Need for Project

A legacy of American colonialism in Alaska has been that Alaska Native children face some of the most dismal educational prospects in the country. Research and experience demonstrates that Alaska Native students score lower than their non-Native counterparts on most measures of academic achievement and few begin or complete post-secondary education.

Community/Target Group: The SYSTEMS Consortium is comprised of five rural school districts, Alaska Island Community Services (a non-profit service agency), and the Wrangell Cooperative Association [***Meets Priority 1: Alaska Native Regional Non-Profit, Letter of Support attached***]. The five school districts are Klawock City Schools, the Craig City School District, Hydaburg City Schools, the Annette Island School District, and Wrangell Public Schools. The SYSTEMS Consortium schools serve approximately 648 Alaska Native students K-12. The free and reduced lunch rate in each school is 50% -100%, *[Table 1*] indicating high rates of poverty in the consortium communities. Research indicates that students who qualify for free and reduced lunch programs typically score significantly lower in the areas of science and mathematics.[1]

Table 1: SYSTEMS Consortium District Demographics[2]

	Student Enrollment	AKN #	AKN %	Secondary Enrollment	Secondary AKN #	% Free /Reduced
Annette Island School District	283	272	96%	119	113	100%
Craig City School District	321	112	35%	175	53	68%
Hydaburg City Schools	53	52	98%	20	20	70%
Klawock City Schools	156	100	64%	69	47	63%
Wrangell City Schools	314	66	21%	185	51	54%
TOTAL	**1127**	**648**		**568**	**284**	

[1] National Assessment of Educational Progress (NAEP), http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid
[2] Alaska Department of Education and Early Development, http://www.eed.state.ak.us/reportcardtothepublic/

Our communities, Craig, Klawock, Hydaburg, Metlakatla and Wrangell are all located in the Tongass National Rainforest. Craig is a first class city located outside of any organized borough on Prince of Wales Island. Fishing, logging and sawmill operations form the basis of the economy and provide most employment in the community. Craig is approximately 31% Alaska Native. Klawock is located about seven road miles north of Craig. It is a first class city outside of any borough. Klawock is primarily Tlingit with a 58% Alaska Native population. The economy is dependent on fishing and cannery operations, with the timber industry playing an increasingly large role. Hydaburg, a first class city outside of any organized borough, is one of the only two Haida communities still in existence in the United States. Located on Prince of Wales Island, its overall population is 89.5% Alaska Native, with a fishing and timber-based economy. Metlakatla, located on the Annette Island Reserve, is the only Federal Indian Reservation in Alaska. It is unincorporated and outside any organized borough. Metlakatla is predominantly Tsimshian, with 89.7% of the total population Alaska Native. Fishing, fish processing and services are Metlakatla's economic base. Wrangell is one of the oldest non-Native settlements in Alaska. It is a home rule city located outside of any organized borough on the northwest tip of Wrangell Island. The Wrangell City School District is the applicant for this grant. Wrangell is 24% Alaska Native. Its economy is based on commercial fishing, timber, and fish processing.

In each community, a large percentage of the population is not in the work force. [*Table 2*] Low employment is often the result of a lack of year-round jobs available to unskilled workers. The jobs most often available year-round in the consortium communities are in government, education, or medical. To be employed in these sectors, individuals must possess some form of post-secondary education. Schools in our consortium are not currently producing Alaska Native

students who progress successfully to college or career training. According to John Pugh, the

Table 2: SYSTEMS Consortium Community Demographics[3]

	Population	% of Adult Population Not in Work Force	Annual Income per Capita	% Below Poverty	% College Degrees (In adults over age 25.)
Klawock	755	39%	$14,621.00	14%	9%
Craig	1201	30%	$20,176.00	10%	23%
Hydaburg	376	66%	$11,401.00	24%	12%
Metlakatla	1405	49%	$16,140.00	8%	14%
Wrangell	2369	31%	$21,851.00	7%	17%
Total	**6106**				
Average		***43%***	***$16,837.80***	***13%***	***15%***

Chancellor of the University of Alaska Southeast, "Many of our students emerge from village communities not-fully-equipped to engage in the rigorous study required by college-level work. Specifically, 66% of our incoming students must enroll in remedial work in English or math prior to taking degree level requirements." He also stated that 25% of students enrolling as freshmen at the University of Alaska Southeast are Alaska Native and historically over half drop out during their first year.[4] There are several gaps in service and opportunities that must be addressed through specialized assistance. First, Alaska Native students are not academically prepared to succeed in post-secondary education. Second, Alaska Native students have few local role models in careers that require post-secondary education. Third, Alaska Native students are not aware of educational or career opportunities available to them.

