A. NEED FOR PROJECT

A.(i) Magnitude of the problem to be addressed. Native Hawaiians (NH) are the indigenous peoples of the Hawai`i Island Chain. The NH population is expected to double by the year 2050 to approximately 536,947, which will significantly impact Hawai`i's public schools and supportive services (Malone, 2005). NHs have lower levels of formal schooling than non-natives. This is significant in that in recent decades the difference between income levels of college graduates on the one hand, and persons with low levels of education on the other, have been increasing. Although NHs are almost as likely to have completed high school as non-Natives (77% compared to 81%), the largest difference is in the proportion of Hawaiians who have graduated from college - just 9% of NHs - compared to 24% of non-Natives living in Hawai`i (Complete College America, 2011). This difference in college completion is reflected in sig-nificantly lower personal incomes for NHs compared to non-Natives. The issues, associated with postsecondary education entrance and completion, are many, with one being low achievement in math. Issues associated with this occurrence, that is, the performance differential of NH youth in the core academic area of math, and how they will be addressed through Ka Pilina, follow.

Importance of Math Performance. Increased performance in math is linked to student success across the education continuum, workforce competitiveness, and overall quality of life (Geary, 2011). The National Science Board (2010) estimates that 80% of today's workforce requires the logic, reasoning, discipline, and decision-making skills developed through successful completion of a high school math curriculum. Geary (2011) summarized studies reporting consequences of underdeveloped mathematical competencies on employment outcomes in Great Britain and in the U.S. and reported that poor math skills were linked to lower rates of full-time employment and higher rates of employment in lower paying occupations as well as limited opportunities for promotion. The importance of this math and employment link cannot be overstated when considering the rapid growth of Science, Technology, Engineering, and Mathematics (STEM) jobs in the nation and in Hawai`i. In fact, in Hawai`i's workforce, STEM employment is growing at 4 times the rate of low-tech jobs (Hawai`i Department of Business, Economic Devel-

opment, & Tourism, 2007). These jobs tend to require postsecondary education degrees in STEM fields. Unfortunately, many individuals lose out on opportunities to attend college and to acquire high-paying jobs as a result of poor performance in math (Mazzocco & Thompson, 2005).

Algebra as a Gatekeeper. More specifically, Algebra, is considered a "gatekeeper" course, which means students must master this content before they will be successful at not only higher level math but other STEM courses (Jetter, 1993). Success in Algebra I has proven to be an excellent predictor of college entrance and Algebra II, has been linked as a good predictor of college graduation (Adelman, 2007). Noting this importance, the American College Testing Program recommends high school (HS) students complete 3 or more years of Algebra I and higher, and the College Board recommends students take Algebra and Geometry (NEA, 2008).

Discrepant Math Performance. Although the link between math and future success is clear, student outcomes in this area remain dismal especially in Hawai`i. In Hawai`i, the 2011 National Assessment of Educational Progress (NAEP) revealed the average math score of 8th grade students at 278, 6 points lower than the national average of 284, and Hawai`i ranked below 40 other states (National Center for Educational Statistics/NCES, 2011). For 8th grade, approximately one third of the test items are on the topic of algebra thus indicating poor algebraic performance for NH 8th grade students. Moreover, the NAEP disaggregated score by ethnicity for 2011 (the first time Native Hawaiians (NHs) and other Pacific Islanders were not grouped with Asians) revealed that, Hawai`i's NH and other Pacific Island 8th grade students scored 21 points lower, at a scaled score of 263, than the national average of 284, and 15 points lower than the overall state average of 278. This means 84% of the students were only at basic or below basic in math. This dismal outcome is further magnified in considering the effects of poverty and disability. Within Hawai`i, the average scaled score for 8th grade math, for those who were eligible for free/reduced lunch (an indicator of low SES), was 268 in comparison to those who were not eligible at 286. For students with disabilities, the average scaled scored was 230 compared to 283 for students without disabilities. This statistics is particularly significant in considering the definition of students at risk, which includes students with disabilities. Students at risk, per US

Department of Education, are defined as "any primary or secondary grade student who is at risk as a result of substance abuse, teen pregnancy, recent migration, disability, ESL (limited English proficiency), juvenile delinquency, illiteracy, extreme poverty, or dropping out-of-school." Many NH students fall into this category of "at risk". In 2010, 43.9% of all public school students in Hawai`i were eligible for the free and reduced cost lunch program (Ah Sam, Hoe, & Makuakane-Drechsel, 2011), and many NHs are overrepresented in special education services (Kana`iaupuni, Malone & Ishibashi, 2005) making almost half of all NH public school students "at risk."

Downward Trend. The poor math outcomes in 8th grade do not improve in high school. In fact, there is a downward trend. The Hawai`i Department of Education Trend Report (2011) shows the proportion of students proficient in mathematics during the year 2009-10 for 8th graders was 44.8%, but for 10th graders, the proportion dropped to 38.4%, a difference of -6.4%. The negative trend continues beyond high school. Two-thirds of students interested in enrolling in math, at University of Hawai`i community colleges, were identified as needing remediation to enter college level math courses (Hawai`i P-20 Partnerships for Education, 2008).

Cultural mismatch. According to the NCES, most recently available data, in the 2007-2008 school year, 31.7% of teachers in Hawai`i were white/non-Hispanic; 43.9% were Asian; 10.1% were NH or other Pacific Islander/non-Hispanic; 7.2% were Hispanic, single or multiple races; and 6.7% were multiple races, non- Hispanic.

In the targeted schools (Campbell, Ewa Makai, Ilima Intermediate) approximately 23% of students are NH or Part Hawaiian (Kamakau has 96% NH). Thus, one can see the discrepancy between student culture and teacher culture whereas only about 10% of teachers are NH or Part Hawaiian. As indicated in the literature this mismatch can have significant negative impacts on NH students (Kana`iaupuni et al, 2005). In addition, as noted by Gay (2001), "most graduates of typical teacher-education programs know little about the cultural traits, behaviors, values, and attitudes that different children of color bring to the classroom and how they affect students' responses to instructional situations (p. 211)." Gay (2001) goes on to point out that teachers often misinterpret student behaviors as being deviant and may treat the students punitively thus placing

the students at a disadvantage in the classroom.

Recently, proposed project staff talked with teachers from Hawai`i Charter and Immersion schools. The teachers indicated that they too struggle to make math meaningful to their students. They indicated that this is primarily due to their limited skill set that does not include strategies for engaging students within a cultural and contextual framework (K. Takahashi, personal communication, April 15, 2012). Due to this they end up using western textbooks that further alienate their students. Clearly, there is a need for an innovative, culturally/contextually based math intervention, focusing on Algebra I and II skills. This is necessary for NHs to increase their enrollment in postsecondary education and to improve their occupational outcomes.

