

## A. NEED FOR THE PROJECT (20 POINTS)

### Major Need: Improve Academic Performance Among Alaska Native Students

This three-year proposal seeks to address the persistent academic gap between American Indian/Alaska Native (AI/AN) students and their majority culture counterparts. Merriam (1928) noted this almost a century ago. Then and now, curriculum was not relevant to the students, local knowledge was not used, and there was a high teacher turnover rate (*White House Conference on Indian Education*, 1992). In Alaska, a typical AN majority, rural school district scores between the 10th and 30th percentile in math on Alaska's Benchmark exam, while a typical urban school scores between the 40th and 70th percentile (<http://www.eed.state.ak.us/stats/>). In the school districts that we propose to partner with, all of them with a majority of Alaska Native students<sup>1</sup>, from 44% to over 90% of 6<sup>th</sup> grade students were not proficient in math on the benchmark tests in 2004. The potential project schools have over three times more limited English proficiency students than the statewide average (55% compared to 15.3% statewide). These same schools have a teacher turnover rate approximately three times greater than urban Alaska school districts, and have higher poverty rates and lower literacy rates. All of these factors put these students at academic risk. Later in this section, we suggest a partial remedy to this situation.

Ever since Merriam's 1928 report, culturally based instruction has been suggested as one way to close the gap between AI/AN and majority culture students. In Alaska, one key untapped educational resource is the wisdom of the elders: using their knowledge and expertise (Barnhardt & Kawagley, 2005; Lipka, with Mohatt and the Ciulistet, 1998; Cajete, 1993).

The promise of culturally based curriculum and pedagogy is to increase students' access to academic content through materials that students can identify with (local knowledge), thus

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<sup>1</sup> With the exception of the Juneau Public School System, where we plan on initially working with their Tlinglit immersion program in two of their elementary schools.

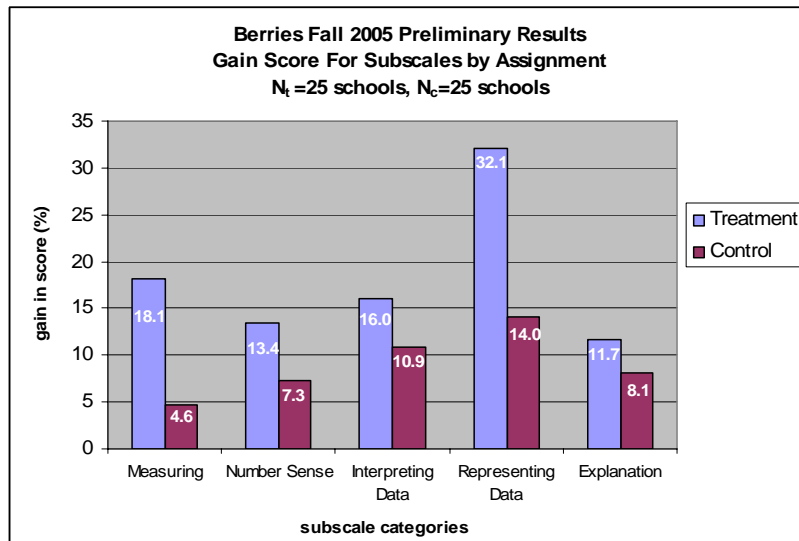
increasing their motivation to learn. Numerous federal reports such as *Indian Nations at Risk* (1991) and the *White House Conference on Indian Education* (1992) have called for culturally based curriculum (CBC) and pedagogy. These reports are supported by Vygotsky's theory (1978) that stresses the social nature of all human activity and situates learning within social and cultural contexts. Thus, research and theory strongly suggest that by tapping into local knowledge, local ways of organizing knowledge and local ways of teaching, we can improve AI/AN students' academic achievement.

We propose using Math in a Cultural Context (MCC), a culturally based curriculum developed in Alaska in collaboration with a dedicated group of Yup'ik elders, Yup'ik teachers, school districts, and university academics, to help AN elementary students improve in math. MCC is an instructional program that meets the guidelines of No Child Left Behind (2001). MCC has been singled out as one of very few CBC projects in the United States with statistically significant growth in student achievement, shown through a "rigorous research design" (Demmert & Towner, 2003, p. 22; BEST, [http://www.bestworkforce.org/PDFdocs/BESTPre-K-12Rep\\_part2\\_Apr2004.pdf](http://www.bestworkforce.org/PDFdocs/BESTPre-K-12Rep_part2_Apr2004.pdf)). More recently, we have continued to rigorously test the MCC series. Consistent results have shown that students who use MCC outperform students who use the school districts' regular math curriculum at statistically significant levels (Lipka et. al. 2005).

One example from MCC shows the possibility of not only closing the academic gap, but actually reversing it. A 6<sup>th</sup> grade class in a school district that typically scores at the low end of state and national assessments in math outscored all other project sites, both in gain score and absolute score, after using the *Building a Fish Rack: Investigations into Proof, Properties, Perimeter, and Area* curriculum module. Their gain and absolute score (post test) were substantially higher than urban and rural treatment and urban and rural controls. This data shows

a closing of the gap between urban and rural achievement levels.

