Mālama ʻĀina Foundation

Mahope O Ke Kula Ke Aʻo Mau Ana

Project Narrative

A. Need for Project

This proposed Native Hawaiian Education program will target three communities with the largest concentration of Native Hawaiians globally in 1) West Oʻahu on the Island of Oʻahu, and 2) the Keaukaha Homestead and 3) Kaʻū/Pāhala on the Island of Hawaiʻi.[1] These communities historically reported low academic achievement, which can be traced back to the legacies of colonialism following the illegal overthrow of the Hawaiian monarchy in 1893, in which the U.S.-identified oligarch outlawed the teaching of the Native Hawaiian language, histories, and epistemologies in public and private schools.[2] Native Hawaiian children were thrust into an educational system that punished them for using their native language, denigrated their cultural practices, and erased the rich knowledge of their ancestors. As a result of these histories of discrimination and educational disenfranchisement, generations of Native Hawaiians struggle not only to succeed in the U.S. school system but also to maintain a cohesive identity that honors their heritage. Today, Native Hawaiians see higher rates of chronic absenteeism as well as continued achievement gaps in core subjects, including math, science, and English/language arts (ELA) among Native Hawaiians. Consequently, the schools with the lowest math, science, and ELA achievements, highest dropout, and lowest graduation rates are located in communities with the largest concentration of Native Hawaiians on Oʻahu and Hawaiʻi Island.[3] This project builds upon the goals and resources of school and community members on Hawaiʻi Island and in West Oʻahu to address the service and achievement gaps of at-risk Native Hawaiian youth.

For over two decades, the Consortium for Hawai‘i Ecological Engineering Education dba Mālama ‘Āina Foundation (MAF), a 501(c)(3), public not-for-profit, Native Hawaiian Education Organization, has developed and delivered community-based programming to at-risk Native Hawaiians living predominantly in rural areas. At the end of its three-year DOE NHEP project (2013-2016), MAF's Mahope O Ke Kula Ke A‘o Mau Ana (Mahope) recorded an average increase of 43% in Science, Technology, Engineering and Mathematics (STEM) knowledge among 1,300 middle school students taught in and after school. With some students, this program demonstrated greater pre- to post-test gains up to 600%. Student testimonies note how the Mahope program creates a "STEM-friendly" environment to address barriers to education (e.g., math phobias, lack of pre-knowledge) (See Appendix 5). This proposed U.S. DOE NHEP project will continue MAF's culture-based STEM education work in West O‘ahu, while also expanding to rural communities on Hawai‘i Island. The program will also address interrelated ELA skills to help at-risk Native Hawaiian youth attain academic success in math and science through the experience of Hawaiian cultural values and practices with hands-on learning during intersessions, summer breaks, and after school. In the proposed project, the Mahope program will address the following community-identified needs:

1. Science, Math, and ELA Achievement Gaps. For Native Hawaiians, unequal educational access is a result of socioeconomic barriers. Markedly, the Hawai‘i DOE reported that Native Hawaiians are twice as likely as non-Hawaiians to attend school in communities with the highest levels of poverty (26.7 percent versus 13.1 percent),[4] which results in ill-prepared students and generational poverty. Community members point to broad gaps and institutional weaknesses in services, particularly classroom support for culture-based learning and out-of-school programming appropriate for Native Hawaiians. The long-term result of these gaps

excludes Native Hawaiians from participation in a growing STEM field and perpetuates socioeconomic inequities for disadvantaged Hawaiian majority schools. Significantly, the U.S. DOE reported that these kinds of service gaps are the result of deeply-rooted inequities along racial lines in areas of access, participation, and success in STEM and ELA education.[5]

Some alarming indicators of the conditions mentioned above include achievement gaps between Native Hawaiian learners and their peers. The chart below lists the math, science, and ELA proficiency of Native Hawaiian middle school students in schools targeted for this project:

SY 2018-2019 STRIVE HI Report[6]

School	NH Population	Free and Reduced Lunch	Native Hawaiian Student Proficiency			NH Chronic Absenteeism
			Math	Science	ELA	
Kamaile Academy PCS	54%	62%	9%	16%	23%	22%
Kaʻū High & Pāhala Elementary School	43%	59%	6%	15%	16%	47%
Hilo Intermediate School	44%	47%	29%	48%	33%	14%
HI DOE Average *General Population	25%	48%	43%*	44%*	54%*	15%*

As demonstrated in the chart above, Native Hawaiians STEM proficiency is well below the Hawaiʻi DOE average at Kamaile Academy, a West Oʻahu public charter school serving a large homeless Hawaiian population (Math Gap -34%, Science Gap -28%, ELA Gap -31%). Native Hawaiian students at Kaʻū High & Pāhala Elementary (Kaʻū/Pāhala), a remote, rural public school on the Island of Hawaiʻi, also report similar achievement gaps (Math Gap -37%, Science Gap -29%, ELA Gap -38%). At Hilo Intermediate, Native Hawaiians have made some growth due to initial culture-based STEM interventions from the Mahope program. However, this growth has not kept pace with their peers, since Native Hawaiian students' Math (29%), Science

(48%), and ELA (33%) proficiency lags behind their Asian (Math 73%, Science 79%, and ELA 75%) and Caucasian classmates (Math 52%, Science 79%, and ELA 56%). Although Hilo Intermediate is a target DOE school site, the predominant Mahope program participants are Native Hawaiian youth who are bused from Keaukaha Homestead, four miles out of Hilo where most families live below the federal poverty line.