A.(ii) Gaps, nature, and magnitude of these gaps, and how they will be addressed. As indicated, NH students are behind their non-NH counterparts in math achievement. There are three primary gaps that influence this achievement gap: (1) math is decontextualized thus students do not understand the relevance of math in life; (2) teachers are not prepared to deliver math content through culturally responsive nor Hawaiian contextual means; and (3) students do not have a good balance of problem solving and drill and skill strategies.

Ka Pilina addresses these gaps, the identified needs of at risk youth (Priority 1), and improved achievement and high school graduation rates and college enrollment (Priority 6) through application of an innovative, culturally based, blended learning (BL) math intervention linked with teacher professional development (PD) and engaging NH students through college mentors as follows and as described in section B, Project Design.

Math without Context. Presently, the existing norms driving our educational system, are incongruent to a large number of students and their families (Kana`iaupuni et al, 2005; Weisner, Gallimore, & Jordan, 1988; Yamauchi, 2005). Many students find classroom contexts to be "foreign" to their goals, expectations, and way of life. This disconnection between the values and expectations of home and school often lead to disadvantages in the classroom (Markus & Kitayama, 1991; Tharp et al., 1999; Zambrano & Greenfield, 2004), which are likely to lead to low achievement in math. To address the problem, Kana`iaupuni, Ledward, and Jensen (2010)

suggest that culture-based educational strategies positively impact student outcomes in math, particularly NH students. Brody (2009) as cited in the Native Hawaiian Education Council report (2011), reports that national research on students and STEM careers shows that experience with hands-on content is an important element for encouraging students to aim for mathematical and scientific careers, and hands on-learning is a NH culture-based educational strategy.

However, evidence based research and validated interventions for NHs are very limited. Accordingly, educators must rely on strategies and procedures that do not match the needs of NH students, a practice at odds with NCLB and Race to the Top (Sze, 2005). Ka Pilina will address this gap through a BL intervention that includes the development of culturally relevant and locally contextual math strategies to be utilized by teachers in the classroom. In addition, Math Camps, with a focus on hands on activities and the integration of a strong cultural base and local context, will be held during school breaks. Also, it will include college mentors and the importance of ‘ohana for NH students have been well documented. The Math Camps will provide student participants with direct links to their cultural, the local context, and their lives.

Teachers are not prepared to deliver math content through culturally responsive nor Hawaiian contextual means. Most teachers and other school personnel have not been trained in culturally responsive teaching or to interpret linguistic, cultural, and socio-economic characteristics (Ortiz & Yates, 2002). In order to improve NH student achievement in Algebra I and II, teachers need to be better prepared to utilized culturally and contextually based teaching strategies. This will be accomplished through Ka Pilina as the project is designed to develop such strategies. Teachers will learn the strategies and utilize them in their classrooms with supports from project staff. In addition, NH college students will be identified and trained to mentor the student participants in the use of the cultural and contextual strategies. Mentoring will be provided in the classroom or virtually via emails and social networking and during the Math Camps. Mentors may also be utilized to provide support to students throughout each semester.

Students do not have a Good Balance of Problem Solving and Drill and Skill Strategies. Problem solving is one of the key domains in math and learning. To solve problems is a primary

objective in learning math, as problem solving skills can be used in everyday life (Zakaria & Yusoff, 2009). Yet, instruction in math often does not reflect fostering problem solving skills. Instructional practices are believed to be one of the most crucial variables influencing outcomes discussed in the *Science and Engineering Indicators, 2010.* This report, published by the National Science Board, indicates that quality instructional practices of teachers made a significant difference in student performance (Clotfelter, Ladd, & Vigdor, 2007; Darling-Hammond et al., 2005; Goe, 2008). The National Council of Teachers of Mathematics (1989, 1991, 1995) indicates that curricula, assessment, and teaching practices that emphasize complex math tasks requiring problem solving and mathematical reasoning, while deemphasizing rote computation and memorization tasks (i.e., following procedures) are more effective for the students' learning of math. However, most instructors provide skill and drill and do not encourage students to use skills in any context outside of mathematics (Haver, et al., 2006). This is also reflective of most math instructions at Community Colleges (Gagnon & Maccini, 2001).

Ka Pilina will address this gap through the BL Intervention as indicated previously. The BL Intervention will focus on problem solving within a local context. Students learn basic facts, typically taught through "drill and skill" strategies using ITS and real life application through hands on activities linking to local context and STEM fields.

As indicated, *Ka Pilina: AIM Together,* will address the needs of at-risk NH students through the provision of a culturally responsive, innovative BL math intervention leading to improved math skills and completion of Algebra I & II. This will lead to increased rates of HS graduation and college entrance for the identified students (priority 6). The BL approach will be utilized by combining face-to-face classroom methods with computer mediated activities. For ensuring the cultural responsiveness of the intervention, project staff will work with Kamakau School personnel, which is a NH Immersion charter school, as well as Kupuna (cultural experts). Both local context and NH culture will be integrated within the BL intervention.

B. QUALITY OF THE PROJECT DESIGN

B.(i) Project is appropriate and addresses the needs of the target population. The over-

arching goal of the project is to improve math achievement of at risk NH youth in grades 7 to 12 leading to increased and timely HS graduation rates and increased enrollment into credit bearing college math and STEM courses (priority 6) through a collaborative effort. As the Hawaiian term *Pilina* suggests, the project Ka Pilina: AIM Together will connect teachers to resources, students to college mentors, math content to local context and STEM fields, and schools to communities.

The population targeted by Ka Pilina is 7-12th grade NH students, including those with disabilities and those who are at risk of school failure, most likely to be referred to special education, and most vulnerable to dropping out-of-school (priority 1) due to poor math outcomes. One step to intervene with this population is to engage students, families, and teachers in math learning through an innovative BL intervention (i.e., face-to-face evidence based and culturally based math strategies & use of intelligence tutoring system - ITS). Another step is to engage NH students beyond high school by connecting them to college mentors through math activities. These two steps will contextualize math and bring relevance of math to students and families; equip teachers with culturally relevant evidence based strategies to effectively teach NH students; and equip students with both math skills and general problem solving skills.

