant positions are requested to implement the overall coordination of the project. The full-time Project Coordinator will be responsible for the day-to-day administration and coordination including student management, procurement, coordinating student participation at outreach events, recruitment for summer programs, administering research and professional internships, and providing advising and mentoring for undergraduate participants. One Graduate Assistant will support the Project Coordinator and the Project Director in operations. During the summer terms, this position will be responsible for oversight and day-to-day operations of the STEM Skills, Freshman Bridge, and TRACs programs. A second Graduate Assistant will coordinate efforts between the overall team and respective campuses to provide in-house evaluation and database management for all project services, objectives, and outcomes.

The process (position descriptions and advertisements) for the project coordinator and graduate assistants encourages applicants from diverse and traditionally underrepresented backgrounds who will provide experience in Native Hawaiian culture and values, knowledge of STEM fields and needs of Native Hawaiian & underrepresented University students, and strong communication, organization, and management skills. The HR team will ensure wide dissemination of the project coordinator position to organizations, college campuses, and community programs that employ and serve persons who are members of groups that have been traditionally underrepresented. As staff members on the ground in the Natural Science and Engineering colleges, the project team can directly encourage high-quality candidates from diverse backgrounds to apply. It is noted that the UH System is an Equal Employment

Opportunity and Affirmative Action Institution committed to diversity of their faculty/staff, administration, and student populations.

██████████ will help to coordinate and oversee the program activities focused on ICS outreach, recruitment, and retention. ██████████ has a full-time appointment as Assistant Faculty Specialist in the Information & Computer Science (ICS) Department at UH Mānoa, College of Natural Sciences. In his position, ██████████ has provided undergraduate & graduate student advising, developed & led outreach programs to inform potential students about the ICS department, and has participated as a Faculty Ambassador for the University. He also mentors upper-class student projects (ICS 499) that focus on cybersecurity implementations and education and is helping to coordinate efforts to incorporate CSP4ALL programs in our K-12 schools.

██████████ Outreach Director, will manage and coordinate the STEM Summer Series (S³) for middle & high school students and assist with coordination for the STEM Tech Days & College Explorations. ██████████ has a full-time appointment as Program Director for Nā Pua No‘eau Center for Gifted and Talented Native Hawaiian Children. ██████████ will direct recruitment efforts Statewide for summer participants and supervise intermittent hires that will teach, supervise, and assist in the residential enrichment programs. ██████████ will also recruit K-12 Native Hawaiian students and their ‘ohana for STEM events and coordinate logistics between NPN sites Statewide. As a Native Hawaiian, ██████████ has been coordinating enrichment activities and summer residential programs to make learning meaningful and applicable in a Native Hawaiian context for 20 years.

5. MANAGEMENT PLAN

In addition to the responsibilities of senior personnel as listed in the Project Personnel section, ‘Oi Ka Na‘auao STEM also includes the following mechanisms to ensure high-quality products and services will be offered to its participants through activity milestones, timelines, and designated responsibilities.

MILESTONES -

For the duration of the project, the management team will hold monthly meetings to ensure progress towards project objectives and successful outcomes, beginning with a Grant Kick-off meeting to review overall grant goals, objectives, & outcomes; grant activities (scheduling, implementation, & evaluation); and overall grant budget. Quarterly milestone meetings are scheduled to update project partners on target data and financial spending. Yearly Q1 milestone meetings will include any updates and reviews & feedback from the prior year. Data reported at each quarterly meeting will include: i) participation in STEM outreach/recruitment events and relevant data per event; ii) updates on Undergraduate Scholars’ program participation; iii) maintaining on-schedule progress for all STEM programs including STEM Tech Days & College Explorations, STEM Summer Series & OKN Skills Academies, Freshman Bridge, Undergraduate Scholars Program participation, and Research Internships; and iv) 25% completion of budgetary spending in accordance with project activities.

TIMELINE -

The following Figure 2 displays the planning and implementation phases of the Project’s primary STEM activities and programs for Year 1; the timeline will be replicated for Years 2 and 3, with adjustments from each previous year included in the current year’s planning.