Compared to their peers, Native Hawaiians also experience a persistent gap in English/language arts achievement. The earlier chart (p. 3) shows the reading proficiency gaps at Hilo Intermediate (-21%), Kaʻū/Pāhala School (-38%), and Kamaile Academy (-31%). These low literacy rates have a lasting impact on student achievement in STEM courses, in which students are expected to articulate complex information, to evaluate arguments, and to judge the credibility of a variety of sources. While initiatives in early childhood literacy have resulted in recent improvements among Native Hawaiians in reading and writing skills through Grade 3, these literacy gains have not been extended to Native Hawaiian adolescents in the secondary grades.[7] Between 4th and 9th Grade, demands on literacy skills rapidly increase, particularly vocabulary, reading comprehension, abstract thinking, writing and reading of complex sentence structures, recognition of different literary forms, and textual understanding across a variety of content areas.[8] Without these crucial skills, Native Hawaiians struggle to meet STEM national standards that require them to describe real-world phenomena, to present scientific explanations in writing, and to analyze logical arguments.

2. Gaps or Weaknesses in Services. Studies consistently show that the after-school hours between 2:00 p.m. and 6:00 p.m. are the peak hours for juvenile crime and experimentation with drugs, alcohol, cigarettes and sex.[9] However, positive after-school activities have been shown to reduce delinquent behavior among middle school youth.[10] Furthermore, research across 68

evaluative studies found that participants in academically rigorous after-school programming made significant improvements in attendance, behavior, and school achievement.[11] Nevertheless, an alarming 1 out of every 2 youth in Hawai‘i are waiting for an after-school program.[12] Moreover, for Native Hawaiian youth in rural communities, little or no educational after-school programming is available. After-school programs like the Boys and Girls Club and After-School All-stars provide opportunities, but distance (in Wai‘anae the nearest Boys and Girls Club is 16 miles away with no transportation services), access (Kamaile and Hilo have no After-School All-Stars program), lack of rigor (Kamaile, Hilo, and Ka‘ū/Pāhala do not offer out-of-school hour STEM programming) and lack of Native Hawaiian cultural programming (none of the mentioned schools offer Native Hawaiian cultural programming) make these programs unattractive, inaccessible, or ineffective. Furthermore, parents and caregivers in these high poverty areas are unable to pay for intersession and summer programming, and therefore most Native Hawaiian middle school youth are left at home unattended, putting this group at a great disadvantage for academic and professional success.

3. Need for Middle School Intervention. According to a 2014 study by the University of Chicago, the middle school years offer a key predictor of high school graduation rates and college attendance.[13] The report points out that high school outcomes are better for students who started high school at the same achievement levels as their peers in subjects of ELA, math, and science. However, for middle school students entering the 9th grade in school districts where large achievement gaps exist, their chances of school success and college attendance significantly dwindle. The report concludes that students “who are at risk of 9th grade failure can be identified as early as 6th grade, although some fall into this group as their attendance declines through the middle grade years.”[14] Ill-equipped middle schools hinder Native Hawaiians during

key educational years, expanding the math, science, and ELA achievement gaps in high school. The chart below demonstrates the proficiency of Native Hawaiian learners in the fields of math, science, and ELA in the feeder high schools falling far below the DOE average:

SY 2018-2019 Strive HI Report[15]

School	% Native Hawaiian students	Free/ Reduced Lunch	Chronic Absenteeism	NH 9th Grade Proficiency		
				Math	Science	ELA
Waianae High	58%	55%	41%	1%	22%	8%
Hilo High	44%	62%	24%	15%	12%	41%
HI DOE Average*	30%	48%	15%	43%*	44%*	54%*

* General Population

In order to address the needs discussed, the Mahope program will provide classroom teacher support, after-school STEM/ELA programming, and summer/intersession field days.

B. Project Design

1. Addressing the Needs of Native Hawaiian Youth. This program will achieve its objectives specifically because its design addresses specific gaps in services and achievement (pp. 1-6) and its approach is supported by data and strong theory (pp. 12-17). The Mahope program's three unique educational settings – Kamaile Academy, Hilo Intermediate, and Ka‘ū/Pāhala – all serve high at-risk Native Hawaiian youth **(Absolute Priority #1B)**. Mahope's Director of Operations met with these schools and community representatives who collectively recognize the low achievement data trends and agree with the following needs and opportunities for proposed services to improve educational support to Native Hawaiians.

Needs Expressed - Gaps in Service/Achievement	Proposed Service Opportunities
After-school programming for Native Hawaiian middle school students (pp. 5-6)	Create and deliver an integrated Native Hawaiian STEM and ELA youth-mentoring program after school

Intersession and summer programming (pp. 4-5)	Quarterly field day outreach during intersessions/summer
Direct-service intervention in classrooms (pp. 5-6)	In-school resource support for science, math, and ELA teachers and mentoring
STEM and ELA Student Achievement Gap among Native Hawaiian Youth (pp. 2-4)	Development and implementation of Culture-, Place-, and Project-Based Curricula integrated in all Mahope components (after school, intersession/summer, in class)

Building from these needs, the Mahope program will use the following delivery strategies to improve teaching and learning for Native Hawaiian youth.

2. Project Rationale. The proposed Mahope program will inspire students and their facilitators from Native Hawaiian communities to achieve academic success in math, science, and ELA through the experience of Hawaiian cultural values and practices with hands-on learning during and after the school year, intersession and summer breaks. The following logic model (Appendix 4) lays out the program's objectives, activities, outcomes, and impact.