Currently, we are conducting a rigorous experimental study (random assignment of teachers) with 67 teachers, 50 schools, and over 800 students that meets DOE’s gold standard of educational research. The study takes place in four different cultural and linguistic groups, in urban and rural Alaska. The treatment group uses two MCC second-grade modules. The preliminary results from the first semester show strong results in favor of the treatment (MCC) vs. the curriculum in use before. The treatment students made substantial gains compared to control group students on all math topics (see figure below).



Interestingly, although the MCC curriculum was developed from Yup’ik elders’ knowledge, in the present study and in previous ones, we have found that Athabaskan, Inupiaq, and urban students of mixed ethnicity all made strong academic progress compared to their counterparts who used their district’s regular math curriculum (Lipka, Parker Webster, & Yanez, 2005). In the present study, 59% of the treatment classes made high gains between the pre and post test, while only 13% of the control group did so, in both urban and rural classrooms during fall 2005.

**Major Need: Programs for Both Rural and Urban AN Students**

There is a need for programs that increase achievement levels of AN students in both rural and urban districts. As the above data shows, MCC has been at least equally effective with urban populations of AN students and urban students of various ethnicities in Anchorage, Fairbanks, and Juneau school districts. However, because our sample size for urban indigenous students is too small for each trial, we have had to rely on qualitative data, instead of statistical procedures. When the current study is completed in August 2006, we will have substantially more quantitative data for urban areas. Numerous teachers have indicated that AN urban students who typically do not get engaged in math become involved in MCC, and it has made a difference for these students (see Rickard, 2005).

Therefore, MCC is a powerful remedy that works across Alaska's diverse geographical and cultural regions. We are currently testing MCC's 2<sup>nd</sup> grade modules in Anchorage and Juneau. Preliminary results from a mostly Tlingit class in Juneau are equally positive.

Along with quantitative data on the increase in student achievement for students using MCC, we also have qualitative analyses to begin to explain the reasons for these positive results. MCC provides opportunities for students to gain access to math curriculum by building on their cognitive strengths. For example, many of the everyday activities that elders presented involved spatial abilities, so we developed MCC curricula to include many mathematical activities that have hands-on spatial tasks. Sternberg viewed MCC as an exemplar of how to put into practice his theory of intelligence (personal communication, 2001; Grigorenko, et al., 2004) because the MCC curriculum tapped into students' practical, creative, and academic knowledge. Further, through videotape analysis of teachers whose classes performed very well on MCC tests, we have found that these teachers connect their students' math learning to their students' prior experiences, everyday knowledge, and out-of-school knowledge. Similarly, we believe that

incorporating elders' knowledge into MCC helps students appreciate the connections to their real world, particularly in math. Also, MCC is challenging, and teachers who implement it successfully keep the math rigorous.

### **Major Need: Bilingual and Bicultural Materials for Alaska Natives**

There are few bilingual materials available for AN students. Many of the anticipated project schools have many students considered limited English proficient, and many of these students have Yup'ik as a heritage language or are speakers of Yup'ik. We propose to improve this situation in two ways: (1) produce five bilingual stories (Yup'ik and English) that are well illustrated and connected directly to the MCC math series; and (2) provide professional development to participating districts on how to connect elders' knowledge and traditional stories to school learning. Further, it appears from teacher and district comments that connecting literacy to math motivates students to learn math when they identify with the context of the stories; also teachers feel supported with this approach because they are often more comfortable with literacy than math. In addition, the MCC series includes other bilingual tools such as Yup'ik Math Glossary in a CD-ROM format, which includes elders demonstrating traditional games and how to count in Yup'ik. The demonstrated games are integrated into the MCC series.

### **Major Need: Culturally Based Professional Development**

Because teacher turnover rates in rural Alaska are three times higher than in urban areas and "outside" teachers only stay on average three to four years, it is difficult for teachers to learn about the local culture and to use this knowledge effectively in teaching. Although experienced teachers typically outperform inexperienced ones, research on MCC's professional development and how teachers with different levels of experience effectively use MCC suggests that MCC's modules and professional development make a difference for both novice and experienced

teachers. Although MCC or this project cannot remedy the teacher turnover rate in rural Alaska, MCC's professional development for teachers appears to increase the performance of both novice and experienced teachers, ameliorating the negative impacts of rapid teacher turnover.

### **Major Need: Sustainability, Local Capacity, and Local Culture and Context**

This proposal seeks to use MCC's approach to in-service education and to build on MCC's strengths through professional development to further develop local capacity, particularly among AN teachers and aides within project school districts. We envision project staff development, long-term retired Yup'ik teachers, who have effectively worked with MCC to be role models to other AN teachers in the various project districts. The professional development process includes Yup'ik elders, retired Yup'ik teachers, practicing teachers who use MCC, and math educators. MCC's professional development has been noted at professional meetings (both national and international) as having a unique approach to working with elders and communities and academics, and we wish to share this process with participating teachers and school districts.