RESPONSIBILITIES -

1.1 STEM Engagement: Program staff and mentors will meet to begin planning and coordination of *STEM Tech Days & College Explorations* in August-September, January-February, & May-June: selecting & confirming event dates, creating flyers for advertisement & recruitment of participants, reserving on-campus facilities and lodging, coordinating travel logistics, recruiting for student volunteers, selecting dates for student volunteer Orientation & team meetings, and other tasks as needed. Program staff will also oversee event day responsibilities including ground transportation, registration, and general coordination of participants and student volunteers. All staff and students who participated will be asked to submit evaluations and event feedback.

1.2 Bridge to the Undergraduate: November-December: Project Coordinator & staff will begin initial planning, coordination, and creating and disseminating recruitment flyers and applications for *S³*, *OKN Skills Academies*, and *Freshman Bridge*. January-February: recruitment of summer program mentors, student kumu (teachers), and intermittent hires; continued recruitment for program participants; initial curriculum planning; requests for faculty-driven research projects for Freshman Bridge. March-May: applicant review & selection process; continued curriculum planning; confirmation of logistics. June-August: *S³*, *OKN Skills Academies*, and *Freshman Bridge* occur. September: evaluation will take place. Planning for College Prep Workshops will take place the month before each event date.

2.1 Undergraduate Scholars Program: *Freshman Learning Communities* (LCs): confirmation of selected LC courses in January, registration in April, introductory course curriculum planning in July-August, and LC enrollment in August-December of each academic year. Project PI and Coordinator will provide *advising* to undergraduate participants throughout the academic year,

with four mandatory student check-ins annually. *Tutoring* is offered weekly, throughout the academic year, located in the NHSEMP STEM Resource Center. UH partners will offer mentoring, tutoring, access to STEM & Native Hawaiian Centers, and other support services at their respective campuses. The Project Coordinator will begin collaborating with students and professors before the start of each term to coordinate the academic year *SS TRACs Research Experiences*, which will be offered each academic term. Planning and coordination of the summer *SS TRACs Research Program* will begin in November; January: continue participant recruitment; February-May: review, selection & placement; June-August: SS TRACs occurs; September: evaluation will take place.

3.1 Culture-Based Learning and OKN Workshop Series: Student meetings, speaker series, and professional development & cultural workshops are held monthly. Freshman Bridge and SS TRACs participants will attend OKN Workshops weekly throughout the duration of each summer program.

6. EVALUATION

‘Oi Ka Na‘auao STEM will implement both quantitative and qualitative evaluation strategies to monitor and document programmatic activities, identify coordination and execution challenges, and assess outputs and outcomes. ‘Oi Ka Na‘auao STEM will address GPRA Measures 1 and 3 and will implement the following targets for each activity for the project’s outcome indicators. The leadership team intends to attain or exceed these targets by adhering to the timeline, responsibilities, and milestones as stated in the Management Plan. Data will be collected through questionnaires, student tracking, monitoring of student progress, participation rates, and standard University assessments (placement exams, GPA, department academic standing). Timelines for evaluation are listed in Figure 2 on pg. 23.

1.1 STEM Engagement: *STEM Tech Days & College Explorations*

Impact and continued participation in ‘Oi Ka Na‘auao STEM outreach events will be monitored and tracked through qualitative questionnaires that are age-appropriate (for example: visual cues for elementary school, multiple choice for middle school, and short answer for high school) and a participant database. Project staff and student volunteers will complete a short assessment using the PMI technique (Plus-Minus-Interesting) to address key challenges, discuss attainable solutions, and provide input on progress towards stated objectives and outcomes. Utilizing this technique requires thinking critically, identifying areas of interest, and engaging in creative thinking as participants are challenged to come up with new ideas to modify or improve upon what is said [21].