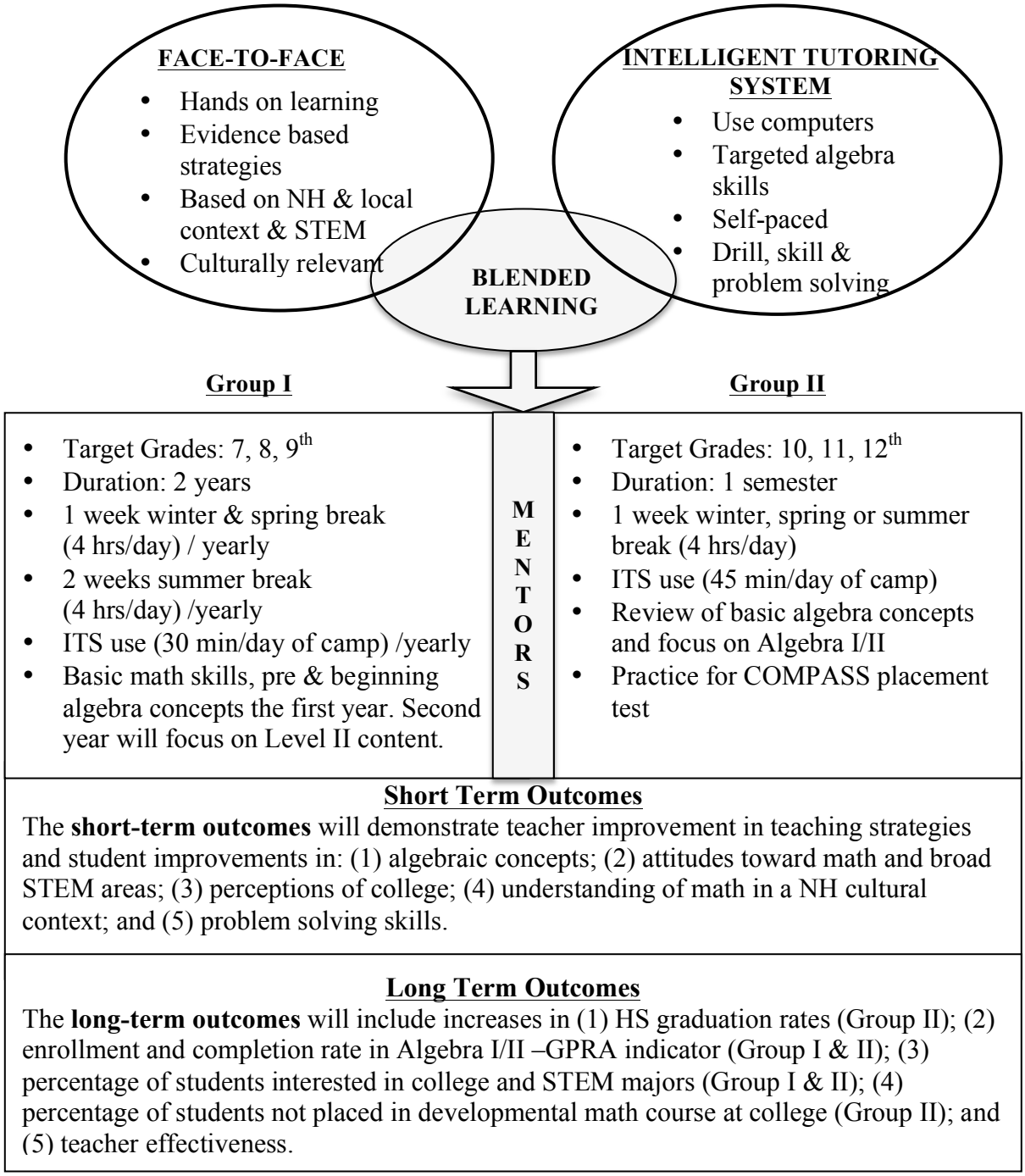
BL is an instructional method that utilizes various forms of learning tools such as computer software or the Web (Singh, 2003). It often combines the traditional face-to-face instruction with learning environments such as live e-learning or self-paced computer assisted learning. The goal of BL is to use the best aspects of both face-to-face and other learning environments to complement each other and expose students to content in a format that is engaging, and thus, provides students a chance to learn often difficult or confusing concept (Singh, 2003). For Ka Pilina, the BL form of content delivery will be through face-to-face, culturally relevant, evidence based math strategies, and computer mediated learning with ITS. This will be referred to as, the BL intervention. Research indicates that the BL form of content delivery, as opposed to the more traditional lecture, shifts instruction to be more student centered in which students become more interactive learners; increases interaction between student-instructor, student-student, student-content, and student-outside resource typically not available in the classroom; and integrates

assessment to help students stay on track (Watson, 2008).

The proposed project is a collaborative effort of secondary and college math, cultural (including kupuna), disability, and educational experts. Together they will develop the BL intervention that will consist of a unique combination of instructional milieu (i.e. evidence based, culturally responsive face-to-face math strategies and ITS) and content. Teachers will learn the BL intervention through professional development (PD) and will implement the intervention with students in school, as well as during math camps, held during school breaks. Math Camps will be held on a college campus and will be supported by college mentors. The use of ITS will be ongoing with use in school and during breaks. ITS will be monitored by the college mentors. Quantitative and qualitative methods will be used to effectively monitor and assess the development, implementation, refinement, and dissemination of the BL intervention.

As seen in Figure 1, the math camp will occur face-to-face, on a college campus, during Spring, Winter, and Summer breaks and ITS will be continuously used during the school year as well as during Math Camps. Students participating in the Math Camps will be grouped by grades. Students from grades 7, 8, and 9 will participate in one camp (Group I), and students from grades 10, 11 and 12 will participate in another camp (Group II). Group I will focus on the mastery of math facts and pre- and beginning algebraic concepts to ensure smooth transition and completion of HS Algebra I and preparation for Algebra II or equivalent. Group II will focus on beginning and intermediate algebraic concepts (Algebra II), and preparation for the Computer Adaptive College Placement Test (COMPASS). COMPASS is used within the UH system community colleges as a placement test for English and mathematics. Students' performance during camps will be monitored on a regular basis. Statistically significant positive effects of such out-of-school time math programs on the math achievement of at-risk students in both elementary and secondary education, but primarily those in secondary education, were reported in a meta-analysis of 35 studies (Lauer, et al., 2006). There was no difference in the effects by type of out-of-school time program, and both summer camps and afternoon school programs had similar positive effects. Based upon these findings, both academic and social activities

Figure 1: Blended Learning Intervention Design



appropriate to NH culture and local context, applied to STEM fields, will be provided. The BL Intervention will be a mix of 1-on-1 and small groups. As recommended (Lauer, et al., 2006), the duration of the intervention will be more than 45 hours/year.

The overarching goal of the project is to improve the math achievement of at risk NH youth