MCC has built a library of video clips and case material of exemplary teaching of MCC materials. The use of professional development materials that are based on Alaskan classrooms (both rural and urban) is another way to build local capacity.

#### **The three primary goals of this proposal are to:**

1. **Improve the academic performance of AI/AN students in math** by using culturally based math curriculum modules (MCC) and meet the state of Alaska's cultural standards (<http://www.ankn.uaf.edu/publications/culturalstandards.pdf>).
2. **Strengthen professional development in project school districts** by using a culturally based and Alaska-based approach to professional development.
3. **Build local capacity and sustainability** in participating school districts in using MCC

by adopting and adapting it and using it as a model to develop their own culturally based math and literacy materials.

The following summarizes the products and process of this proposal.

**Products:** Publish two math modules in the MCC series, publish five bilingual children's stories (all in English and Yup'ik and well illustrated), revise CD-ROM Glossary (in English and Yup'ik), and publish *A Guide for Using MCC*, including a DVD of AN and other teachers successfully teaching AN students. Disseminate and/or expand culturally based learning tools: an abacus based on Yup'ik ways of counting, pattern blocks (*Tumartat*—gathering pieces to make a whole), model smokehouse and three-dimensional geometry, model kayak, and other connections to local culture and school learning.

**Estimated Impacts:** 3,500 AN students and 175 teachers will use MCC materials; AN students' math performance will increase; professional development will enhance teachers' classroom abilities; and we will build local capacity to use culturally based materials and to develop them based on what is appropriate in their circumstances.

### **(B) QUALITY OF PROJECT DESIGN (30 POINTS)**

The design of the project lays out the steps required to successfully implement the plan to meet the needs identified in the previous section. We describe key activities and how they are linked to the identified needs and goals of the project.

**Goal 1: Improve the performance of AN elementary school students in math and meet the state of Alaska's cultural standards.**

**Objective 1: Adoption of MCC in Project Districts.** Participating school districts will begin systematically adopting and adapting MCC modules (spring 2007). Districts will identify a district liaison with the project, who will be responsible for training, adapting, and implementing

MCC in their districts. The project will provide partial funding for this position. In addition, Southeast Regional Resource Center (SERRC, Alaska's only nonprofit educational resource agency) will adopt MCC as the curriculum for its projected activities during 2006-2009, if funded.

**Objective 2: Expand MCC Material.** In addition to the nine published or in-press MCC modules and stories, we will publish two more curriculum modules: the first by the spring of 2008 and the second by the spring of 2009. They will be available in draft form to participating school districts beginning in the fall of 2007. This project will also expand the scope of existing modules, expand the math in new directions, and deepen some of the existing activities, for example two modules related to the way Yup'ik seamstresses make patterns explores symmetry and geometry and this can be expanded into fractions. We make project tools accessible to liaisons and teachers such as model smokehouse and three-dimensional geometry, model kayak and math, and other connections to local culture and school learning.

**Objective 3: Develop a Guide for Using MCC.** We will develop, disseminate, and publish *A Guide for Using MCC* with information on the math content, cultural background, and pedagogical strategies. Accompanying it will be a DVD of classroom examples of exemplary practice. The first draft will be ready in the summer of 2007 and piloted and used in the winter of 2007–08. The final version will be ready for publication in the summer of 2008.

**Objective 4: Develop and publish bilingual stories that will accompany MCC math modules.** MCC's literacy component consists of both traditional and modern stories published in both English and Yup'ik. There is also a guide for using the stories to support math instruction that includes information to help teachers effectively use a genre of literature they are often not familiar with, such as storyknifing and oral traditions. We propose to write and publish five new



children's illustrated stories in Yup'ik and English. The first story will be published during the late summer of 2007. Two more will be published during the second year of the project, and the final two will be published in the last year of the project. Two draft stories will be available at the first Summer Math Institute (SMI) and the rest of the stories will be available at the second SMI. By year 3, the five bilingual stories will have been published.

We believe that these activities will meet the first goal of this grant and the major need of improving the academic (math) performance of AN elementary school students.

## **Goal 2: Strengthen Professional Development in Project School Districts**

Too often, professional teacher development ignores Alaska's Cultural Standards and imports professional development models that do not take into consideration the challenges and opportunities of the Alaskan context. MCC's curriculum and professional development approach takes these factors into consideration, and our preliminary results show that MCC's professional development has a positive impact on student achievement.

**Objective 1: Train district liaisons in the pedagogy of MCC and support them so they can train the teachers in their districts.** Below, we explain the two different levels of support we will provide project school districts to increase the number of teachers and students who have access to MCC materials.

All districts will identify project liaisons by January 2007. Level 1 school districts will receive the following components as each is available: the modules, including the literacy components, the *Guide for Using MCC*, and systematic and continuous professional development from both MCC and their district liaison. These districts will formally adopt MCC modules into their math curriculum as a supplemental program and adapt the MCC materials to fit their local context.