Alaska Native Students are not academically prepared for post-secondary education. Alaska Native students have unique learning characteristics. Often in their families, the learning paradigm is "watch and do". Then, at school, the paradigm is "listen and represent". At home, learning is contextualized and relevant and at school, it is the opposite. Engagement for Alaska Native students means the work must be relevant, place-based, and taught or guided by a

[3] Alaska Department of Commerce, Community and Economic Development, Community Profiles, http://www.commerce.state.ak.us/dca/commdb/cf_comdb.htm
[4] John Pugh, Chancellor, University of Alaska Southeast, Correspondence, May 5, 2010.

respected other. In schools who have adopted these ideas, student test scores have improved and an increasing number of rural students are attending college and choosing to pursue studies in the fields of science, math, and engineering (STEM).[5] In schools where these ideas have not been adopted, Alaska Native students continue to perform poorly on standardized measures of school success. In the five SYSTEMS consortium districts, 65% of secondary students are proficient in math and only 38% are proficient in science. These results are not adequate to ensure that students are prepared for post-secondary education in science, technology engineering and math (STEM) subjects. "For over six generations, Alaska Native people have been experiencing recurring negative feedback in their relationships with the external systems that have been

Table 3: SYSTEMS Consortium Standards Based Assessment Results, Spring 2010[6]

		Math		Science	
Annette Island School District	Proficient	54	66%	22	50%
	Total Tested	82		44	
Craig City Schools	Proficient	28	82%	11	46%
	Total Tested	34		24	
Hydaburg City Schools	Proficient	17	47%	2	14%
	Total Tested	36		14	
Klawock City Schools	Proficient	39	58%	10	36%
	Total Tested	67		28	
Wrangell City Schools	Proficient	25	69%	5	42%
	Total Tested	36		12	
AVERAGE FOR ALL DISTRICTS			**65%**		**38%**

brought to bear on them, the consequences of which have been extensive marginalization of their knowledge systems and continuing erosion of their cultural identity."[7] External systems in this context include public educational systems where Alaska Native students consistently

[5] Barnhart, R., Hill, F. & Kawagley, A.O. (2006) Alaska Rural Systemic Initiative: Final Report Phase II, 2000-2005, University of Alaska, National Science Foundation.
[6] Alaska Department of Education and Early Development, Report Card to the Public, http://www.eed.state.ak.us/reportcardtothepublic/
[7] Barnhardt, R.,& Kawagley, A.O. (2005) Indigenous Knowledge Systems and Alaska Native Ways of Knowing, Anthropology and Education Quarterly, 36(1), pp.8-23.

underperform[8] in academic areas as measured on standardized tests (SBA, NAEP, Terra Nova). As a result of lack of educational attainment at the secondary level, Alaska Natives are vastly underrepresented in careers that require college degrees, particularly those in science, technology, engineering and math (STEM). The SYSTEMS Project will support students to be more engaged in STEM subjects through culturally relevant, place-based experiential learning, empower teachers to guide learning processes in ways that engage Alaska Native students, and individualize the remediation of basic skills for Alaska Native students who are struggling.

Alaska Native students experience few local role models in careers that require post-secondary education. Each of our communities is experiencing a large percentage of the adult population not in the work force. Low percentages of adults over 25 years of age have college degrees and many live below the poverty line. [*Table 2*] Alaska Native students in the SYSTEMS Consortium schools have few adults in their lives that model diverse career paths. Research shows that young people need a vision of a preferred future career *that they understand* in order that their education become personally relevant and therefore engaging[9]. Alaska Native families are often marginalized by generational weaknesses in educational attainment. The SYSTEMS Project will provide models for Alaska Native students in STEM careers as well as demonstrating that each student may be a scientist, an engineer or mathematician through honoring Alaska Native traditional knowledge and worldview and bridging the gap between Alaska Native culture and the culture of Western science.

Alaska Native students are not aware of the opportunities available to them. An estimated 2,748 new STEM-related positions will be created in Alaska through 2018 and an additional 5,376 will open as workers retire, change occupations, or leave the labor force. All

[8] Alaska Department of Education and Early Development, http://www.eed.state.ak.us/stats/.
[9] Terenzini, P.T., Cabrera, A.F, Deil-Amen, R. & Lambert, A. (2005) The Dream Deferred: increasing the College Preparedness of At-Risk Students, Year 4, Final Report, Gear UP, USDOE.

together, more than 8,100 projected STEM openings will need to be filled.[10] An estimated 95 percent of STEM workers need more than a high school diploma for their positions, compared to just 47 percent of non-STEM workers. College degrees that prepare workers for STEM occupations require more math and science courses, and preparation for those classes begins in grade school. Our students need a clear vision of what is possible for them and they need support in finding the pathways to STEM careers. In order to do this, Alaska Native students need several types of support, which include school, family, and community. The SYSTEMS Project proposes to reach Alaska Native students through providing knowledge and training to multiple stakeholder groups in order that students feel confident and competent in their ability to achieve in STEM subjects in school as well as in STEM careers following post-secondary education.

Project Design

The SYSTEMS Project utilizes a STEM education approach to guide the development of curricula and learning processes. This approach is consistent with place-based learning and culturally relevant education. Our goal is to help bridge the gap between Alaska Native knowledge systems and Western science in order that Alaska Native students substantially increase preparedness for college and career. STEM education, with culturally relevant, place-based learning will empower Alaska Native students participating in the SYSTEMS project to increase self-efficacy as learners and leaders in STEM subjects.