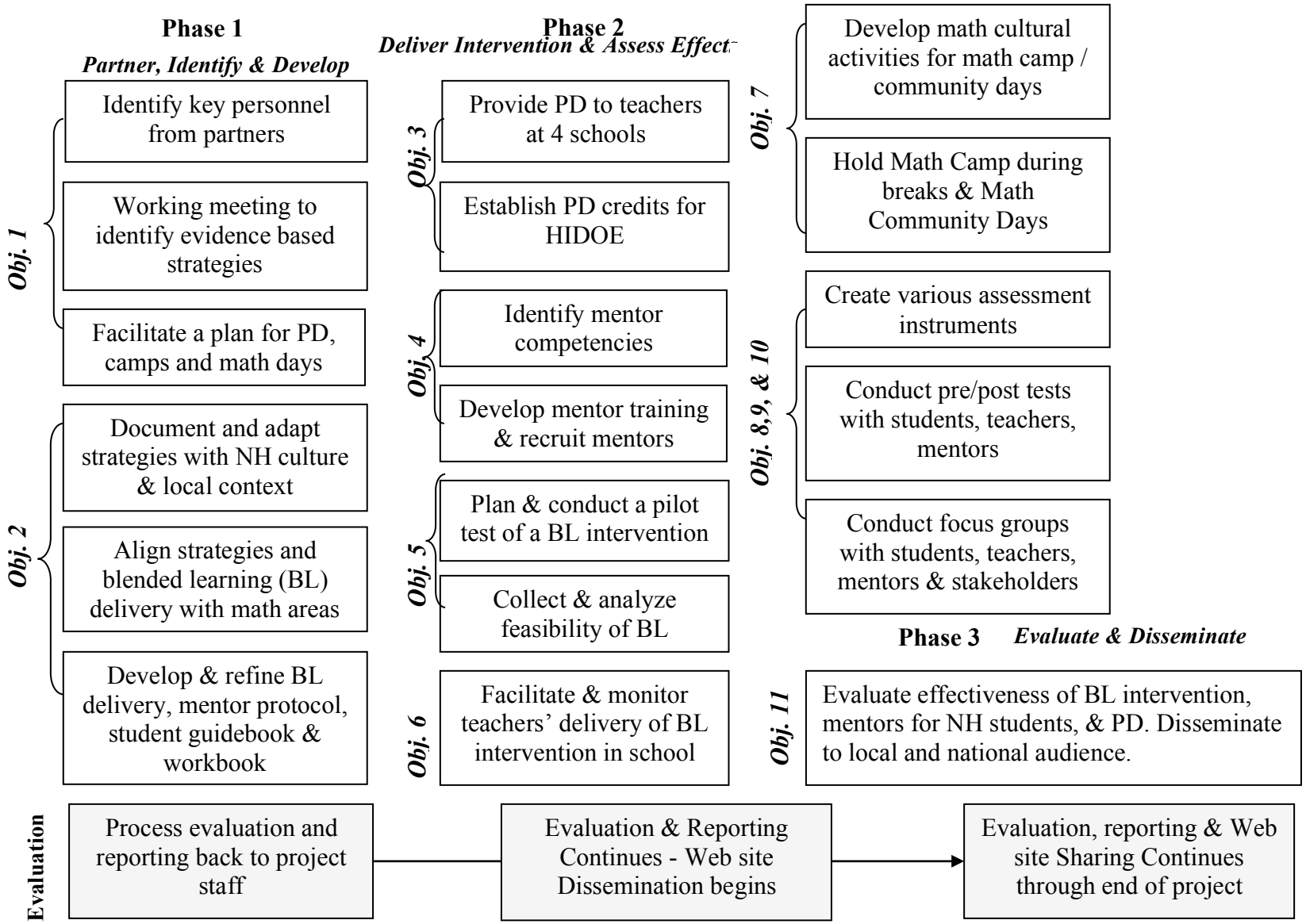
including those with disabilities in grades 7 to 12, thus leading to increased and timely HS graduation rates and increased enrollment into credit bearing college math and STEM courses (priorities 1& 6). The proposed short-term outcomes will demonstrate increases in (1) algebraic concepts & skills; (2) attitude towards math and broad STEM areas; (3) perception of college; (4) understanding of math in local context especially applied to NH culture and STEM fields; and (5) problem solving skills. The long-term outcomes include increases in (1) HS graduation rates (Group II); (2) enrollment and completion rate in Algebra I/II –GPRA indicator (Group I & II); (3) percentage of students interested in postsecondary education and STEM focus (Group I & II); (4) percentage of students not placed in developmental math courses in college (Group II); & (5) teacher effectiveness. Staff will achieve the goals and outcomes through three major phases over the 3 years of the project (see Figure 2). Each of the phases is aligned to meet the objectives of the project. Phase 1 is focused on partnership, identification of needs of NH students in math, identification of strategies, and development of a BL intervention. Phase 2 is focused on delivery and implementation of the BL intervention through PD and mentoring. The developed intervention will be piloted, feasibility analyzed, and field-tested. The final phase, Phase 3, is focused on evaluation and dissemination. The effectiveness of the BL intervention will be measured through data collection and the refined intervention will be disseminated to local and national audience through web sites, professional development, publications, and replication.

Specific objective and activities, designed to achieve the goal and aligned with the project design, are provided in section D, Table 1, Quality of the Management Plan.

B.(ii) Extent the project reflects up-to-date knowledge from research and effective practice.

There is a considerable body of research that supports the effectiveness of culturally compatible interventions in increasing learner outcomes (Klinger, et al., 2005; Klinger & Edwards, 2006; Ogata, Sheehey, & Noonan, 2006). This is an important component of the project design, as often, math taught in Hawai`i schools, does not reflect the local context nor does it reflect practical application. Therefore, for many of the NH students, and especially those who struggle in math, they have difficulty grasping the concepts and bringing meaning to math

Figure 2: Developing and Field Testing PD & Blended Learning Math Intervention for NH Youth: Three Year Overview



in their daily lives. Thus the cultural foundation and local context will connect students' experiences and prior knowledge that reside out-side of the traditional school curriculum. Teaching *through* local culture brings depth, breadth, and significance to the learning experience. Furthermore, key to Ka Pilina, is ongoing instruction and mentoring by college students who are NH or have an interest in NH education and values. By having college student mentors, who have succeeded to enroll in college, the participants will be more likely to persevere to graduate from HS and enroll in postsecondary education.

The project design, goals, and objectives (Figures 1 & 2), rely on the BL intervention which highlights evidence-based strategies, NH culture, math camps, and the use of ITS. The following describes how each element of the project is supported by research and evidence based practice.

Cultural Sensitivity: Examines topics of cultural significance; involves cultural experts; addresses cultural standards; and ensures opportunities to attain deeper cultural understanding. Culturally contextualized interventions, provided through rigorous math strategies, will engage students to a greater degree than untested curricula with a Western orientation (Yamauchi, 2005).

Math Content & Instructional Strategies: Math instructional strategies will be built based on the *Seven Effective Instructional Practices for Students with Learning Disabilities and Struggling Learners* (Jayanthi, Gersten, & Baker, 2008); *The Final Report of the National Mathematics Advisory Panel* (2008); *Doing What Works Clearing House*; and with input from math teachers and culture experts from Kamakau Hawaiian Immersion School and Kupuna; Algebra I and II course content; and Hawai`i State Assessment (HSA) and COMPASS content.