Project Goal: The goal of Mahope O Ke Kula Ke A'o Mau Ana is to inspire students from Native Hawaiian communities to achieve academic success in math, science, and ELA through the integration of Hawaiian cultural values and practices with hands-on STEM learning.				
Objectives	**Strategies & Activities**	**Short-term Outcomes**	**Long-term Outcomes**	**Impact**
Objective One: Improve attitude of students toward School Community and the Hawaiian culture by integrating math, science, and ELA with Hawaiian cultural practices through summer and intersession field days and teacher/classroom support.	**Classroom Support:** Mentor and tutor students and aid teachers in public and public charter schools serving majority homeless and at-risk Native Hawaiians in Wai'anae, Keaukaha and Ka'ū/Pāhala.	Statistically significant ($p<.05$) improvement in attitudes toward **school and community** among in-school and after-school students 75% of all students and facilitators served in class, after school and field days will agree or strongly agree with the statements on the **project satisfaction survey**	Availability of culturally appropriate STEM/ELA curriculum to math, science, and ELA teachers. Students have greater interest in STEM/ELA fields and their links to Hawaiian Culture	Improved academic and economic achievement for school children with more competitive performance in school and for employment in STEM fields by Native Hawaiians.

Objective Two: Increase student knowledge of STEM and ELA content as aligned to the Common Core Math and ELA standards and Next Generation science standards by creating an integrated STEM/ELA curriculum that incorporates Native Hawaiian culture and is taught through hands-on, place and project-based methods.	**Field Days:** The project will conduct field days to introduce STEM issues and awareness to students. **Curriculum Delivery:** Develop and implement STEM/ELA curriculum during after-school programs, summer and intersession field days, and as supplemental lessons in classrooms.	Twelve **STEM curriculum units** created that integrate STEM and Native Hawaiian culture into place and project-based learning Statistically significant ($p<.05$) increase in average **STEM/ELA knowledge gain** 575 students served in school and/or after school in three years 350 students served in outreach field days in three years	Students are equipped with reading and writing skills to work in STEM fields. Students have greater knowledge to compete in STEM fields Greater interest in STEM studies and STEM employment	

Objective One Activities: Classroom Support and Summer/Intersession Field Days.

During the school day, the Curriculum Coordinator (CC), Education Specialist (ES), and Education Coordinator (EC) will assist administrator-identified faculty and their students by providing tutoring, student mentoring, and classroom support. Working from a theory of social cohesion, which recognizes the developmental need for at-risk and homeless students to strengthen their social identity, this program will base educators, mentors, and curriculum content within a supportive community. Research indicates that students who have a *robust sense of social cohesion* (positive attitudes toward school and community) and secure attachment to adults, friends, and community members in school have improved emotional and social development and are more likely to succeed in school.[16] Accordingly, a study by EdForce found that higher-performing middle grade schools with successful transitions into high school cultivated a future orientation by reinforcing a student's long-term role in their community.[17] For

this reason, the components of this program reinforce positive relationships with peers, school, and community. As educators and advocates for at-risk youth, CC, EC, and ES will also model and teach a) how to respond to social conflict and stressors, b) how to integrate cultural identity with academic success, and c) how to engage in their community through service learning. This in-school class time will be valuable for ES, EC, and CC to build relationships with students, providing tutoring, gaining familiarity with classroom content, and understanding the challenges students are having socially and academically. Based on earlier MAF projects, the program found that this in-class component enhances after-school programming, since staff will be able to supplement textbook lessons, leverage teacher and student relationships, and build positive attitudes between the classroom and out-of-school hour experiences.

In order to further fortify the relationship between community and classroom, the Mahope program will provide summer/intersession activities (field day), in which students apply STEM/ELA learning at partnering community programs and locations. These field days will be adapted to each site, and all three sites will host field days four times a year (spring, summer, fall, winter), offering place-based, service learning activities that integrate ELA, math, and science content with Hawaiian cultural values and practices. For example, Kalani Kahalioumi, a crew member of the world-famous *Hōkūleʻa* canoe, has agreed to arrange speakers and host field days that would supplement the waʻa (or canoe) units. In an application of STEM knowledge, students will learn navigation techniques on the canoe and help with the restoration of a waʻa. In their study of traditional wayfinding practices, they will compose a written explanation of the Hawaiian star-compass, including quantitative and qualitative support. This field day will show students how STEM and ELA skills apply to potential maritime careers **(Absolute Priority #1C)**. Other possible field days include working at a local loʻi (taro patch), using a heʻe holua

(Hawaiian sled) at a traditional kahua (game field), learning about local watersheds such as Nu‘uanu Reservoir, helping with the wall restoration of a loko i‘a (fishpond), or studying conductive heat at an imu site (traditional underground geothermal cooking). Field day curricula will include lessons that address Common Core math/ELA and Next Generation science standards with a focus upon Hawaiian cultural practices and values as shown above.

These field days will address several critical needs: 1) It will serve as a recruitment tool to other middle school students by introducing new students to Mahope's voluntary after-school program; 2) It will provide a valuable service to families by offering a safe, education-based activity for middle school youth when there is no school; 3) It will connect STEM professionals and Native Hawaiian cultural practitioners to students, who often do not get to interact. This continued support in and out of school builds social cohesion and equips at-risk and homeless youth to thrive in a growing STEM job market.