What is STEM Education? STEM education is a process that offers all students an opportunity to make sense of the world holistically. STEM education removes traditional barriers and integrates separate subject areas into a cohesive teaching and learning paradigm. It

[10] Stimpfle, E. & Mosher, T., (2011) *Science. Tech, Engineering and Math: Knowledge Workers in Alaska*, Alaska Economic Trends, Vol. 31, No.2, pp 4-12.

offers students opportunities to make sense of the world and take charge of their learning, rather than focusing on isolated bits and pieces of content. It is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise. STEM skills include critical thinking and problem solving, communication, creativity and innovation, collaboration, information and media literacy, and contextualized learning. The SYSTEMS Program will work with students, teachers, and communities in the five consortium districts to further the goals of STEM education to help ensure our students have access to the opportunities of tomorrow.

Bridging the gap between Alaska Native Knowledge and Western science: Research in Alaska Native education validates that when presented with scientific information in ways that honor traditional knowledge systems; students are more successful in gaining and retaining understanding.[11] While Western science and education tend to emphasize compartmentalized knowledge, which is often de-contextualized, indigenous people have traditionally acquired their knowledge through direct experience in the natural world.[12] The SYSTEMS Project will find common ground between Alaska Native and Western science and thinking. In indigenous settings, students best understand explanations of natural phenomena if they are cast first in indigenous terms to which they can relate, and then explained in Western terms. The SYSTEMS Project staff will be trained in culturally relevant methods and will have the benefit of working with Alaska Native elders who are able to help address the Alaska Native worldview.

Place-Based Learning: The importance of linking education to the physical and cultural environment in which the student/school is situated has special significance in indigenous

[11] Barnhardt, R.,& Kawagley, A.O. (2005) Indigenous Knowledge Systems and Alaska Native Ways of Knowing, Anthropology and Education Quarterly, 36(1), pp.8-23.
[12] Barnhardt, R. & Kawagley,A.O., (2010) *Alaska Native Education: Views from Within,* UAF.

settings, where people have acquired a deep and abiding sense of place and relationship to the land in which they have lived for millennia.[13] Place-based learning focuses on the local community of a student. It provides learners with a path for becoming active citizens and stewards of the environment in the place where they live. The approach emphasizes hands-on, real world experiences that challenge students to learn and solve problems.

The SYSTEMS Project: The SYSTEMS Project has four key components based the needs or our target population and on the Juneau Economic Council's *Framework for Developing STEM Literacy Skills K-12*.[14] These components are STEM skills for all, purposeful design and inquiry, basic skills and knowledge, and 21st century content. The components together reinforce the goal that all students graduate prepared for career and college. [*See SYSTEMS Project graphic, Appendix 1.*]

STEM Skills for ALL: *Kindergarten through 12th grade*-- Students lose interest in STEM subjects early, often by fifth grade.[15] Keeping students engaged in STEM subjects is essential. SYSTEMS Project students will work with elementary students in their districts to help young students become and stay interested in STEM subjects. Also, the SYSTEMS project will provide on site professional development through 1-4 hour sessions for all STEM teachers (K-12) in each district. These sessions will include philosophy, materials, and modeling.

STEM Literacy—Research shows that schools and communities are not fully aware of the need for STEM education. Trends in the Alaskan and national economy powerfully reflect the need for students to be prepared in STEM education for our future.[16] An extensive public

[13] Barnhardt, R., & Kawagley, A. O. (2005). Indigenous Knowledge Systems and Alaska Native Ways of Knowing. *Anthropology and Education Quarterly*, 36(1), pp. 8-23.
[14] *A Framework for Developing STEM Literacy Skills K-12*, Juneau Economic Development Council, Nov, 2011.
[15] The Institute of Engineering and Technology (2008) *Studying STEM: What are the Barriers?*
[16] Stimpfle, E. & Mosher, T., (2011) *Science. Tech, Engineering and Math: Knowledge Workers in Alaska*, Alaska Economic Trends, Vol. 31, No.2, pp 4-12.

relations and media campaign will be conducted by the SYSTEMS Project both in the consortium communities and to a wider audience through our website. Through print and web media, public presentations, and email marketing techniques the SYSTEMS Project with both share information and gather feedback.

Careers Presentations--Nearly two thirds of teens indicated that they might be discouraged from pursuing a career in STEM because they do not know anyone who works in these fields (31%) or understand what people in these fields do (28%).[17] The SYSTEMS Project will connect Alaskan role models in STEM education with students at multiple levels. First, professionals in STEM careers will co-instruct during presentations at the SYSTEMS Station 10 and 20-day experiences. Second, SYSTEMS staff will connect with STEM professionals in each district and engage them to present at schools during career days, in science classes, or to join field trips or other place-based experiences. Third, the SYSTEMS Project staff and students will create digital media (videos) of STEM Professionals at work to share with students both at schools and on the SYSTEMS Project website.

Purposeful Design and Inquiry: *Curriculum Integration*—Curricular integration of STEM subjects is essential. Scientific thought should not be limited to the science classroom. The habits of mind inherent in problem solving, creating solutions, and experimental design should be utilized throughout a student's academic program. The SYSTEMS Project will support curriculum integration through providing teacher professional development in the design of integrated units of instruction. Other professional development at each district site will be customized to district curricular needs; this might include support with 1:1 technology initiatives, K-12 curricular design, or mentoring teachers in the classroom. With the support of the Alaska

[17] Thomas B. Fordham Institute, High Achiever Un-helped, by NCLB, (2008).