The evidence based strategies will be aligned with NH concepts and values and have an emphasis on problem solving skills, group work/thinking, use of manipulatives, indigenous math, and application of math in a local context and in STEM. For example, huki huki (tug of war) is a cultural activity that students can participate in. Using an algebraic expression and applying math skills in physics, students can create their teams based on body mass and by measuring force using the Newton scale. Physical activity will then be translated onto paper and generalized to other problems. Blended Learning: Blended learning (BL) itself is an instructional

method that utilizes various forms of learning tools such as computer software and the Web (Singh, 2003). BL, also sometimes known as a hybrid delivery, creates strategies, materials and activities that increase participation and performance by making learning goals achievable by individuals across the spectrum of learning styles and needs. Research shows that BL includes flexible, integrated strategies and aligned supports for persons of differing cultures and abilities by highlighting on the principles of Universal Design for Learning (Rao & Tanner, 2010; Dukes, Waring, & Koorland, 2006). Math Camp and Community Days: The use of math camps, or out-of-school time, to teach secondary school mathematics in an engaging and creative manner, has existed in the American context since at least the 1960s (Kennedy, 1960). Math camps allow for innovative mathematics instruction to occur in casual and less threatening environment, relieving students of the potential stress associated with the junior high or high school math classroom. This alternative form of instruction also allows students to be less concerned about making errors than engaging in the learning process. Through math camps, students potentially improve their logic and reasoning skills and gain new confidence in mathematics. More recently, through a meta-analysis of 35 studies, out-of-school time math programs were shown to have a statistically significant positive effect on the math achievement of at-risk students in both elementary and secondary education, but primarily those in secondary education (Lauer, et al., 2006). No difference, in the effects, was found by type of out-of-school time program, with both summer camps and afternoon school programs having similar positive effects. In short, math camps are effective programs for building student's overall mathematical aptitude through nontraditional content (Passty, 2002) and are suitable for our target student population. Intelligent Tutoring System. ITS draws on artificial intelligence technology to provide interactive instruction that adapts to individual students' needs within the various math domains, and, most typically, supports student practice in learning complex problem solving and reasoning. ITS is also aligned with explicit instruction and multiple instructional examples, designed to teach problem solving skills, at an individualized pace based upon the Zone of Proximal Development (Vygotsky,1986). Studies have shown ITS usage to improve student math outcomes (Shapiro,

Sueker, & Koedinger, 1998). Mentoring. Research suggests that mentor-protègé relationships provide students at risk with psychosocial, academic, and career support (Burgstahler & Ladner, 2007). In addition, mentors can increase students' engagement in school (Johnson, 1995).

B.(iii) Extent the project will be coordinated with similar efforts. The project goal is complimentary and builds on the Race to the Top (RTT) goals in Hawai`i while also being aligned with GPRA indicators 1 and 3. The RTT goals include: raising Hawaii State Assessment math scores by 2014; all students becoming proficient in math by 2018 (GRPA 1); and having NAEP scores meet or exceed the national median score by 2018. RTT also has goals to improve HS graduation rates (GPRA 3 & priority 6) and have all graduates earn the HS diploma, that requires meeting STEM competencies. Moreover, the project is designed to bring in local capacity from the beginning by partnering with existing projects and infrastructure such as Leeward Community College (LCC) and building upon similar efforts that exists within the University of Hawai`i at Manoa (UHM) Center on Disability Studies (CDS) (i.e., Pacific Alliance: www.cds.hawaii.edu/pacificalliance/ and Pathways to STEM: www.cds.hawaii.edu/pacificalliance/pathwaystostem/). The partnership allows sharing of resources and assists in better coordination between K-12 schools and postsecondary education. In maintaining sustainability beyond year 3, the project will develop a website for dissemination of the BL intervention and its materials. Specific objectives are within the design to conduct PD to at least 40 educators in Hawai`i to improve math outcomes of 500 students. In addition, the objectives include disseminating the BL intervention materials and information to pre-service teachers. Furthermore, replicability of the BL intervention will be determined in year 3, and may be replicated in other sites in Hawai`i.

C. ADEQUACY OF RESOURCES

C.(i) Costs are reasonable given number of persons served, results, and benefits. Considering the number of persons served and expected results and benefits, the projected costs are reasonable. The potential significance of the project is clearly described as: *bringing value and benefit to a large number of NH youth, including those at risk who struggle with math, leading to increased HS graduation rates and preparation for successful enrollment in college (pri-*

orities 1 & 6). By addressing this for the NH community through an academic area of greatest need (i.e., math) and doing so with the involvement of community partners, and key stakeholders, including teachers, the long-term impact & sustained benefit of Ka Pilina will be assured.

By the end of year 3, we estimate 500 NH students and 40 teachers will benefit from the BL intervention and PD as described in the expected short-term and long-term outcomes of the project. In addition, at least 20 college mentors will benefit from taking on a leadership role and learning specific skills such as mentoring skills, effective math teaching practices, and advanced technology use. At least 600 parents and community members will also benefit from participating in the Math Community Days. The project benefits will impact the participating middle and high schools (e.g., higher graduation rate, higher Algebra course completion rate, and improved student performance and teacher effectiveness) and collaborating colleges (e.g., lowered number of students placed in developmental math classes in college). Statewide and national dissemination efforts are expected to reach at least an additional 2,000 individuals as dissemination will occur through conference presentations and publications in relevant journals. Local dissemination will reach an estimated 100 teachers through a teacher focused session at the annual Pacific Rim conference and presentations at the HIDOE annual math department meeting. Dissemination will also occur through an ongoing project website.

C.(ii) Commitment of partners and adequacy of support. The CDS at UHM is an interdisciplinary organization, which brings a vast resource base of educators, cultural specialist, math specialist, and training, research, and evaluation specialists to Ka Pilina. The CDS-UHM has maintained long-term linkages with groups working with NH students. With extensive experiences in conducting federally funded research in Hawai`i public schools and the UH system, CDS-UHM will also ensure that Ka Pilina is fiscally and logistically responsible with the adequate resources and expertise in place. The identified project staff have well established relationships with collaborating schools: Campbell High, Ilima Intermediate, Ewa Makai Middle, and Kamakau Immersion School, as well as LCC. The four schools, and LCC, have all indicated their commitment to participate through letters of collaboration (see appendix). The public

schools are located in the HIDOE Leeward School District, which has a large NH population and Kamakau is an Immersion school with 96% NH students. All schools are committed to improve NH student performance and outcomes. In addition, LCC will be the site of the math camps. LCC has the largest number of NH students enrolled of all the UH sys-tem campuses and is committed to providing a wide array of services and supports for NH students and their surrounding community to perpetuate the Hawaiian culture with all students. These rich collaborations will contribute to achieving the highest level of project quality and outcomes.

In addition, Ka Pilina activities will be linked with those of existing projects housed at CDS. This includes the Pacific Alliance for Supporting Individuals with Disabilities in STEM Fields Partnership (http://www.cds.hawaii.edu/pacificalliance) and Pathways to STEM math focused research grant (see http://www.cds.hawaii.edu/pacificalliance/pathwaystostem).

C.(iii) Budget is adequate to support the proposed project. The proposed budget includes the minimum number of personnel required to plan and manage the project effectively. The budget has been carefully crafted to ensure fiscal supports are in place to: (1) travel to and work with participants from Leeward district schools and Kamakau; (2) purchase adequate computer and communication equipment for the successful implementation of the BL intervention; and (3) provide college mentors with stipends and training.

(D) QUALITY OF THE MANAGEMENT PLAN

D.(i) Adequacy of management. Table 1. provides a clear representation of the project object-tives and activities that will be addressed to achieve the identified goals and projected outcomes.