Objective Two Activities: After-School Tutoring and STEM/ELA Lesson. Culture-, Place- and Project-based curricula will be taught at three different schools environments with high representations of at-risk Native Hawaiian learners. Each learning environment will be supported by varying approaches of pedagogy tailored to meet the needs of the learner. For example, in a seventh grade class at Hilo Intermediate, a DOE middle school with a high student representation from a nearby Hawaiian Homestead, the curriculum will be delivered in an after-school setting by an Education Specialist (ES). This delivery will utilize successful approaches of earlier MAF programs, but also improve and adapt these approaches to their unique settings. Students will begin to explore their environment and culture through units that are based on project- and place-based teaching strategies. In the classroom, the students may learn about redwood and oak trees (national curriculum), but in the after-school program the students will

learn about the traditional use of indigenous trees such as koa and ʻōhia in canoe building, structural engineering, and cultural rituals. They will also develop crosscutting ELA skills by reading texts by Native Hawaiian writers and conducting ethnographic interviews with elders, cultural practitioners, and community members to document the cultural history of these plants. They will read and analyze the texts of Hawaiian writers and scientists, such as Mary Kawena Pukuʻi's *Native Planters in Old Hawaiʻi*, which documents early Hawaiian knowledge about these endemic plants. Each after-school session will begin with a healthy snack and a circle time to check-in, which is a highly important socio-emotional activity. Based on in-class relationships, the ES or EC can determine if students had an emotionally or physically challenging day and may redirect behavior or provide emotional support for learners, before homework time and STEM projects.

In order to integrate culture-, place-, and project-based learning further, Mahope staff will offer curricula and lesson demonstrations for classroom teachers. For example, Kamaile Academy has board certified middle school science teachers, but their classroom lacks connections to culturally-responsive learning. While teacher education programs and science standards stress the importance of addressing student diversity through culturally responsive lessons that build upon students' lives and experiences, teachers struggle with the institutional focus on standardized teaching curriculum.[18] Therefore, Mahope staff will offer culturally responsive curricula that both addresses standards and engages Native Hawaiian students.

In addition to the research and evaluation findings mentioned above, this program's rationale is also based on three educational theories – culture-based education, place-based education, and project-based learning, which are supported by up-to-date research. These theories will be further covered in the next section (pp. 12-13).

C. Project Services

1. Research and Practice. As mentioned in earlier sections the Mahope program will be working closely with specialists and experts in their field to ensure that the program utilizes up-to-date knowledge from research and effective practice:

a. Culture-Based Education (CBE) has been an organic solution to the sobering negative statistics associated with Native Hawaiian children, such as juvenile deviance, poor educational outcomes, and school delinquency.[19] U.C. Berkeley Education Research Roland G. Tharp studied culture-based education for decades, particularly in indigenous communities in the United States, and he credits culture-based education with "systematically produc[ing] greater student engagement, greater parent involvement, better attendance rates, lower dropout rates, better graduation rates, and general satisfaction of all participants, as opposed to a standard, traditional program based on mainstream models."[20] The Mahope program's STEM curriculum is rich in Native Hawaiian cultural content and context.

b. Place-based education (PBE) emphasizes the use of the social, cultural, and natural environment by children, teachers, and adults in the community. In this way, their community becomes an inquiry-based learning laboratory for K-12 students to gain knowledge and skills across the curriculum.[21] Curriculum Studies professor Pauline Chinn points out that "students in Hawai'i have a unique natural laboratory to explore fundamental biological questions involving evolution, adaptation and the development of socio-ecosystems on isolated island systems."[22] Because Hawai'i's students historically study mainstream, textbook-based science, they may become literate in school science but seldom learn about issues of endangered and invasive species or soil and water pollution in their own communities. Through the place-based approach in this proposed program, students will learn about the richness of their culture through wahi

pana (sense of place) histories from community elders, how the Native Hawaiians incorporated STEM into their society and what ecological threats face their community. For example, textbooks may use maple or fir trees to teach the subject of botany or the forest ecosystem. However, Hawai‘i Island has some of the richest rainforests in the world, with indigenous species being threatened by the effects of civilization. Mahope's pedagogy includes place- and project-based learning because the content in place-based learning is relevant and project-based learning addresses tangible issues which are more easily understood.

c. Project-Based Learning (PBL) most effectively frames both culture-based and place-based education through a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging and complex question, problem, or challenge. The Buck Institute of Education defines project-based learning as "a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks."[23] This process can last for varying time periods and can extend over multiple content areas. The Mahope program curricular units are all inquiry-based, the key component around which project-based learning is built. For example, one current issue is a virus that is threatening the state's ‘ōhi‘a trees. Place-based and project-based learning will allow Mahope students to gather data and create an essential question at a local rainforest that will guide their project-based work into how to solve the rapid decline of the ‘ōhi‘a tree.

d. Crosscutting ELA Learning Concepts. This curriculum also reinforces crosscutting English Language Arts Common Core standards by utilizing texts by Native Hawaiian authors. While Hawai‘i ELA classes still dominantly emphasize texts by continental U.S. or European writers, often in unfamiliar urban settings and foreign environments,[24] Mahope curriculum

incorporates texts by Native Hawaiian writers who work from familiar traditions and landscapes. For example, in the Engineering in Makahiki unit, the program will include moʻolelo (histories or legends) written in English, such as texts by Hawaiian historian Mary Kawena Pūkūʻi. In a lesson on engineering and papa hōlua (the Hawaiian sled), curricula includes an excerpt from *The Legends and Myths of Hawaiʻi* (1888) by King David Kalākaua in which goddess Pele challenges Hawaiian chief Kahawali to a race down the slopes of Kīlauea volcano. Since many Hawaiian elders point to this moʻolelo as a lesson about skill and craftsmanship, students will have the opportunity to read and interpret the themes and central ideas of this text while working toward ELA Common Core Standards and reinforcing STEM Engineering lessons on reiterative design.