Level 2 school districts will receive the modules, accompanying literacy materials, the *Guide for Using MCC*, and very limited professional development (liaison only, not teachers).

MCC has had extensive experience in conducting professional development for teachers, from conducting two-week intensive Summer Math Institutes to in-service workshops from a few hours to three days in duration. This will begin in the first year of the project. We believe that these activities will also meet the need of improving AN students' academic achievement because project research has shown that professional development correlates to students' improved math performance on project tests. Also, the Southeast Regional Resource Center (SERRC) will use this model and prepare additional administrators, teachers, and aides to effectively use MCC, thus increasing the scope and impacts of this project.

#### *Identifying Partner School Districts*

The following districts have applied to be part of this proposal: Level 1—Chevak, Kuspuk, Juneau Public Schools, Lower Yukon, Northwest Arctic, Southwest Regional, and Yupiit. Level 2—Iditarod, Lake and Peninsula, St. Mary's. Most of these districts are considered high risk. We are expecting a few other school districts to apply.

**Objective 2: Each district will align MCC materials to their district standards.** MCC standards follow NCTM, State of Alaska Content Standards, and Alaska Cultural Standards. Districts can align MCC to district curriculum standards in year 1 for 2<sup>nd</sup> grade materials and continue in year 2 for 3<sup>rd</sup> and 4<sup>th</sup> grade materials and some of the 6<sup>th</sup> grade series. In year 3, the rest of the 6<sup>th</sup> grade modules will be aligned. District liaisons will align MCC and school district curriculum, coordinate professional development, and identify teachers who will implement MCC and receive professional development during the late fall of 2006 and the spring of 2007. Level 1 liaisons from two school districts will identify teachers during the spring of 2007 who

will participate in the Summer Math Institute for the summer of 2007.

**Objective 3: Summer Math Institute (SMI) and staggered implementation.** Each summer, teachers from two districts will attend SMI and liaisons from all level 1 districts. Starting in the summer of 2007, the project will hold a SMI for both liaisons and teachers from two different level 1 school districts and continue this until each of level 1 districts have participated in the SMI.

The first week of the SMI includes all level 1 liaisons, Yup'ik elders, mathematicians, Yup'ik consultants, project staff, and the evaluator. This group will follow the lead of elders who will model an everyday activity such as making parka patterns. Then, the group will work with these activities and observe how the project staff expands the existing math. This will introduce the liaisons to our process of working with elders and content specialists. By working together this way, the project will create professional development materials that have at their base elders' knowledge and that bring out the mathematics and make the direct and age-appropriate connections to school math. In the second week, the project staff will work with teachers, introducing them to MCC modules and how the modules connect culture, math, and pedagogy. During this time, the liaisons are mentored in this process. We will use Alaskan classroom examples to improve teachers' practice. This occurs each summer of the project, and during each summer we will bring different specialist to work with the group, such as mathematicians, developmental psychologists (will assist in developing culturally appropriate assessment tasks), and a literacy specialist.

Level 2 districts, which receive more limited support, will receive two-day trainings along with level 1 liaisons in the fall of each grant year.

**Objective 4: The Guide and Case Studies.** At the SMI in year 1 of the project, a draft of A

*Guide for Using MCC* will be developed during the spring of 2007 and disseminated at the SMI in year 1 of the grant. It will be piloted with level 1 and level 2 districts. The guide will contain case studies of effective implementation of MCC and ways of working with elders, how to connect local knowledge and ways of communicating with schooling, and pedagogy that is based on local ways of communicating (expert-apprentice modeling and joint productive activity). The guide will be finalized at the end of year 2 and used with level 1 and level 2 districts. It will be especially important for level 2 districts.

**Objective 5: MCC and Districts Develop and Implement a Systematic In-service Plan.**

During the fall of 2007, the project liaisons from two of the level 1 districts and MCC staff will co-lead in-services in their districts for other participating teachers. During January 2008, these liaisons will organize and run MCC in-services for their respective districts on their own. During the spring of 2008, MCC will assist and co-lead in-service workshops for two other level 1 districts. This process continues until all level 1 school districts have been mentored. Thereafter, MCC will continue to support and assist but no longer take a lead role. A major milestone is achieved as each district runs the MCC portion of their district's in-service.

**Objective 6: On-site observations and support.** There will be 24 observational visits to level 1 schools each year to provide on-site support to district liaisons and/or project teachers. Level 2 districts will be observed once during the grant period. SERRC will supply additional support to administrators, aides, and teachers through distance education (if they are funded).

**Goal 3: Build local capacity and sustainability in participating school districts**

**Objective 1: Level 1 school districts adopt and adapt MCC materials.** By the end of the first year, each participating level 1 school district will have adapted at least two modules and integrated them into their school district curriculum. More specifically, they will adapt MCC's

materials using the processes modeled during the SMI and all other professional development training sessions and develop one local story, game, or other local material that expands MCC to reflect their local circumstances. This is a requirement of all level 1 school districts, and each completion represents a major milestone.