Table 1. Project Management & Evaluation Plan

Activities	*Persons Responsible*	*Timeline*	*What Evaluated*
Administrative Tasks to Launch Project			
Recruit & hire project personnel	PI, CoPI, PC	M1-2	Confirm GEPA hiring; Positions filled
Establish fiscal structure	PI, CoPI, AA	M1-2	Fiscal structure established
Develop stipend process	PI, AA	M1-4	Stipend process established
Obtain human subjects approval, update annually	PI, CoPI, PC,DAE	M1; 12, 24	Human subjects approval obtained; updated
Obj. 1: Formalize existing partnerships w/math, cultural (including Kupuna), disability, & educational experts into a workgroup/advisory panel that informs project activities. (M1)			

Act. 1.i. Identify key personnel from existing partners.	PI, CoPI, PC, MFS, MTS	M1	Key personnel identified; agreement to participate obtained
Act. 1.ii. Hold working meetings to identify basic math, algebraic, & problem solving skills, & math standards & courses that impact the success of NH middle & HS those w/disabilities.	PI, CoPI, PC, MFS, MTS	M2	Work group formalized; meetings held; factors affecting the student success identified
Act. 1.iii. Facilitate a plan for PD implementation, camp activities, & math community days.	PI, CoPI, PC, MFS, MTS	M3	Plan for PD, camp, & math community day developed
Obj. 2: Identify, document, & adapt evidence-based, face-to-face math teaching strategies using NH cultural context & create a BL intervention that includes ITS. (M2-4)			
Act. 2.i. Collect resources & identify evidence-based face-to-face & ITS strategies from Doing What Works, What Works Clearing House & other sources that are demonstrated to improve algebra skills & problem solving regardless of ethnicity or culture.	PC, MFS, MTS, GA	M2-3	Resources collected & reviewed; strategies identified
Act. 2.ii. Identify characteristics of math that provide evidence of improving math performance of NH students including those w/disabilities.	PC, MFS, MTS, GA	M3-4	Effective characteristics identified
Act.2.iii. Document practices & teaching strategies that have shown promise to support improvements in math achievement of NH students in a form of teacher guide & student workbook.	PC, MFS, MTS, GA	M3-4	Effective practices & teaching strategies documented; teacher guide & student workbook developed
Obj. 3: Provide Professional Development to participating teachers (M4-30)			
Act. 3.i. Identify math teachers from each school to participate in Ka Pilina. Math Department Chairs will refer the teachers. Participation is voluntary.	PC, MFS, MTS	M3-24	Teachers contacted & recruited
Act. 3.ii. Utilize the materials developed under objective 2 & provide PD to the teachers during professional learning prep times & weekends.	PC, MFS, MTS, GA	M4-30	PD provided; teachers trained on the intervention
Act. 3.iii. Work w/the Hawai`i Department of Education to establish the PD for teacher credit.	PI, Co-PI	M4-5	HI DOE contacted; PD teacher credit established
Obj. 4: Recruit & provide training to college mentors to work w/NH students during camp & to monitor NH students' ITS usage during the school year (M4-30)			
Act. 4.i. Identify & determine characteristics of specific competencies necessary for college mentors to work w/the targeted participants.	PI, Co-PI, PC, MFS, MTS	M1-5	Mentor characteristics & competences identified
Act. 4. ii. Develop mentor training materials.	PC, MFS, MTS, GA	M2-6	Mentor training materials developed
Act. 4.iii. Recruit NH college students from within the UH system to serve as mentors to participants. Ka Pilina pro-	PI, Co-PI, PC, MFS, MTS	M6-30	Math departments contacted; College students recruited

ject staff will work w/the math departments at each institution to establish a pool of interested candidates.			
Act. 4.iv. Utilize the mentor training materials to provide mentors w/training on mentoring & ITS during the first month of each semester.	PC, MFS, MTS, GA	M7-30	Mentor training provided; mentors trained on mentoring & ITS
Obj. 5: Conduct a pilot test & a feasibility analysis of the BL Intervention & accompanying student workbook, & teacher guide. (M5-8)			
Act. 5.i: Identify & refine critical variables to be addressed in the feasibility study.	PI, Co-PI, PC, MFS, MTS, DAE	M5	Factors affecting feasibility identified
Act. 5.ii: Plan & conduct a pilot/feasibility test of BL intervention including classroom and math camp activities.	PC, MFS, MTS, DAE, GA	M5-8	Pilot test conducted and intervention revised based upon data
Act. 5.iii: Collect & analyze feasibility data informing the project on the BL intervention.	DAE, GA	Collect-M5-8 Analyze-M8	Data collected & analyzed; analysis report made and disseminated to all stakeholders
Act. 5.iv: Collect & analyze feasibility data on mentoring & mentor trainings	DAE, GA	Collect-M5-8 Analyze-M8	Data collected & analyzed; analysis report made and disseminated to all stakeholders
Obj. 6: Facilitate & monitor the teachers' delivery of BL intervention in school. (M9-36)			
Act. 6.i. Work w/teacher participants, after PD, to support them in the use of the BL intervention in the classroom. This will occur as project staff work w/the teachers at least 2 times a wk.	PC, MFS, MTS, GA	M9-36	Teachers facilitated & monitored
Obj. 7: Develop & implement math cultural activities & application to STEM during math camp & math community days to contextualize math & make math meaningful to NH students. (M5-34)			
Act. 7.i. Collaborate w/partners (obj. 1) to develop math activities that are culturally relevant. Involve Kupuna & others to lead culturally & context based activities.	PC, MFS, MTS	M5-8	Culturally relevant math activities developed
Act. 7.ii. Collaborate w/partners to develop math activities that can be applied to STEM learning. Involve other STEM initiatives such as Pacific Alliance for Individuals w/STEM Partnership at CDS.	PC, MFS, MTS	M5-8 - & Ongoing	Math activities applicable to STEM learning developed
Act 7.iii. Inform parents, student participants, teacher participants, & mentors, of the math camp & math community day dates.	PC, MFS, MTS, GA	M9-34 Prior to event	Information disseminated
Act. 7.iv. Work w/staff from LCC to arrange the logistics (e.g., rooms, equipment, & food) associated	AA	M9-34 Prior to and during	Logistics confirmed