Staff Development Network, the SYSTEMS Project will provide a credit earning college course for teachers focusing on integrating STEM subjects into the curriculum.

Hands On Investigations & Rigorous Real-World Problem Solving Experiences—One of the cornerstones of the SYSTEMS Project are the culturally relevant, place based STEM education experiences for both students and teachers on the SYSTEMS Station. The SYSTEMS Station is a fully functional floating science lab anchored in the Wrangell Narrows. Students will have the opportunity to participate in 10-day intensive STEM experiences with peers from their home district in order to develop student STEM leaders and enhance student understanding and engagement in STEM subjects. Also, students will be able to participate in 20-day summer sessions with peers from various communities in order to further develop STEM learning and leadership. While participating in the SYSTEMS Station experience, students will engage in place-based real world experiments in subjects including marine biology, forestry, and geology. Students will gather data, provide interpretations, record processes, and then present results. Then to support enhanced instruction for students in each district, STEM teachers from each district will be able to engage in shorter-term SYSTEMS Station sessions designed as professional development. Teachers will learn techniques of teaching in the field, philosophy of STEM education, design a mini-unit for use in the classroom upon return, and develop a network of STEM teachers in the Southern Southeast Alaska region.

Place-Based Education—Understanding of place is essential to the SYSTEMS Project. Alaska Native students have an inherent understanding of the characteristics of their environment. They are often natural scientists and display methods of inquiry that provide knowledge to help continue their Native lifeways. Through illustrating methods of instructional

design in STEM education, the SYSTEMS Project will enhance understanding of "place" as well as encouraging habits of mind and processes including problem solving and critical thinking.

Basic Knowledge and Skills: While STEM topics are of vital importance to the Alaskan and national economy; basic knowledge and skills in all subjects are vital to enhanced preparedness for college and career. The SYSTEMS teacher at each district site will provide tutoring, mentoring, and advocacy for Alaska Native students struggling in any academic subject. Special attention will be paid to reading and writing.

21st Century Content: *Scientific and Technological Immersion*—The SYSTEMS Station experience is an intensive immersion into science, technology, and math. Through real-world experimentation, connections with STEM professionals, and collaboration with peers, and design of digital products, students will learn what it takes to be a scientist and/or technology in Southeast Alaska. Students will produce products that display the analysis of data, digital imagery that illustrates scientific processes, and written journal accounts of their experience.

Collaboration with Peers—Connections, communication, and collaboration are essential skills in the 21st century. The SYSTEMS Project will provide students with opportunities to connect with peers, instructors, and professionals, to communicate in writing, speaking and through digital skill development, and to collaborate with peers in the creation of products that demonstrate their learning.

Goals, Objectives and Activities:

GOAL I: Alaska Native student preparedness for college and career in STEM subjects will substantially improve as a result of participation in the SYSTEMS Project.

Objectives:

1. Each year, 100% of students participating in the SYSTEMS Project will graduate from high school with increased preparation in STEM subjects as measured by graduation rate, transcripts, and HSGQE scores.

2. By the end of the three-year grant cycle, 100% of students who participated in the SYSTEMS Project will score proficient or advanced on the Alaska Standards Based Assessment (SBA) in science and math.

3. Each year, 100% of students participating in the SYSTEMS Project will increase awareness of STEM careers as indicated by self report surveys, interviews and focus group participation.

4. Each year, 100% of students participating in the SYSTEMS Project will report increased self-efficacy as learners and leaders as measured by efficacy assessment processes conducted weekly through SYSTEMS teachers and the director.

Activities [See Activities Chart pages 15-17]:

a. Each year, 100% of selected Alaska Native students will participate in a 10 day and/or 20 day culturally relevant, place-based, intensive STEM education experiences.

b. 100% of participating Alaska Native students will improve STEM learning and leadership with the support of an on-site SYSTEMS teacher annually.

c. By the end of the three-year grant cycle, 100% of participating Alaska Native students will enhance basic skills through tutoring, mentoring and advocacy from an on-site SYSTEMS teacher.

d. By the end of the three-year grant cycle, 100% of participating students will gain understanding of STEM careers through presentations and mentoring by STEM professionals in their communities.

e. By the end of the grant cycle, 100% of participating students will be culturally empowered through interactions with Alaska Native community elders.

In order to meet this goal and the four objectives aligned with it, a half time teacher will be hired at each district site. Each will receive training in culturally relevant, place based learning processes. The teachers will also be trained in the philosophy of STEM education and will work collaboratively with the other SYSTEMS teachers, the SYSTEMS director, and the SYSTEMS Station coordinator to establish an annual calendar to ensure all activities that the SYSTEMS teachers are responsible for are completed on time.

The SYSTEMS Station Coordinator will work with Alaska Island Community Services (AICS) administration to recruit and hire staff for the SYSTEMS Station. They will then

schedule the 10-day intensive experience for each consortium district. Each 10-day experience consists of hands-on learning, real fieldwork and data gathering, mentoring by STEM professionals, and connections with Alaska Native elders. AICS has extensive experience operating outdoor experiential programs. They will be managing all travel, coordination, food, and materials for students while at the SYSTEMS Station. In the spring the SYSTEMS Station Coordinator and AICS will schedule and plan the 20-day summer intensive experience.