GPR Measure 1: The ‘Oi Ka Na‘auao STEM model of Hawaiians mentoring Hawaiians begins with STEM Tech Days & College Explorations activities that will increase awareness, readiness, and level of comfort to pursue STEM pathways amongst NH and high-need students as well as families, teachers, and individuals from diverse communities. The project will engage 150 K-12th grade students from O‘ahu and the neighbor islands each year. The project will reach an additional 500 students, parents, and community members over three years through STEM engagement opportunities.

1.2 Bridge to the Undergraduate: *S³, OKN Skills Academies, and Freshman Bridge*

Questionnaires will be distributed to all participants at the start and end of each program. Project staff will use collected data to assess the performance measures of the summer programs and make any design adjustments. Weekly surveys will be distributed to OKN Skills Academies and Freshman Bridge participants to assess progress towards achieving goals and highlight concerns or problems that warrant immediate attention. Participants in all summer programs will

be tracked throughout the duration of the project until high school or college graduation, respectively, to monitor expected outcomes and overall Project goals.

GPR Measure 1: ‘Oi Ka Na‘auao STEM will recruit 75 6th-11th grade students Statewide for both middle school & high school STEM Summer Series programs annually, targeting the State’s rural areas such as the islands of Lana‘i and Molokai. The OKN Skills Academies will provide experiential learning and industry shadowing for 40 high school students, with a goal of up to 120 Skills Academies students by Year 3. Participants will gain a greater understanding of professional expectations & opportunities and learn and apply technical & 21st century skills. These programs will accelerate learning and improve high school graduation and college enrollment for Native Hawaiian and high-need participants. ‘Oi Ka Na‘auao STEM will recruit 15 pre-college students for Freshman Bridge each year who are interested in studying the STEM fields at UHM. Upon entrance to UHM, Native Hawaiian students will meet or exceed proficiency standards (as determined by the UHM Math Department) and be prepared to enroll in college-level mathematics within two semesters of Freshman Bridge participation. STEM enrichment workshops and residential programs carry a high cost, however research has shown that these strategies are appropriate to take both the advanced learner and the high-risk student to the next level [22]. The project views these strategies as excellent investment in Native Hawaiian education, retention, and advancement.

GPR Measure 3: S³ and OKN Skills Academies will provide continued STEM engagement and improve high school graduation rates and college enrollment rates for Native Hawaiian and high-need students. Student motivation and achievement will improve as evidenced by at least 90% of student participants graduating from high school with a high school diploma; of those, at least 80% will enroll in college.

2.1 Undergraduate Scholars Program: *Freshman LCs, STEM Research Experiences*

Surveys will be distributed at the end of the academic year and will be used to assess the performance measures of the Undergraduate Scholars program and its academic support services. Additional surveys will be sent to program graduates six months after receiving their Bachelor's degrees to collect updates and determine their level of continued participation as program alumni. The Project Coordinator will create and manage a secure student database to track and monitor progress during student enrollment in the program. Surveys conducted will measure the quality of student experiences and impact of program services on students' professional development & cultural awareness and educational & occupational outcomes one year after graduation. Research contracts will be required for all participants to sign (student, faculty, Project personnel). Pre-assessment via research contracts will identify internship & personal/professional expectations, goals, and project abstract. Milestone meetings between Project personnel and interns will be scheduled during the mid-term to assess research progress & satisfaction and discuss any concerns or issues. If concerns arise, personnel will work with internship supervisors to address and implement effective changes. Post-questionnaires and reflection on interns' pre-assessments will take place at the end of each term to identify growth & achievements and field suggestions & overall comments.

GPR Measure 1: 'Oi Ka Na'auao STEM intends to recruit and provide direct financial support to 130 Undergraduate Scholars – 100 students at UH Mānoa and 10 each at UH partners Honolulu CC, Kapi'olani CC, and Leeward CC. Metrics for success include: a) % of Scholars who continue in good academic standing (goal = 90%); b) number of Scholars who participate in academic year & summer STEM research experiences or industry internships and student

projects (goal = 20); c) % of program graduates who enter graduate school or employment in the fields of STEM within one year of earning their Bachelor's degree (goal = 80%).