w/holding the math camps & math community days on campus. Math community days will also be held at participating schools.		event	
Act. 7.v. Develop math camp & math community day agendas w/input from the workgroup/advisory panel, teachers, student participants, & mentors.	PI, Co-PI, PC	M9-34 Before camps	Agenda developed
Act. 7.vi. Coordinate other logistics such as transportation & disability related needs.	AA	M9-34 Before camps	Logistics for transportation & disability related needs confirmed
Act. 7.vii. Hold math camp for Group I during winter, spring, & summer breaks.	PI, Co-PI, PC, MFS, MTS, GA	M9-34 During breaks	Math camps for Group I held
Act. 7.viii. Hold math camp for Group II during winter, spring & summer breaks.	PI, Co-PI, PC, MFS, MTS, GA	M9-34 During break	Math camps for Group II held
Act. 7.ix. Conduct pre-post assessments of student knowledge of the math content presented.	DAE, GA	M9-34	Pre-post assessments conducted; data collected & analyzed; analysis reports made
Obj. 8: Assess the effects of the BL intervention on students. (M3-34)			
Act. 8.i. Create pre-post assessments to measure student knowledge of algebra I & II concepts.	PC, MFS, MTS, DAE	M3-4	Pre-post assessments developed
Act. 8.ii. Conduct focus groups.	PC, MFS,GA MTS, DAE,	M16, M22 M28, M34	Focus groups conducted
Obj. 9: Assess the effects of PD on teachers. (M3-34)			
Act. 9.i. Create pre-post assessment to measure teacher knowledge of evidence based strategies, culturally relevant education, & NH culture.	PC, MFS, MTS, DAE	M3-4	Pre-post assessments developed and validated
Act. 9. ii. Conduct focus groups.	PC, MFS,GA MTS, DAE,	M16, M22 M28, M34	Focus groups conducted
Act. 9.ii. Administer the pre-post assessments prior to & after participation in the PD.	DAE, GA	M9-34 Aligned with PD	Pre-post assessments administered; data collected & analyzed; data analysis report made
Obj. 10: Assess the effects the effects of cultural math activities & STEM application activities on students. (M3-34)			
Act. 10.i. Create pre-post measure self-efficacy related to math.	PC, MFS, MTS, DAE	M3-4	Pre-post assessments developed
Act. 10.ii. Create pre-post measure on interest level in math & STEM fields.	PC, MFS, MTS, DAE	M3-4	Pre-post assessments developed and validated
Act. 10.iii. Administer the pre-post assessments.	DAE, GA	M9-34	Pre-post assessments administered; data collected & analyzed; data analysis report made
Obj. 11: Disseminate the findings & deliverables. (M12-36)			
Act. 11.i. Present findings & results at relevant conferences.	PI, Co-PI, MFS, MTS, GA, PC, DAE	M12-36	Proposals made & submitted; conference presentations conducted

Act. 11.ii. Hold a teacher session at the annual Pac Rim Conference to inform teachers from Hawai`i, & other locations of the impacts of the project.	PI, Co-PI, PC, MFS, MTS, DAE, GA	M12-36 During Pac Rim Event	Teacher session planned & held
Act. 11.iii. Publish results in relevant journals & locally.	PI, Co-PI, PC, MFS, MTS, DAE	M18-ongoing	Appropriate journals identified; publications submitted and published
Act. 11.iv. Seek out & attend HIDOE math department meetings to inform math teachers of the impacts & outcomes & to provide them w/the finalized BL Intervention materials.	PI, Co-PI, PC	M18-ongoing	HI DOE contacted; presentations made at Math Department meetings
PI=Principle Investigator, Co-PI=Co-Principle Investigator, PC=project coordinator/field specialist, DAE=Data Analyst/Evaluator, MFS=math & field specialist, MTS=math & technology specialist, GA=Graduate Assistant, AA=Administrative Assistant			

D.(ii) Extent time commitments are appropriate and adequate. Table 2 provides the percentage of time personnel will devote to achieving project activities. It illustrates that each objective has an adequate amount of personnel time to ensure the activities are completed in a timely manner. The PI/Director has over 12 years of experience in educating students at risk and has been involved in projects to develop culturally responsive trainings, strategies, and materials in Hawai`i. The PI will work closely with the project coordinator to ensure all proposed activities are implemented efficiently, rigorously, on schedule, within budget and according to design. The Co-PI will serve as a mentor to the PI and will provide direction and guidance on the project. The Co-PI is experienced having directed more than 15 federally funded projects focused on multiple topics, including educational outcomes of NH and other underrepresented groups.

Table 2. Personnel Loading Chart

Project Team	*Obj 1*	*Obj 2*	*Obj 3*	*Obj 4*	*Obj 5*	Obj 6	Obj 7	Obj 8	Obj 9	Obj 10	Obj 11	**Total FTE**
PI	.05	0	.1	.1	.1	0	.1	0	0	0	.05	0.50
Co-PI	Support PI throughout the project at 1 month overload											
DAE	0	0	0	0	. 01	0	.05	.10	.10	.10	.05	0.50
PC	.10	.10	.10	.10	.10	.15	.10	.05	.05	.05	.10	1.00
MFS	.02	.1	.1	.025	.05	.05	.05	.025	.025	.025	.03	0.50
MTS	.05	.10	.10	.10	.10	.10	.10	.10	.10	.05	.10	1.00
GA1	0	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	0.50
GA2	0	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	0.50
AA	0	0	0	0	0	0	.50	0	0	0	0	0.50
Total FTE	0.22	.40	.50	.425	.55	.4	1.00	.375	.375	.325	.43	5.00

D.(iii) Mechanisms to ensure high-quality products & services. The following evaluation plan is closely aligned with the project activities ensuring high quality of all activities and products.

E. QUALITY OF PROJECT EVALUATION

E.(i) Extent the methods of evaluation are appropriate to the context. Considering the importance of understanding context, as well as the need to "assess" the "whole project picture," the formative and summative evaluation will be conducted using the Context Input Process and Product evaluation model (Stufflebeam, 2007). The context and input will be assessed, progress monitored, and project impact and effectiveness determined. The main purpose of the formative evaluation is to provide performance feedback and periodic assessment of project progress toward achieving the goals. The main purpose of the summative evaluation is to determine project impact and effectiveness and provide information about effective math instruction for NH students, replicable in other settings. Objective performance measures, along with mixed-methods, will be used to produce both quantitative and qualitative data.

I. FORMATIVE EVALAUTION: *(Evaluations of context, input, and process)*

A. Goals: The goal of *context evaluation* is to assess and update the needs, as described in section A, of the participating students and teachers, mentors, community, and other stakeholders including partners and kupuna and resources available to the project. The goal of the *input evaluation* is to determine if the project inputs and activities are responsive and sufficient to the assessed needs as described in section A. The goal of the *process evaluation* is to monitor the activities; maintain an up-to-date profile of the activities; and assess the extent of project implementation as planned and described in sections B and D.

B. Data Collection Methods: Data will be collected through meeting notes taken at all meetings; pre and post-surveys of student participants, teachers, and mentors; project activity plans; activity delivery documentation forms; class observations; attendance lists; and ITS use logs.