**Objective 2: Systematic and sustainable professional development.** Too often professional development consists of one-shot workshops. Instead, MCC and level 1 school district liaisons will work with teachers over time in a systematic way to increase their capacity to teach MCC. The professional development will focus on instructional improvement; project staff, the district liaison, and project teachers will work to build the teachers' knowledge of practice through such activities as videotape analysis of classroom practice, examining student work, and practicing instructional strategies. This will be monitored by the project evaluator and the P.I. through project instruments (Ball, 2004; Ross, 2003) and observations of changes in teacher practice will be noted.

**Objective 3: Increase capacity of underrepresented groups.** Project staff, specifically the project's Yup'ik consultants, will increase their math content knowledge and their expertise in conducting in-service workshops. Their training occurs during the SMI and the milestone is achieved when they conduct in-service school district workshops. Level 1 districts will be encouraged to involve local teachers in a similar capacity.

### **(C) QUALITY OF MANAGEMENT PLAN (20 POINTS)**

Since the late 1980s, the key actors in this grant—Lipka, Sharp, Yanez, elders such as Annie Blue and Anuska Nanalook—have been working together to develop culturally based curriculum. The rest of the staff and many of the school districts have also been involved with MCC for years. MCC resides in the School of Education at the University of Alaska Fairbanks,

and its purpose has been to develop culturally based math curriculum and more recently literacy, to provide professional development, and to conduct research and evaluation studies on the effectiveness of MCC, particularly with AN students. This is a seasoned and well-functioning team. In addition, a number of elders will also join this team. Therefore, members of traditionally underrepresented groups play key roles and functions in this project. This project fits extremely well into MCC's organizational structure, and its goals are a direct match with MCC's expertise.

This section explains MCC's organization and its connection to potential school district partners, SERRC, and SeaAlaska's nonprofit Regional Native Organization. Math in a Cultural Context (MCC) and its earlier related work Adapting Yup'ik Elders' Knowledge give this organization approximately 10 years of direct work in Alaska Native education. The core group of the proposed staff consists of retired Yup'ik teachers and Yup'ik Eskimo elders who have successfully worked together with mathematicians, math educators, and literacy specialists.

We have worked in Native education programs for more than a decade with Southwest Region Schools (SWRS) and Yupiit Schools; approximately four years with St. Marys, Northwest Arctic, Yukon Flats, Kuspuk, and Lower Yukon; and approximately three years with most of the other school districts. SERRC (a Nonprofit Educational Organization) organizations will send a representative(s) from their organization either to the SMI or to smaller follow-up workshops so that they can use MCC materials and processes in their work with school districts in their region. In particular, BBNA is an important partner because of its association with the SWRS and Lake and Peninsula districts and because many of the elders who work with MCC are from southwest Alaska. Evelyn Yanez and Ferdinand Sharp will work with Annie Fritze, education director, sharing with her products and processes related to this project so that BBNA may use these materials and processes in their educational efforts. SERRC is interested in

developing and using MCC's materials directly in training Alaska Native aides in many of the same districts mentioned in this grant and with districts from Southeast not included in this grant. Both SERRC and Sealaska (a potential partner) are interested in using our materials as models or templates to produce additional culturally based materials—adapting MCC to their context. This is an excellent fit. MCC will provide training to SERRC's trainers and work directly with Sealaska so that they understand our processes and can effectively use and adapt them. This makes for effective use of resources.

The organizational structure of the project is divided between (1) curriculum development (modules and stories) and professional development and (2) administrative functions, including travel and budget. The curricular and professional development is led by Jerry Lipka and the administrative functions are led by Flor Banks. Jerry Lipka, as the P.I., will organize a series of interrelated teams (their qualifications are spelled out below) to meet the goals of this project. The teams are curriculum and professional team, consisting of the P.I., Tony Rickard (math educator), Ferdinand Sharp (Yup'ik educator), Dora Andrew-Ihrke (Yup'ik educator), Evelyn Yanez (Yup'ik educator), Dan Watt (math consultant), Susan Addington (consulting mathematician), Yukari Okamoto (consulting cross-cultural developmental psychologist), and Yup'ik elders such as Frederick George, Annie Blue, and Anuska Nanalook, to name a few.

The first week of the SMI is for district liaisons, partners, and MCC staff. The second week of SMI will be led by this same group and we will prepare the level 1 district liaisons and teachers on how to use MCC materials.

From this process and from past experiences such as from our video clips library, Lipka and Rickard will take the lead in developing the first draft of the *Guide for Using MCC*. They will be supported by the curriculum and professional development team noted above. The technical

work of putting these clips into a coherent DVD structure will be done by Maya Salganek, who has developed a similar DVD working with the P.I., elders, and Yup'ik teachers on how to make different types of patterns (this DVD will also be distributed to all participating teachers and partners). Through this process we will connect local culture, math, pedagogy, and context. The work of conducting in-services will be divided up into smaller teams (an elder, Yup'ik consultant, and a content specialist) taken from the curriculum and professional development team. For level 1 districts. Lipka, Rickard, Sharp, Yanez, Andrew-Ihrke, and SERRC affiliates will conduct two in-services with elders per year. The same group will make periodic observations in level 1 districts and fewer observations in level 2 districts.