GOAL II: Teacher effectiveness in instructing Alaska Native students in STEM topics will increase through enhanced awareness and skills in culturally relevant, place based, STEM education as a result of the SYSTEMS Project.

Objectives:

5. Each year, 100% of STEM teachers participating the SYSTEMS Project will implement culturally relevant, place based learning units of instruction in their classrooms as measured by written units of instruction posted on the SYSTEMS website with completed learner products.

6. Each year, 100% of STEM teachers participating the SYSTEMS Project will report improvement in skills and ability to deliver STEM Education to Alaska Native students as indicated through surveys, interviews, and participation in focus groups.

Activities [see Activities Chart page XX]:

f. Each year, 100% of selected STEM teachers from each district will participate in an intensive culturally relevant, place-based STEM education professional development experience at the SYSTEMS Station.

g. Each year, 100% STEM teachers from each district will have access to SYSTEMS teachers and staff to support STEM education implementation in the classroom and surrounding environment.

h. By the end of the grant cycle, 100% of participating STEM teachers from each district will earn college credit if they elect to participate in a STEM curriculum development course.

i. Each year of the grant cycle, SYSTEMS teachers will model culturally relevant, place based STEM education in their district.

j. By the end of the grant cycle, 100% of STEM teachers (K-12) in each district will participate in professional development sessions focused on the integration of culturally relevant, place-based STEM education.

To meet this goal the SYSTEMS Project Director and a place-based experiential learning expert will travel to each consortium community to explain the program, gather feedback from the teachers, staff, and administration in each school, and provide information on the professional development opportunities available. The SYSTEMS Project Director will recruit secondary STEM teachers to participate in the first SYSTEMS retreat. Then, the SYSTEMS Project Director will work with the SYSTEMS teachers and school administration to schedule professional development opportunities throughout the year.

GOAL III: Increase awareness in schools and communities of the need for Alaska Native knowledge and lifeways in STEM education that will lead to enhanced programming for Alaska Native students.

Objectives:

7. By the end of the three-year grant cycle, 100% of teachers and administrators in consortium districts will report increased understanding of and willingness to implement culturally relevant, placed based learning in STEM Education as indicated by survey and interview responses.

8. Each year of the three year grant cycle, parent/community awareness of the importance STEM education will increase 33%+ resulting in a 100% increase by the end of the grant cycle as measured by survey and interview responses.

Activities [See Activities Chart, pages 15-17]:

k. SYSTEMS students and staff will produce a media rich, interactive website that provides information on STEM education.

l. SYSTEMS students and staff will produce print resources on STEM education to be distributed in consortium communities.

m. SYSTEMS students and staff will conduct quarterly multi-media presentations on STEM education in each of the consortium schools and communities.

In order to meet this goal, the SYSTEM Director will purchase the equipment and software necessary to develop a web presence. The SYSTEMS project director will train SYSTEMS staff and teachers in the use of the equipment in order that it is used effectively. The SYSTEMS Project Director will train staff how to use digital tools to create brochures, flyers,

ACTIVITY CHART (Page 1 of 3)					
Activity	**Need Addressed**	**Outcome**	**Evaluative Method/Measure**	**Responsible Party**	**Timeline**
100% of selected Alaska Native students will participate in a 10 day and/or 20 day culturally relevant, place-based, intensive STEM experiences.	Alaska Native students are not prepared for post-secondary education.	Students will gain efficacy as learners and leaders in STEM topics. They will share knowledge upon return to their home community.	▪ Students will self report increased self-efficacy. ▪ Students will produce digital records of their experience.	SYSTEMS Teachers SYSTEMS Station Coordinator SYSTEMS Director	Student selection in Sept/Oct., 5 ten-day experiences offered throughout the year, Two 20-day summer sessions.
100% of participating Alaska Native students will improve STEM learning and leadership with support from a SYSTEMS teacher.	Alaska Native students are not prepared for post-secondary education.	Students will learn to use media to communicate with various audiences. Students will write, speak, & collaborate well.	▪ Students deliver multi-media presentations in school & community. ▪ Students will participate in STEM leadership	SYSTEMS Teachers SYSTEMS Director	Quarterly presentations by SYSTEMS students. STEM leadership group established by Oct 2011.
100% of participating Alaska Native students will enhance basic skills through tutoring, mentoring and advocacy of SYSTEMS.	Alaska Native students are not prepared for post-secondary education.	Students who are struggling will increase their skills in core subjects such as reading and writing.	▪ Attendance logs for tutoring sessions ▪ Student grades (pre-post) ▪ Narrative of advocacy efforts.	SYSTEMS Teachers	Establish tutoring schedule Sept 2011. Ongoing.
100% of participating students will gain understanding of STEM careers through presentations by STEM professionals in their communities.	Alaska Native students have few local role models in careers that require college.	Students will internalize a vision of career possibilities including understanding of STEM careers.	▪ Digital presentations of STEM careers. ▪ Attendance at presentations & # of presentations. ▪ Digital recording of STEM Career presentation	SYSTEMS Teachers SYSTEMS Director	Recruit STEM professionals in communities (Sept-Nov) Schedule and implement presentations in each community. (Oct-May)