These become Scaffolded Reading Experiences (SRE)[25] for students as the lesson builds from student interests and personal connections to form reading contexts, to learn unfamiliar vocabulary, and to shape textual analysis and evaluation. Following each reading, guiding questions will help students to synthesize, organize, and evaluate their understanding of the text, which will promote literal and inferential comprehension and invite greater opportunities for the students to construct knowledge. These SRE will also help students to develop key reading mastery skills for low-level readers to improve phonemic awareness, decoding abilities, vocabulary, and comprehension. In a first phase study of 1,500 teachers across five islands of Hawaiʻi by Kamehameha Schools Research and Evaluation Department, researchers found that students exposed to a culture-based education (CBE) showed a significant improvement in reading outcomes skills as compared to students not exposed to CBE approaches.[26]

In addition, students will develop writing skills through an interdisciplinary, culture-based approach to language arts. From cross-sections of science, culture, and ELA, students will

recognize examples of form (e.g., Claim-Evidence-Reasoning models) and style in science and literary texts.[27] In turn, they will have opportunities to respond to and build from these mentor texts in their own writing. For example, in a unit on the Loko I‘a (Hawaiian Fish Ponds), students learn about photosynthesis in land and ocean vegetation and read the traditional Hawaiian Creation Chant (Kumulipo) that compares land plants to seaweed (limu) with parallel sentence structures. In a follow up writing exercise, they will reinforce science concepts and work from mentor texts to learn how simple conjunctions can add complexity to their writing:[28]

Land plants are like seaweed **because** *they both use photosynthesis to make energy*.

Land plants are like seaweed, **but** *they are in different locations*.

Land plants are like seaweed, **so** *they both need sunlight, water, and nutrients to live*.

In meeting key Common Core ELA standards, these crosscutting exercises will assist middle school students with clarifying relationships among claims, reasoning, and evidence.

e. Hawaiian Culture-, Place-, and Project-based STEM Curriculum. The Mahope program harnesses the efficacy of all three related educational models to provide a comprehensive approach to improving teaching and learning aimed at achieving rigorous academic standards. The program also delivers its curriculum in a PBL framework to capture the attention and interest of at-risk Native Hawaiian learners, resulting in a deeper appreciation for the Native Hawaiian culture and greater achievement in the STEM fields. This curriculum design gives students an experience of different activities and specific Hawaiian cultural practices. For example, Unit One “Engineering in Makahiki” starts with a lesson on the traditional Hawaiian sport of papa hōlua (sledding). In this unit, students discover different materials that can be used to create a hōlua (sled) and explore relevant science, math, and ELA topics related to the art of sledding (See Appendix 6). Below is a sample overview of the curriculum:

Mahope O Ke Kula Ke A‘o Mau Ana Curriculum - Units and Standards

Units	After-school Unit Topics	Common Core Math Domains	Common Core Language Arts Strands	Next Generation Science Standards
Unit 1	(1) Engineering in Makahiki (Field Games)	The Number System (7/8.NS.A), Functions (8.F.A/B), Geometry (7.G.A/B)	Key Ideas and Details (CCSS. ELA-Literacy.RST.6-8.1-3)	Physical Sciences (MS- PS), Engineering and Technology Sciences (MS-ETS)
Unit 2	(2) Lo‘i and ‘Āina (Taro and Farming)	Ratios and Proportional Relationships (7.RP.A), Statistics and Probability (7.SP.A.1)	Range of Reading and Level of Text Complexity (CCSS.ELA-Literacy.RST.6-8.10)	Life Sciences (MS-LS)
Unit 3	(3) Wa‘a (Canoes)	Expressions and Equations (8.EE.A/B/C), Geometry (8.G.A/B)	Craft and Structure (CCSS.ELA-Literacy.RST.6-8.4-6), Integration of Knowledge and Ideas (CCSS.ELA-Literacy.RST.6-8.7-9)	Earth and Space Sciences (MS-ESS)
Unit 4	(4) Loko I‘a (Fish ponds)	Statistics and Probability, Geometry (8.G.B/C)	Range of Reading and Level of Text Complexity (CCSS.ELA-Literacy.RST.6-8.10)	Life Sciences (MS-LS)

Each unit has two curricular modules with each consisting of three to five lessons. Pre- and post-knowledge tests at the unit level will consist of fifteen multiple choice questions modeled after the Hawai‘i State Assessment released items and will align with a State standard.

Currently, Native Hawaiians are underrepresented in STEM jobs on O‘ahu, but in this project each unit will also build STEM knowledge base and skills among youth and meet the needs of **Absolute Priority #1C** (Needs in fields or disciplines in which Native Hawaiians are underemployed) and **Competitive Preference Priority #1** (Promoting Science, Technology, Engineering, or Math). Each unit includes lessons on computational and algorithmic skill that aid in collection and management of data for classroom experiments or engineering challenges. This includes coding to create data collection applications and software via iPads or CAD (computer-aided design) activities for 3-D modeling. As part of the Engineering and Makahiki

Unit, students will examine traditional game implements, such as moa pāheʻe (club sliding) and heʻe holua (sleds), at the Bishop Museum and learn about traditional wood-working techniques for their production. After taking measurements, they will recreate game implements, utilizing both traditional and modern approaches to carpentry and woodwork, including CAD, 3D printing, and CNC routers. Through field day outreach events, classroom and after-school guest speakers, students will hear from university researchers and STEM professionals about the possibility of STEM careers.