3.1 Culture-Based Learning and OKN Workshop Series

Questions pertaining to cultural awareness, identity, and knowledge will be provided in the Undergraduate Scholars' annual surveys and will be integrated into the pre-, post-, and weekly surveys during the STEM Summer Series, OKN Skills Academies, Freshman Bridge, and SS TRACs summer programs.

GPR Measure 1: Students level of awareness, understanding, and identity will increase through participation in 'Oi Ka Na'auao cultural workshops, cultural site visits and service projects, and interaction with the Native Hawaiian guest speakers and community.

- [1] *2018 Science & Engineering Indicators*. National Science Foundation National Science Board. Web. 31 Jan. 2020.
- [2] *STEM Highlights*. Strada Education Network: Hawaii Industry Sectors. Web. 03 Feb. 2020.
- [3] Kamehameha Schools. (2014). *Ka Huaka'i: 2014 Native Hawaiian Educational Assessment*. Honolulu: Kamehameha Publishing.
- [4] Allaire, Franklin. (2017). Navigating Uncharted Waters: First-Generation Native Hawaiian College Students in STEM. *Journal of College Student Retention: Research, Theory & Practice* 0(0) 1-21.
- [5] NHEC. (2015).
- [6] UH System Institutional Research & Analysis Office. Fall 2019.
- [7] *Support K-12 Computer Science Education in Hawaii*. Computer Science Education Week, 9-15 Dec. 2019. Web. 03 Feb. 2020.
- [8] *Teens ages 16 to 19 not in school and not working by race in the United States*. The Annie E. Casey Foundation: Kids Count Data Center. Web. 02 Feb. 2020.
- [9] Collected, translated, and annotated by Mary Kawena Pukui; illustrated by Dietrich Varez. (1983). *‘Ōlelo No‘eau: Hawaiian Proverbs and Poetical Sayings*. Honolulu, Hawaii: Bishop Museum Press.
- [10] Tai, Robert H., Liu, C., Maltese, A., and Fan, X. (2006). Planning Early for Careers in Science. American Association for the Advancement of Science: Education Forum.
- [11] Kallison Jr., James M. & David L. Stader. (2012). Effectiveness of Summer Bridge Programs in Enhancing College Readiness. *Community College Journal of Research and Practice*, 36:5, 340-357, DOI: 10.1080/10668920802708595.
- [12] *What Is CS Principles?* Code.org. Computer Science Principles. Web. 02 Feb. 2020.
- [13] Kendricks, Kimberly & Anthony Arment. (November-December 2011). Adopting a K-12 Family Model with Undergraduate Research to Enhance STEM Persistence and Achievement in Underrepresented Minority Students. *Journal of College Science Teaching*.

- [14] Astin, Alexander W. & Astin, Helen S. (1992). Undergraduate Science Education: The Impact of Different College Environments on the Educational Pipeline in the Sciences. (Final Report). UCLA: Higher Education Research Institute.
- [15] The ACT Profile Report - National: Graduating Class of 2018.
- [16] Harackiewicz, Judith. (2018). To Hook Students on STEM, Start With Their Parents. Education Week. Web. 02 Feb. 2020.
- [17] Pender, M., Marcotte, D., Domingo, M., Maton, K. (2011). The STEM Pipeline: The Role of Summer Research Experience in Minority Students' Ph.D. Aspirations.
- [18] Hunter A, Laursen LS, Seymour E. (2007). Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. Science Education. 91:36–74.
- [19] Will, Madeline. (2018). Early-Grades Science: The First Key STEM Opportunity. Education Week. Web. 02 Feb. 2020.
- [20] Hokoana, L. (2010). Native Hawaiians and College Success: Does Culture Matter? (Doctoral Dissertation) USC, Los Angeles, CA.
- [21] Kivunja, C. (2015). Using de bono's six thinking hats model to teach critical thinking and problem solving skills essential for success in the 21st century economy. Creative Education, 6(03), 380.
- [22] Kaiaulu STEM: Advancing Native Hawaiian achievement, leadership, and career pathways in STEM. (2011). Proposal submitted and awarded to the U.S. Department of Education program. University of Hawaii. Doc #362A110077.