ACTIVITY CHART (Page 2 of 3)					
Activity	**Need Addressed**	**Outcome**	**Evaluative Method/Measure**	**Responsible Party**	**Timeline**
100% of participating students will be culturally empowered through interactions with Alaska Native community elders.	Alaska Native students are not aware of the opportunities available to them.	Students will feel culturally valued and thereby increase confidence and efficacy.	▪ Bio of Alaska Native elder ▪ Digital recording of presentation and/or interaction.	SYSTEM Director	Recruit Alaska Native elders. (Sept-Nov) Schedule & give presentations (Oct-May)
100% of selected STEM teachers will participate in a culturally relevant, place-based STEM education PD experience.	Alaska Native students are not prepared for post-secondary education.	Students will have the benefit of more effective teachers in STEM subjects.	▪ Pre/Post self-report on teaching skill and efficacy. ▪ # of participants in professional development	SYSTEM Director SYSTEM Station Coordinator	Select participant teachers in October and March. Retreat in Fall and Spring
100% STEM teachers will access SYSTEMS teachers to implement STEM in the classroom	Alaska Native students are not prepared for post-secondary education.	Students will have the benefit of more effective teachers in STEM subjects.	▪ Service log from SYSTEMS teacher ▪ Digital products such as photos and video.	SYSTEMS Teacher	(Sept) School presentations offering support. Monthly emails.
100% of participating teachers will earn college credit participatg in a STEM curriculum course.	Alaska Native students are not prepared for post-secondary education.	Students will have the benefit of more effective teachers in STEM subjects.	▪ # of teachers signed up for college course ▪ # of teachers completing course	SYSTEMS Director	Course begins in late September. (Distance Education) Course ends in May
SYSTEMS teachers will model culturally relevant, place based STEM education in their district.	Alaska Native students are not prepared for post-secondary education.	Students will have the benefit of more effective teachers in STEM subjects.	▪ Digital products from the classroom (exemplars). ▪ Completed model unit plans.	SYSTEMS Teacher SYSTEMS Director	September - May

ACTITIVITY CHART (Page 3 of 3)					
Activity	**Need Addressed**	**Outcome**	**Evaluative Method/Measure**	**Responsible Party**	**Timeline**
100% of STEM teachers (K-12) in each district will participate in professional development sessions.	Alaska Native students are not academically prepared for post-secondary education.	Students will have the benefit of more effective teachers in STEM subjects.	▪ # of teachers who attended professional development ▪ Session post evaluations ▪ Integration "reports"	SYSTEMS Teacher SYSTEMS Director	Quarterly professional development sessions at each district.
SYSTEMS students and staff will produce a media rich, interactive website.	Alaska Native students are not aware of the opportunities available to them.	Schools & communities will have access to information through website	Completed website with digital images, video, audio, downloadable resources, surveys, polls and connections to social media.	SYSTEMS Teachers SYSTEMS Station Coordinator SYSTEMS Director	Beginning in September and then ongoing.
SYSTEMS students and staff will produce print resources on STEM education to be distributed.	Alaska Native students are not aware of the opportunities available to them.	Individuals in the schools and communities will have increased awareness of STEM education.	▪ Completed print resources. ▪ Distribution log.	SYSTEMS Teachers SYSTEMS Director	Create print materials Sept and Oct. Distribute Oct, Nov, and Dec. Distribution #2 April and May
SYSTEMS students and staff will conduct quarterly multi-media presentations on STEM education in each of the consortium schools and communities.	Alaska Native students are not aware of the opportunities available to them.	Stakeholders will increase awareness of STEM ed and thereby advocate for the use of culturally relevant, place based learning.	▪ # of presentation conducted by staff ▪ # of presentations conducted by students ▪ Presentation post-evaluations by participants	SYSTEMS Teachers	Preparation for presentations. Quarterly multi-media presentation.

and posters that illustrate program activities. Then, the staff will train students during the intensive program as well as back at their district site. Four of the five districts have a one to one laptop program in their schools. This technology will be very helpful to developing students to where they use and integrate technology seamlessly into their learning.

Management Plan

The SYSTEMS Project will begin in each of the consortium districts in the fall of 2011. The following timeline indicates the sequence of core activities. [*For more detail, see the Activities Chart, pages 15-17*.]

Table 4: Timeline of Core Program Activities

Activity	Anticipated Start Date
Hire SYSTEMS Project Personnel	August and September 2011
Purchase all needed equipment and materials.	August and September 2011
Initial training for SYSTEMS Teachers	September 2011
SYSTEMS Director and experiential coordinator travel to consortium districts to introduce the program.	September 2011
Recruit student participants.	September and October 2011
Recruit STEM teacher participants	September and October 2011
Recruit STEM Professionals and elders.	September and October 2011
Schedule stakeholder training, professional development, presentations, and SYSTEMS intensives.	October 2011
Begin SYSTEMS Website	November 2011
SYSTEMS Station intensive culturally relevant, place based experience for students.	Five sessions scheduled throughout the year.
SYSTEMS Station intensive culturally relevant, place based experience for teachers.	Two sessions, one in fall and one in spring.
Professional development for teachers.	September 2011 then ongoing.
Evaluation Processes	See Evaluation Timeline
20-day summer place-based experience for students.	June 2011

The 1 FTE Project Director will provide direction and leadership for the project. The project director will be employed by AICS. The project director shall be familiar with school district administration, grants administration, technology, professional development, teacher supervision and Alaska Native education. The Project Director currently with the project has

been a middle school and elementary principal, a grants administrator for several large Alaska Native Education grants, has a Master's degree in educational technology, has extensive experience in professional development processes, and is an Alaska Native from Metlakatla. She has lived and worked in Southern Southeast her entire life. The director will work closely with the SYSTEMS Project staff to ensure that all project activities occur in an organized and timely manner. (*See Camille M. Booth resume.)*

The 1 FTE SYSTEMS Station Coordinator will provide direction and supervision of the day-to-day operations of the SYSTEMS Station. The coordinator is highly experienced in placed based experiential learning. (*See Erik S. Wortman resume*.)