C. Tools: *i) Teacher pre and post-surveys*. Teachers will complete a needs survey when beginning their participation, during each PD session, and at the end of each semester. The purpose is to find any change in their needs, students' needs, available resources, and inputs;

thoughts of responsiveness and sufficiency of project activities; challenges and actions taken; and ideas for improvement. *ii) Student pre and post-survey*. The students will be asked to complete a survey at the beginning of participation and after each break and semester until they exit the intervention. Its purpose is to find and update their needs pertaining to math and obtain their feedback on the provided activities. *iii) Mentor pre and post-surveys.* Mentors will complete a needs survey when beginning their participation, during each training session, and at the end of each semester. The purpose is to find any change in their needs, students' needs, available resources, and inputs; thoughts of responsiveness and sufficiency of project activities; challenges and actions taken; and ideas for improvement. *iv) Project activity plans* will be collected before implementation to find what is planned. *v) Project activity documentation forms* will be filled out by project staff, mentors, and teachers to document what actually happened, including meetings. *vi) Class observation* will be conducted three times a semester using a checklist and a form to understand how trained teachers apply what they learned during PD in a classroom and provide feedback as well as technical assistance. *vii) Attendance lists* will be used to keep track of the participants' involvement in class, camp, PD for teachers, mentor trainings, mentor participation, math community days, and other project relevant activities and meetings. *viii ITS use computer log* will be retrieved weekly from the software.

D. Data Analysis: Data will be inputted into the database and analyzed after each break and semester activity to provide prompt information for quality improvement. Quantitative data will be analyzed using appropriate statistics with SPSS. Qualitative data will be analyzed using the constant comparison method with NVivo.

E. Measure of Success: More than 90% of students and teachers, evaluating the project activities, will indicated the activities are responsive and sufficient for their needs; 100% of planned activities are implemented; more than a 90% attendance rate by students, teachers, and mentors in activities; observed teacher application of strategies learned in the PD workshops; and observed student engagement in math as measured through observations.

F. Deliverables: Right after each break and semester, a brief data analysis report will be made to

inform the project team of the project performance. The same information will be disseminated to participants and key stakeholders through a newsletter. The reports will be compiled and used in the semi-annual formative evaluation report. This will provide performance feedback about the periodic achievement of the objectives and necessary modifications. This information will be available to the project team and partners.

II. SUMMATIVE EVALUATION: To determine the impact and effectiveness of the project, the summative evaluation activities will be conducted annually. In addition, a *comprehensive* summative evaluation will be conducted during the last 2 months of grant funding to determine the overall effectiveness of the project on the outcomes of NH students.

A. Goals: The goals are to: ensure that the project activities reached the targeted NH population; determine if the project achieved the intended outcomes; and find any unintended outcomes.

B. Data Collection Methods: The student and teacher demographic information will be collected through the teacher pre-survey and school registrars. The intended short-term outcomes will be measured using pre-post surveys of teacher professional development workshop; pre-post camp tests of algebraic concepts and skills that include culturally relevant and STEM application problems; ITS tests; pre-post tests of mathematical problem solving skills; pre-post student and teacher surveys; and student and teacher focus groups. To measure long-term outcomes, state baseline statistics, on the targeted indicators (i.e., HS graduation, enrollment & grades of Algebra I/II courses, COMPASS test scores, & students declaring STEM majors at college or expressing interest in college and majoring in STEM) will be collected by Month 6. On the same indicators, the project participant data will be collected through students, teachers, and school registrars. The data on the intended and unintended outcomes perceived by students and teachers will be collected through the student and teacher post-surveys and focus groups. In addition, mentors will complete an informational form on their experience. A focus group will also be held to understand their mentoring experiences with students and to determine successes, challenges, and ways to improve mentoring. Focus groups with partners and community stakeholders will be held to understand their experience with the community math days and other involvement.

C. Tools: *i) Student demographic information form* (e.g., race, ethnicity, gender, free or reduced lunch status, special education status, and ELL status) will be gathered and completed by teachers or school registrars. *ii) Pre-post surveys of teacher professional development workshops* will be completed before and after each workshop to assess any change in knowledge and attitudes. *iii) Pre-post camp tests of algebraic knowledge and skills* will be developed for each camp, appropriate to the content and level of camp, and administered at the beginning and end of each camp. *iv) ITS tests*: During the semester the students use ITS, each will take several tests given by ITS. This data will be retrieved from the software twice in a semester and compiled. *iv) Pre-post tests of math problem solving skills* will be developed using existing tests by Month 2 and completed by the students at the beginning of participation and in the end of each camp and semester. *iv) Student pre-and post surveys* will include items to measure a) change in the student perception of use of ITS, understanding of math in the NH cultural context, studying and entering math and broad STEM fields, and determination about graduating HS and entering college; b) student evaluation of teachers' math instruction, cultural mentoring with college students; and family and community support; and c) student evaluation of project participation. *v) Teacher pre-post surveys* will include items a) to collect information about demographic and past experience, b) measure change in knowledge and attitudes toward using culturally responsive and evidence-based teaching strategies as well as expectations about NH student performance in math; and c) find their evaluation of project participation. vi) *Student outcome form* will collect information on HS graduation, college enrollment, grades in HS Algebra I/II, and COMPASS test scores. *vii) Student and Teacher focus groups* will be held in the end of every semester to deeply understand their experiences in the project and perceived project outcomes. *viii) A college mentor evaluation form* will be completed at the end of each break and semester about each mentee to assess the student's engagement in mentoring and camp and any change of the student in terms of the short-term and long-term outcome indicators, perceived through mentoring. *ix) College mentor focus group* will be held in the end of every break and semester. *x) Focus group with partners and community stakeholders* will be held yearly.

D. Data Analysis: Summative evaluation data will be analyzed annually. The percentage of students who meet the annual project target will be calculated, and the demographic characteristics of the students will be reported. The quantitative data measured repeatedly will be analyzed using Mixed Models with SPSS. The summary of quantitative information will be presented using descriptive statistics with SPSS. The qualitative data will be analyzed with NVivo.

E. Measure of Success: Statistically significant increases in short-term outcomes and long-term outcomes, when comparing student participants' baseline data to post outcomes data; and positive evaluation by teachers, students, college mentors, partners and stakeholders.

F. Deliverables will include the annual and comprehensive summative evaluation reports. The reports will provide detailed information about effective math instruction strategies for NH students in grade 7 to 12, suitable for replication in other settings. Using the reports, five conference presentations and two journal publications will be made. Newsletter will be written on the results for parents, schools, participants, partners, and other community stakeholders. Presentation at local schools and during math community day will be held.

E.(ii) Extent evaluation provides guidance for quality assurance. The project data analyst/ evaluator will monitor the process and collect quarterly update reports from all staff and partners. The quarterly reports will be summarized within semi-annual formative evaluation reports focused upon processes and annual summative evaluation reports focused upon outcomes. Each evaluation report will include targeted recommendations for quantity and quality improvement for each project objective. The project team and partners will review the recommendations, and actions taken to respond to the recommendations and improve project performance and outcomes.

E.(iii) Objective measures that produce quantitative and qualitative data. The objective performance measures to be used to evaluate the project progress toward, and achievement of the expected outcomes, are described above in B. Data Collection Methods, C. Tools, and E. Measure of Success in both the formative and summative evaluation plans. Using the measures, both quantitative and qualitative data will be collected and analyzed.