The Mahope program will reinforce field day experiences with classroom activities. Lessons will incorporate the Native Hawaiian language **(Absolute Priority #1D)** through ʻōlelo noʻeau (traditional proverbs) and moʻolelo (local history), along with the teaching of cultural concepts and Hawaiian values. During staff meetings, the Cultural Specialist will provide language translations and instruct staff on the proper use of the Hawaiian protocol, language, kaona (hidden meaning), and related cultural practices. As a voluntary after-school program, these cultural connections are important for student recruitment and continued engagement.

2. Equal Access and Treatment for Participants. The Mahope program is a non-discriminatory program that is cost-free to participants. The program promotes core values of laulima (working together, connecting, and collaborating) and will ensure that everyone, regardless of ability, age, cultural background, ethnicity, faith, gender, gender identity, ideology, income, national origin, race or sexual orientation has the opportunity to reach their full potential with dignity. All middle school sites (Hilo Intermediate, Kamaile Academy, and Kaʻū/Pāhala School) have inclusive classroom settings which are ADA compliant in a public school environment. Mahope will not tolerate any discrimination, or different treatment, of or among program participants. To this end, the program will be accessible to individuals of different

backgrounds, abilities, income levels, and disabilities.

D. Project Personnel

1. Qualifications, Relevant Training, and Experience. The Consortium for Hawai‘i Ecological Engineering Education dba Mālama ‘Āina Foundation (MAF), a 501(c)(3) non-profit organization, was founded in Hawai‘i in 1998 to impact Native Hawaiian communities and the natural environment through experiential education and the exploration of traditional Hawaiian natural resource management. MAF worked with Hawaiian public charter schools and their teachers and the University of Hawai‘i for over ten years to develop and implement innovative and rigorous science and math curriculum delivered to students during school hours including place-based learning field trips and cultural project days. MAF was established to serve the interests of Native Hawaiians and has a Board of Directors comprised of three members who are all of Native Hawaiian descent (See Appendix 2). MAF has substantial prior and present experience in the design, development, and implementation of programs for Native Hawaiian peoples utilizing curriculum and approaches that incorporate the Native Hawaiian perspective, values, language, culture and traditions which are reflected in the core function of the organization. MAF's educational programs demonstrate the effective implementation of current, culturally relevant research. Throughout the past 22 years, MAF successfully implemented several private and Federal grants serving communities in Hawai‘i with its free programs.

2. Key Project Personnel. All of the following below are key personnel for this project:

[redacted] will serve as the Executive Project Director (EPD). A Native Hawaiian who worked in the development, financing, and implementation of non-profit projects for over forty years, he has extensive experience in project administration and financial management, and has worked with numerous community, education, and economic development projects in

Hawai‘i, nationally, and internationally. He managed over $100,000,000 in project resources during his career. [redacted] is instrumental in the overall vision and direction of the foundation program since its inception in 1998, and advocated for the continued expansion and outreach of the program to the many underserved communities in Hawai‘i. He is a spokesperson for transformational change in the Native Hawaiian community. [redacted] will provide strategic planning and oversight for the Mahope O Ke Kula Ke A‘o Mau Ana program.

[redacted] Director of Operations (DO), will oversee operations and organizational efficiency of the program. He will review program reporting and provide quarterly updates to the Board. The director will work closely with funders and develop strong community partnerships. [redacted] served for three years as the Director of Operations, with seven years of experience as a Program Manager. [redacted] successfully managed two federal grant projects as the MAF Director of Operations and eight federal grant projects as a program manager. He is intimately familiar with the fiduciary responsibilities needed for a successful federal grant program (see Resume). [redacted] has a B.A. in History, a minor in Hawaiian Ethnic Studies and an advanced degree in secondary education specializing in curriculum design. He has 17 years of public and private school teaching experience and is also one of only two nationally-certified National Centers for Families Learning (NCFL) family literacy trainers dedicated to working with homeless families.

[redacted] the Program Manager (PM), will oversee program personnel, review curriculum, and assist with field programming. He will update principals about upcoming activities, classroom activities and after-school programming and solicit feedback on how the program can better serve their school and community. [redacted] is the current Program Manager at MAF, and a board certified teacher in Hawai‘i with fifteen years of teaching experience. He

holds a Bachelor's of Science Degree in Education, and a Master's degree and Doctorate in English. Dr. Lee was a science, math, and ELA curriculum coordinator for MAF for five years and managed two federally funded grants under the Administration for Native Americans. He is a member of the National Science Teachers' Association and attends their annual conference, offering the latest in STEM education innovation.

[redacted], the Native Hawaiian Cultural Specialist (NHCS), will provide information and guidance to MAF staff relative to Hawaiian cultural values and practices for development of program activities and curriculum materials and develop relationships with key community leaders. [redacted] is fluent in Hawaiian and is the current cultural consultant at MAF. He served four years as Division Director of Abigail K. Kawānanakoa Foundation, and twenty-four years as Bandmaster for City & County of Honolulu, Royal Hawaiian Band. He holds a B.A. in Music Ed, University of Hartford.

[redacted], the Education Coordinator (EC), will oversee project delivery on the island of Hawai'i. She will provide teacher training and student instruction during school hours and facilitate the project-based learning activities after-school. [redacted] will also work with the curriculum team to develop and deliver creative and engaging field day projects that integrate the Common Core and Next Generation Science Standards in the content of math, science, Hawaiian culture and ELA. [redacted] is a former graduate of Hilo Intermediate and holds a Bachelor's Degree in Kinesthesiology. She has successfully led STEM programming with Hilo Intermediate and Keaukaha students for three years.