The five .5 FTE SYSTEMS Teachers will be hired by each respective consortium district. Their role is to represent the SYSTEMS Project at their sites. These teachers must have a Type-A Alaska teaching certificate and have at least three years of teaching experience. Since they are serving as teacher mentors, new teachers will not be considered.

AICS will provide contract services to the SYSTEMS Project. Alaska Island Community Services (AICS) is in its 20th year of operation and provides medical, dental, pharmacy, behavioral health, and senior and developmentally disabled services to the community of Wrangell and several other island communities in Southeast Alaska. AICS is a not for profit 501c3 and is governed by a community based board of directors. AICS is a drug and alcohol counseling center, community mental health facility, community health care centre under the FQHC 330 program, and a licensed residential childcare facility. The agency also has substantial experience operating wilderness based education and therapeutic programs. The ICS Alaska Crossings program is the largest wilderness youth program in the state and provides services to over 250 youth each year. As well, the wilderness program has provided science programs for

youth from across Southeast Alaska. The program owns and operates the state of the art SEA Island Marine Research Station, which will serve as the SYSTEMS Station.

The Independent Project Evaluator will contract with the SYSTEMS Project to provide quality feedback on the place-based, experiential element of the SYSTEMS Project. The evaluator has extensive experience researching and evaluating place-based, experiential programming. [*See Keith C. Russell resume*.]

Table 5: Key Positions to the SYSTEMS Project

SYSTEMS Project Personnel	Position Description
SYSTEMS Project Director (1 FTE)	▪ Promote goals of SYSTEMS Project at consortium schools and communities. ▪ Provide administrative oversight of all SYSTEMS Project staff. ▪ Collaborate with the Wrangell Community Cooperative as partner in the consortium. ▪ Provide professional development for consortium schools staff. ▪ Provide training in STEM education for community members of SYSTEMS consortium communities. ▪ Maintain meaningful contact with consortium district leadership. ▪ Collect data for district portion of the evaluation. Author and submit reports for both formative and summative evaluative processes on time and in the correct format. ▪ Share successes through a variety of media. ▪ Serve as webmaster for SYSTEMS Project website.
SYSTEMS Station Coordin-ator (1 FTE)	▪ Provide logistical oversight of SYSTEMS Station facility. ▪ Schedule SYSTEMS Station activities. ▪ Supervise SYSTEM Station personnel. ▪ Provide training to stakeholders when needed. ▪ Gather data for evaluative processes. ▪ Utilize digital media to "tell the story" of the SYSTEMS Station. ▪ Report to AICS Coordinator and SYSTEMS Project Director ▪ Work with students involved in SYSTEMS project.
SYSTEMS Teachers (.5 FTE x 5)	▪ Serve as SYSTEMS Project supervisor within school districts. ▪ Maintain contact with project director. ▪ Supply information and specific student data to project director. ▪ Mentor teachers in STEM education and place-based learning. ▪ Tutor, mentor and provide advocacy for SYSTEMS students. ▪ Recruit students for the program. ▪ Teach at least two STEM content courses in district in order to model STEM educational processes.

Alaska Island Commun-ity Services	▪ Provide the marine research lab facility. ▪ Hire and supervise all SYSTEMS Station staff. ▪ Supervise the project director. ▪ Provide oversight on all intensive place based experiences.
Indepen-dent evaluator	▪ Collect data from SYSTEMS Project Director. ▪ Collaborate with project director on final reports. ▪ Author and submit formative and summative reports on place-based experiential education.

Project Evaluation

A rigorous evaluation program will guide the SYSTEMS Project. As evidenced by the data collection chart on pages 24-25, several different types of data will be collected. The information to be collected is both formative and summative. Much of the data will help manage the project effectively as well as establish whether program activities produced the desire outcomes. The project director is heavily responsible for much of the data gathering. [*See Camille M. Booth resume*] The external evaluator [*See Keith Russell resume*] will receive the data and complete analysis on the data based on program goals and objectives. He will then co-author the evaluation with the director. The director is primarily responsible for formative evaluation to ensure continuous program improvement. The external evaluator is responsible for summative evaluation to determine if the goals and objectives have been accomplished.

The following evaluative questions will guide the SYSTEMS evaluation:

- To what extent does an intensive culturally relevant, place based STEM education experience impact an Alaska Native student's trajectory towards college?
- How does culturally relevant, place-based education training impact students and teachers in terms of efficacy in STEM subjects?
- What community training, events, media or processes are most effective in raising awareness and changing attitudes about the importance of STEM education?