The team for developing the two modules consists of the P.I., Tony Rickard, and Dan Watt. They will be supported by Ferdinand Sharp and Dora Andrew-Ihrke. Dan Watt has previously worked with all of the staff members in MCC, and he was the lead author in one published MCC module and a third author in another. Addington, Watt, and Rickard will all ensure the math of the module is of high quality. This process will continue in this fashion until the new modules, the bilingual stories, and the guide are published and all districts receive their training.

The literacy team would consist of Joan Parker Webster, Cindy Hardy, Dora Andrew-Ihrke, Elizabeth Clark, Sue Mitchell, and at times Yup'ik elders. Evelyn Yanez will lead and ensure that the stories have all been translated and transcribed. She will work with Andrew-Ihrke to ensure that the stories accompanying the modules are authentic and reflect the culture, experiences, and context. Joan Parker Webster will take the lead in transforming the oral stories into children's stories. They will work with Elizabeth Clark to create the illustrations for the story. Evelyn Yanez will work with elders in southwest Alaska to ensure that the illustrations are appropriate. Sue Mitchell will lay out the stories for publication. The first story will be drafted,



edited, and checked by the literacy team and readied for publication at the end of the summer 2007. The next story will go through a similar cycle and be readied for publication during the spring of 2008, followed by stories in the summer of 2008, the fall of 2008, summer of 2009, and fall of 2009, for a total of five over the course of the project. Please note that all of the traditional stories have already been collected, transcribed, and translated, and the literacy team will have the task of transforming these oral stories into children's books. Cindy Hardy will write two contextual/modern stories based on the experiences of elders, Andrew-Ihrke, Yanez, Sharp, and other project participants. This would cycle in a similar fashion until publication.

Pamela Van Wechel will coordinate professional development and communication with school districts, including in-service cycle and other training. She will communicate directly with the P.I. and the project manager, who will also be involved in coordinating and communicating with the districts.

Jerry Lipka, the P.I., has been working in teacher education for more than 30 years and has worked with most of the Yup'ik consultants for almost two decades. He has taken a lead role in developing culturally based curriculum materials (most notably MCC), and he has published extensively on the development and implementation of culturally based curriculum. His published work is increasingly viewed as cutting edge nationally and internationally. He has had ample experience in leading large-scale projects over the past 10 to 12 years. His collaborative approach to working with elders and Yup'ik was documented in the book *Transforming the Culture of Schools: Yup'ik Eskimo Examples*, which received the American Book Award (1999).

Flor Banks, project administrator, will take the lead for overall administrative duties. She has effectively managed externally funded grants for approximately seven years, and she has extensive experience in all aspects of project administration. She has managed large-scale and

multiple projects, supervising more than 10 staff and keeping soft ledgers, and she has a strong knowledge of University of Alaska Fairbanks administrative and budgetary systems. Equally important, she has established good rapport and relationships with project staff and elders.

Anthony Rickard, associate professor of mathematics education at UAF, has experience as a curriculum development consultant for the Connected Mathematics Project (a constructivist-oriented math curriculum) and he has helped develop a number of the MCC modules. He has taken a leading role in Summer Math Institutes and math workshops for MCC and has published research on implementing MCC modules. In this project, he will have a key role in developing *A Guide for Using MCC*. He will write key sections of the guide and use his experience from MCC to write teacher cases. He will take a lead role in the Summer Math Institute and also assist in level 1 district in-services. Further, he will help the P.I. develop the two new modules and help develop pre and post tests.

Evelyn Yanez, a long-term associate and educational consultant, is a retired Yup'ik teacher and a former bilingual coordinator for Southwest Region. She has been recognized by the state of Alaska's Department of Education as a bilingual expert and teacher of the year. She and the other faculty and staff will work with Rickard and mathematicians to show both everyday knowledge and tasks and the potential mathematics embedded in those activities. She will have a major role in teacher training, conducting workshops, in-services, and Summer Math Institutes. She will work with teachers, conduct classroom observations, mentor, and show how to make connections between math, culture, and everyday tasks. She will be a liaison with community elders. She has worked with the P.I. for more than two decades.

Ferdinand Sharp, also a long-term associate and educational consultant, is another retired Yup'ik teacher. He will also bring to bear his cultural knowledge and play an instrumental role in

connecting the math of everyday tasks to MCC's modules and training materials, and he will be a bridge between elders and mathematicians and math educators. He will conduct in-service professional development for teachers during Summer Math Institutes and observe and mentor teachers. He has worked with the P.I. for more than two decades.