3. Other Personnel.

The Education Specialists (ES) all have personal and professional relationships with the schools and communities that participate in the Mahope program. Working from these

relationships, they will implement after-school, intersession, and summer programming. As youth mentors, they will promote health, safety, and academic achievement among students:
a) [redacted] previously taught as an English Language Learner (ELL) teacher at the program's partnering West O'ahu school Kamaile Academy as well as in the CBASE program with Parents and Children Together. [redacted] has teaching experience in areas of math, science, and Hawaiian culture for curriculum delivery and tutoring after school.
b) [redacted] is a graduate of Kamehameha Schools who grew up in Keaukaha with experience as a place-based environmental education specialist at Waiāhole Fishpond and two years of experience working as a STEM after-school instructor in Keaukaha.
c) [redacted] is a former graduate of Ka'ū/Pāhala School and holds a degree in Anthropology from Santa Clara University. Since graduating, [redacted] has experience working with the youth in his community through cultural education programs.

[redacted] the Program Specialist (PS), will assist the Education Specialists by tracking program and student progress and address issues related to course delivery. [redacted] will work on-site to support programming in and after school. She will work closely with evaluators to timely gather, collect and document data and compile program reports. Additionally, she will support direct program management and staff by facilitating orders of educational supplies and distribution items, coordinating field day events, and preparing expense vouchers. [redacted] is a graduate of the Hawai'inuiākea School of Hawaiian Knowledge at the University of Hawai'i at Mānoa and is fluent in Hawaiian language.

The Curriculum Coordinator (CC) will work closely with the Native Hawaiian cultural specialist (NHCS) to develop and facilitate project-based learning activities that interweaves culture while increasing rigor in science and math for grades 6-8 as defined in the Common Core

and Next Generation Science Standards. The CC will train Education Specialists and Education Coordinators on curriculum and assess the effectiveness of lessons in the after-school programs. The CC will work with the EC and ES to develop and deliver creative and engaging field day projects that integrate the Common Core and Next Generation Science Standards in the content of math, science, Hawaiian culture, and ELA. The CC will collaborate with classroom teachers and provide curriculum support and demonstration lessons as needed.

4. Recruitment and Hiring. MAF is an equal employment opportunity organization and encourages applications from all groups, including those from traditionally underrepresented based on race, color, national origin, gender, age, or disability. MAF Human Resources follows its best practices procedures to solicit qualified applicants by making communities served aware of opportunities for employment. Mahope solicits applications from the communities in which the program operates, and 53% of the program staff are Native Hawaiian. This hiring practice allows MAF to be relevant and have the "pulse" of the community. Hiring practices work in accordance with Employment Practices Law, and federal law[29] and as outlined by the Hawai'i Employers Council for the recruitment of candidates.

[redacted]

[redacted]

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[redacted]	[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted] Completed.	[redacted] ADO	[redacted]	[redacted]

[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]			

F. Project Evaluation Methods and Instruments: MAF implements its Ke Ana ʻIke (KAI, meaning to see or measure the anticipated outcome) integrated evaluation model to ensure the integrity of its programs. The External Evaluator, Dr. Scott Ray developed this model for Native Hawaiian agencies based on 40 years of evaluation experience. The model articulates a common set of precepts that underlie the goals, strategies, and intended outcomes. In addition, Mahope has several unique assessments capturing its specific strategies and outcomes (See Appendix 1).

The KAI mixed-methods model consists of (1) formative process evaluation, (2)

summative process evaluation and (3) outcome evaluation – which are explicitly combined to provide valid and reliable performance data, continuous quality improvement and guidance on effective strategies suitable for replication. Outcome evaluation determines program effectiveness by assessing change in participant outcomes on performance indicators, and the process evaluation documents the extent to which effectiveness is achieved and how.

1. Data Analysis.

A) The formative process evaluation will monitor Mahope's "implementation fidelity" by measuring and documenting the extent to which planned performance objectives are implemented, on a timely basis and in compliance with project plans, as well as the extent to which they contribute to the overall program purpose and goals. The tasks in the management plan (Section E) supporting the program objectives (Section B) will be further expanded into the sequence of detailed "action steps" required to achieve each objective, and each action step will be crosswalked to the "person(s) responsible, deadlines and completion status." Completion data will be reported quarterly and summarized annually, assessing each action step *qualitatively* as (1) in planning/not due, (2) on-schedule/on-going, (3) completed, or (4) delayed.

The percentage of steps in each status category will be quantified by program objectives and project-wide, and those results will be interpreted in terms of what they mean for project operations. This continuous quarterly monitoring and reporting of progress will provide guidance during the project to alert administrators of problems before or as they emerge to enable early remedial actions. Reporting on data collected throughout the project on challenges, opportunities, and recommended strategies for improvement will provide a guide for on-going successful project implementation and continuous quality improvement.

B) The summative process evaluation provides quarterly reports of cumulative

inventories of process indicators of the variety of project achievements (e.g. numbers served) in the context of project activities (e.g. field days conducted) that contribute to those results. Together, formative and summative data document the extent to which planned activities are completed and how effectively they achieve the overall project goals and objectives. This data provides staff with on-going feedback to support program improvement during project implementation and to determine best practices and resources for replications.