The SYSTEMS Project will begin in August of 2011. It will begin with the immediate deployment of online surveys for staff, administration and students in each consortium school. We have multiple methods of soliciting feedback to inform the program and to determine success. Surveys will be created on SurveyMonkey or other online survey software and deployed either through email or through the SYSTEMS website. This method of collection will continue throughout the grant cycle. Then we will create tools such as interview and focus group protocols in order to gather data through direct questioning. We will also utilize such measures as student test results, products created for the SYSTEMS Project, attendance at training or professional development, and pre and post efficacy reporting.

TABLE 6: Evaluation Timeline

Evaluative Element	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Individual Responsible
Student intake survey		X	X										SYSTEMS Teacher
Student quarterly survey				X			X			X			SYSTEMS Teacher
Student interviews				X			X			X			SYSTEMS Teacher
Student focus groups						X			X				Director
Pre and Post Efficacy Assessment	Following each SYSTEMS intensive place-based experience.												Coordinator and Evaluator
Digital Reflections										X	X		Director
Scores on GORT-4 Test		X	X										SYSTEMS Teacher
Science and Math SBA Scores		X								X	X		Director
Student Grades										X	X		Director and Teacher
SYSTEMS Teacher Survey	X	X									X		Director
SYSTEM Teacher focus group						X							Director
Pre and Post Efficacy Assessment	Following each SYSTEMS intensive place-based experience.												Coordinator and Evaluator
Attendance Logs		X	X	X	X	X	X	X	X	X			SYSTEMS Teacher
STEM Teacher Survey		X	X						X	X			SYSTEMS Staff
Quarterly Survey				X			X			X			SYSTEMS Staff
STEM Teacher				X			X			X			Director

Interviews													
STEM Teacher Focus Group						X			X				Director
Pre and Post Efficacy Assessment	Following each SYSTEMS intensive place-based experience.												Coordinator and Evaluator
Coordinator Observations					X					X			Station Coordinator
Attendance @ Professional Development		X	X	X	X	X	X	X	X	X			Director
Administrator Surveys		X								X			Director
Administrator Interviews				X						X			Director
Workshop Evaluations		X	X	X	X	X	X	X	X	X			Director
Community member surveys		X	X	X	X	X	X	X	X	X			Director
Community Phone Interviews			X					X					SYSTEMS Staff
Parent survey			X							X			SYSTEMS Staff
Parent interview			X							X			SYSTEMS Staff
Create surveys and instruments	X	X	X										Director and Evaluator
Data Analysis									X	X	X		Director and Evaluator
Report Design and Development									X	X	X		Director and Evaluator
Report Dissemination										X	X	X	Director and Evaluator

All evaluation results, both formative and summative will be published on our website. In order to emphasize the importance of STEM education, we need to demonstrate success with both students and teachers. Using digital media to illustrate activities and then substantiating processes with quality data and aggregated results will reinforce the utility of educational innovation to support underserved groups of students.

Table 7: Data Collection Methods

Data Collection (From)	**Survey**	**Individual Interview**	**Focus Group**	**Response to Program**	**Observations**	**Quantitative (Output)**
Students	Intake survey. Quarterly survey completed online.	Interview 10% of students in program using interview	At mid-year and at end of year, a consortium group	Pre and post SYSTEMS station program assessment	Student digital reflections including discussion of	Scores on initial GORT test and then annual

		protocol.	will convene to discuss the program. Using focus group protocol.	using efficacy instrument.	experience based on guiding rubric.	test. Science and math SBA scores annually. Final grades annually.
SYSTEMS Teachers	SYSTEMS teacher profile as pre-assessment of place-based instructional efficacy.	X	Twice yearly audio conference with SYSTEMS teachers. Use focus group protocol.	Pre and post SYSTEMS station program assessment using instructional efficacy instrument.	Regular reporting of program observations using specific collection tools.	Attendance logs for participating students. (For group sessions and meetings.)
District STEM Teachers	Initial survey when student enters the program. Quarterly survey to determine progress.	Interview 10% of STEM teachers in consortium districts using interview protocol.	A group will be convened annually to discuss the program and concerns.	Pre and post SYSTEMS station program assessment using instructional efficacy instrument.	X	X
SYSTEMS Station Coordinator	X	X	X	X	Regular reporting of program observations using specific collection tools.	Collection of data from students at SYSTEMS station.
Director	X	X	X	Attendance at training opportunities.	Review school documentation that	Annual Standards Based Assessme

					indicates student success or failure (grades, discipline record, testing)	nts (SBAs)
School Administration	Survey to determine how administrators (both principals and superintendents) view the program.	At mid-year using specific interview protocol. Speak to all principals and superintendents.	X	Workshop evaluations with attendees.	X	X
Community Members	General survey to determine awareness of place-based experiential learning and cultural relevance program. (Online survey)	Phone interviews with randomly selected residents from each community about STEM education and careers.	X	Workshop evaluations with attendees.	X	X
Parents & Families	Initial survey when student enters the program. Quarterly survey to determine progress.	Interview 10% of parents of participating students using interview protocol between mid-year and end of year.	X	Workshop evaluation with attendees.	Gather anecdotal responses to program.	X