Dora Andrew-Ihrke is a retired Yup'ik teacher and bilingual coordinator from Dillingham City Schools. She was recognized as teacher of the year three different times. She has also been nationally recognized as a recipient of a Milken Family Foundation's National Education award (1990) and the Alaska Federation of Natives Eileen McLean Education award (2003). She brings to bear her considerable knowledge of Yup'ik culture and a keen awareness of the connection between everyday tasks and the embedded mathematics contained in some of those tasks. She contributed significantly to the development of the *Designing Patterns* (2006) module by adding fresh insights into a variety of ways that she and elders use mathematical reasoning in everyday tasks. She will play a key role in developing teacher training materials and classroom materials and in leading workshops and having a leadership role in the Summer Math Institute. She will be a mentor and classroom observer.

Joan Parker Webster is a literacy specialist and has been involved in MCC for the past three years. She will bring her expertise in writing children's stories. She has developed Literacy Counts, a comprehensive approach to developing literacies across the curriculum.

Beth Leonard, project evaluator, is an Athabaskan educator who has previously worked on evaluating an MCC project, including observing at an SMI and observing classrooms. Her previous experience and her educational background (completing her Ph.D) make her excellent for this position.

Daniel Watt, a math consultant, previous experience in writing and assisting in MCC

modules, working with elders and Yup'ik consultants, gives him the expertise to assist in the development of the two new math modules.

Susan Addington, a math consultant, previously worked with MCC staff and elders, has the expertise to assist in the SMI.

Yukari Okamoto, a cross-cultural developmental psychologist, developed culturally appropriate performance tasks and published on their effectiveness. She can assist in the development of new materials, especially those related to classroom assessments

#### **(D) ADEQUACY OF RESOURCES (15 POINTS)**

The coordinated activities of the grant with partner school districts are arranged to optimize the resources of the grant in order to increase the likelihood that students will show improved math performance. In addition, considerable resources are allocated to ensure that underrepresented groups, AN, have major roles in this grant and that local capacity and sustainability are achievable outcomes of this grant.

MCC brings to this grant many resources that facilitate both the ease with which districts incorporate MCC materials and the ability of teachers to teach the curriculum effectively. First, the MCC team consists of educators and elders who have all effectively worked together for many years, giving coherence to project activities. Further, the long-term relationship with many of the partner school districts demonstrates the goodwill and trust between all partners.

Having worked together as a project and with Alaska districts for an extended time has resulted in the accumulation of a wealth of resources that will be used to support the work proposed in this grant application: data on the effectiveness of various MCC math modules, data on teacher variables and MCC, hundreds of videotapes of teachers using MCC, the beginning of a video clip library of effective practice with MCC, and the nine published or in-press modules

as well as the basic materials for two additional modules that will be published through this grant. We have already collected a number of traditional stories that have been translated and transcribed. All of these raw and partially developed materials form a strong base to draw on.

The proposed model of working with and mentoring liaisons and partners extends the reach of the project, optimizing resources. Because we are partnering with Native regional nonprofits, SERRC, and school districts, we expect that the resources allocated to this project will result in greater accessibility and implementation of MCC's modules and processes. The grant is organized so that MCC's professional development component results in a multiplying effect because we have set up a process for people within the district to further disseminate the MCC curriculum. Each level 1 school district can then provide professional development to sustain the implementation of the curriculum. Further, SERRC will work with other school districts in Alaska listed as "high need" to help them use the MCC curriculum. Therefore, mentoring SERRC staff will also increase the scope and reach of this grant.

Personnel have been carefully selected for their expertise in the various areas of the grant activities. Resources are distributed to ensure that each of the project's goals and products will be accomplished in a timely manner. The budget narrative provides a guide to how resources are expended to meet the goals and products of the project. See the budget narrative

### **(E) QUALITY OF PROJECT EVALUATION**

The evaluation will provide both formative and summative feedback on meeting the project's goals and objectives. The evaluation methodology will consist of qualitative data (observations and surveys) and quantitative data (survey instruments, pre and post tests) that are indicators of the effectiveness of the intervention. Beth Leonard will perform the qualitative functions.

### **Measuring Project Outcomes**

**Goal 1: Improving the Academic Performance of AN Students in Math**—The project evaluator and P.I. will collect the pre and post test data from all school districts using MCC as well as from classrooms within those districts identified as controls. This within-district cross-wise pairing allows us to test the combination of the module and professional development plan. Teachers will be given the key for each test and an Excel database in which to enter the student results. The Excel file will be submitted electronically to the evaluator and the P.I. at the end of each semester, starting in fall 2007. Simple statistical tests will be performed to ensure comparability of the data, and statistical comparisons will be made to determine if AN students are showing improvement in their math learning. Item analyses will be conducted as well. This procedure will be used throughout the project as a way of determining students' academic growth in math. Several project pre and post tests currently exist, but others will be developed during year 1. Also, the formative evaluation will pinpoint what specific content standards are being met well by the intervention and which are not, allowing the project to make adjustments to its professional development and materials to further improve students' academic performance.