Project specific indicators include both process and outcome indicators. Project specific process indicators for Objective 1 (Improving attitudes of students) include: completing program plans, MOUs and MOAs; planning outreach events in team meetings; serving 350 students in three schools with field days; collecting, analyzing and reporting pre-/post-test data; completing all Board of Director's (BOD) progress dashboards to required performance levels and completing USDOE reporting. Process indicators for Objective 2 (Increase student knowledge of STEM) include: completing program plans, MOUs and MOAs; completing 12 cultural-based STEM curriculum units for three years of study; providing support in STEM/ELA to 425 students in-school, and also delivering STEM/ELA curriculum to 150 of those students in after-school programs, across three schools; weekly team meetings; collecting feedback and revising curriculum annually; collecting, analyzing and reporting pre-/post-test data; completing all BOD dashboards to required performance levels and completion of USDOE reporting.

C) The outcome evaluation will measure program effectiveness by documenting student changes in project specific performance indicators. On Objective 1 (Student Attitudes), the anticipated outcomes will include a significant ($p<.05$) increase on the Attitudes Toward School and Community Index (alpha .89, Ray 2019) and the Field Day Evaluation (alpha .865, Ray, 2019). On Objective 2 (Student STEM Knowledge), the anticipated outcomes will be a

statistically significant ($p<.05$) increase on the curriculum-based STEM Knowledge Test, a significant ($p<.05$) increase on items related to the STEM curriculum from the Language Arts domain of NGSS and Common Core and 75% satisfaction by students and adults on the KAI Satisfaction Survey (alpha .83, Ray, 2019). All of the measures are pre-existing except the items to be selected from the ELA Common Core standards, and all locally developed measures will be assessed with factor and reliability analyses after the pre-test. Curriculum-based knowledge tests will be assessed and updated at the beginning of each year.

The methods of analysis for these outcomes will utilize a One Group Pre-Test-Post-Test design to determine whether the interventions produced the anticipated outcomes at statistically significant levels ($p<.05$) sufficient to indicate the project specific indicators are achieved and the project activities are worthy of replication. Outcome measures will be combined, when appropriate, in multiple analysis of variance (MANOVA) models for repetition with multivariate (Hotelling's T) and univariate (F/t-tests) significance tests, with the general linear model (GLM).

Baseline pretests for outcome evaluation will be collected at the beginning of school and at in-take as students are recruited. STEM knowledge post-tests will be collected with the completion of each STEM unit and attitudinal post-tests and the KAI Satisfaction Survey will be collected at the end of school. Field Day Evaluations will be collected at outreach events.

Outcome results will be assessed and reported to program staff annually to identify where they are succeeding or failing in meeting their targeted outcomes. Like the process evaluation, these results will support corrective action plans to address performance deficiencies as soon as possible, verify which outcomes were achieved and identify potential barriers to success and replication. All required GPRA measures (GPRA 1 and 3) will be assessed and reported.

2. Types of Data Collection. The outcome evaluation will measure systemic and

programmatic outcomes with a focus on direct results for participants:

Unit knowledge assessments will include STEM and ELA content questions that are based on Common Core and Next Generation science standards. These assessments will be reviewed and approved by a board certified science and language staff. Through pre- and post-testing, the program will measure knowledge gain based on treatment with a statistically significant ($p<.05$) targeted knowledge at the end of each year of the three-year project.

Attitudes Toward School and Community Index Survey (ATSC). The ATSC survey was adapted from a survey by the Harvard School of Public Health and Medical School to measure student connectedness as a predictor of health outcomes. Based on pre-tests and factor analyses of over 200 students in Hawai‘i, questions were adapted for our target Native Hawaiian population. The ATSC Survey includes four categories: Attitudes toward School, Classmates, Community, and Hawaiian Culture. Through pre- and post-testing, the program will measure improvement in school and community cohesion among student participants.

Project Satisfaction Surveys. Satisfaction Surveys will track whether culture-based STEM/ELA learning experiences meet the expectations of participants. At the end of three years, 75% of students and facilitators served in-class and during summer/intersessions will indicate that they agree or strongly agree with the statements on the project satisfaction survey. Student participant count will measure the impact of this program, and by the end of the program at least 300 students will participate in culture- and place-based learning.

3. Timeline for Outcome Reports. Process and outcome results will be assessed quarterly (Oct-Dec, Jan-Mar, Apr-Jun, Jul-Sept) as sufficient new data become available for analysis. Process and outcome data will be provided to the evaluator in the month following each quarter (Jan, Apr, Jul, Oct), and evaluative results will be shared as they are completed with program

staff to review progress and alignment with targeted outcomes and objectives.

4. Use of Information. The periodic sharing of formative and summative results will document the history of programmatic issues, barriers encountered and solutions tested to provide a roadmap for replication. Combined with the curriculum, teaching materials, and evaluation instruments, this will document the history of project implementation. Evaluation results will be presented to the MAF executive team and Board quarterly. If applicable, results may be shared by program staff and/or the Evaluator in Hawaiian education forums and professional seminars to promote replication. Mahope staff also meet bi-annually with school administration and program partners to review progress and key milestones activities, as well as to receive feedback about the program. Websites, newsletters, hō‘ike (showcase nights), and for field days will also facilitate regular contact between project staff and community partners.

Student records during the administration of the Mahope program will be protected in compliance with federal law, including the Family Educational Rights and Privacy Act (FERPA). Since FERPA provides privacy and access rights with respect to students' education records, participant records are considered confidential and may not be released without the written consent of the student/guardian. Information that is considered non-personally identifiable information or public (sometimes called Directory Information) may be released to reporting agencies, unless the student/guardian specifically requests otherwise.

Staff will have access to information only for legitimate use in completion of work-related responsibilities. All education records will be protected including student rosters, student assessments and surveys, display screen data, and advisement notes. No medical or mental health records are held by this program. Hard copies will be stored in a locked cabinet or drawer when not in use, and electronic records will be stored on secure, password-protected devices.