To further understand the impact of the intervention on students' math performance, we will also compare 6<sup>th</sup> grade students' results on statewide assessment subscales to use as three different indicators. First, analyzing the results over time will be used as an indicator of the math growth of the district over time. In year 1, we will gather the statewide results to establish the baseline. In year 2, we will compare students' results to the baseline to analyze district growth. Second, we will compare assessment results between level 1 treatment and control classrooms (those schools, teachers, and students in the same district that may not participate, particularly for larger districts that may choose to stagger the implementation). This will indicate if students' math performance is improving. Third, we will compare results from students in level 1 to those

in level 2, pairing classrooms or districts appropriately, to analyze the effectiveness of the modules and professional development plan.

Objective 1: Adoption of MCC in Project Districts: the evaluator will collect data from all participating school districts to determine the number of teachers using MCC materials, how many modules, and at what grade levels. This will indicate the degree to which the MCC materials are being disseminated to the participating school districts. The evaluator will pay attention to the degree that the MCC materials are being used across Alaskan sites.

Objective 2: Expand MCC Material: the evaluator will monitor the development of two additional modules. They will review drafts of these modules in year 1 and provide formative feedback to the project for changes. Further, they will collect classroom information from teachers who are piloting the modules. This will occur in years 1 and 2. These modules will be published in year 3 of the grant.

Objective 4: Develop and publish bilingual stories that will accompany MCC math modules: the evaluator will monitor the progress. In year 1 of the project, two new stories should be piloted and used in classrooms. The evaluator will collect feedback from teachers on the effectiveness of the stories: student interest in the materials, connections to the cultural context, and if applicable, connections to math. At the end of year 1 one of these stories should be readied for publication and the second published in the beginning of year 2. This process will continue until all five new stories have been piloted and published.

**Goal 2: Professional Development**—The evaluator will work with the project P.I. and project districts to assess the effectiveness of the professional development plan. To be able to compare the difference between results of districts receiving intense professional development on modules with those receiving only modules, we propose using a statistical technique of

z-scores. Teachers will range from 2<sup>nd</sup> to 6<sup>th</sup> grade and will be using different modules, thus the z-scores will allow those data to be combined for analysis. Z-scores can be calculated for either the gain score from pre to post tests, post test only, or adjusted post tests. Applying statistical tests to the difference in z-scores will show the relative strength of professional development by making comparisons between level 1 and level 2 districts.

**Goal 3: Adopting and Adapting MCC:** The evaluator will work with the project P.I. and project districts to monitor the progress of a systematic professional development plan for all level 1 school districts. They will record the process and the degree to which the different school districts coordinate, adopt, and adapt MCC to fit into their school district's plans. The SMI has two parts: (1) professional development for trainers (district liaisons), and (2) professional development for teachers. Therefore, evaluation will describe the process and use simple survey instruments (to be developed by the evaluator) to determine the effectiveness of both the training of trainers and the training for the teachers. The evaluator will use survey tools to qualitatively estimate the impact of the professional development as seen by those involved.

Quantitatively, district adopting and adapting will be measured by using a simple matrix to measure and evaluate the overall effectiveness of the project. Effectiveness will occur along a continuum from high to low school district participation: the goal is that school districts will adapt the MCC approach and develop their own materials, implementing them with their own staff, and that their students will show increased academic achievement using both district data and MCC tests when appropriate. Teachers' professional development will be measured by predict on average teachers' success in reform-oriented classrooms. In addition, the P.I will work with the project evaluator to consider some additional data that MCC has began collecting that suggests new ways to describe effective use of MCC's implementation: that is the teacher's use



of project tools (manipulatives) and allowing students ample space and guidance to engage in these tools and activities. Teachers will complete the survey at the beginning of the project and again when they depart the project. Here the evaluator will be looking for increases in content knowledge, pedagogical knowledge, and contextual knowledge. The evaluator will conduct classroom observations (approximately 10% of all project classes per year) as another way of documenting teachers' ability to effectively implement MCC. The project evaluator will pay careful attention to classroom interactions between the curriculum (tools and materials), the teacher (ways of teaching), and student involvement. The evaluator will use MCC's implementation instrument as another data source.

Further, the evaluator will monitor the progress of the *A Guide for Using MCC* as well as its implementation in both level 1 and level 2 districts. They will monitor the effectiveness of MCC sharing its process of collaborative work by analyzing the extent to which it carries over into project school district in-services and guides their process for adapting and developing materials relevant to their particular group. Districts should develop one product as evidence of this process by the end of year 1. The information gathered by monitoring the progress of districts incorporating these methods will inform MCC professional development each year.

The evaluator will provide reports at the end of each year to the P.I. to help with development of curriculum, professional development, and work with the liaisons.

The indicators identified are needed to effectively evaluate the components of this grant. Some of these indicators are aligned with the GPRA performance indicators, such as standardized tests at the sixth grade using our project tests as proxies. Other indicators may not align with those in GPRA since second graders are not tested.