

COUNTING ON TRADITION

4 Math in a Cultural Context adds up

“The program works because it fits the Yup’ik children’s lifestyles.”

The formula is simple: Apply Native elders’ everyday knowledge to school mathematics. From that idea Math in a Cultural Context has grown and flourished, producing nine educational modules that consist of curriculum books and accompanying storybooks, training hundreds of teachers, and reaching seventeen school districts across Alaska and beyond.

MCC, which joined SNRAS and the UA Geography Program in 2007, is led by Professor Jerry Lipka. While striving to increase the number of indigenous teachers in Dillingham in the early 1980s, Lipka met with parents and grandparents of potential educators to listen to their ideas. Immediately recognizing the value of the Yup’ik elders’ knowledge, Lipka turned to the National Science Foundation for financial support. The NSF agreed to fund the project if it focused on math. “So we went to the math side,” Lipka said. By 1996 he had a planning grant and by 1997 was operating under a full grant.

“The elders were crucial and fundamental to the project,” Lipka said. “The elders were naturalists and they wanted to help because their children would become teachers.” Over the years Lipka developed slow and steady relationships with the elders, listening, asking questions, working side by side with them. “Trust grew out of those relationships,” he explained.

The program works because it fits the Yup’ik children’s lifestyles. “This is a curriculum that can remove obstacles to learning,” Lipka said. “It removes barriers.”

While mainstream math curricula work fine for the majority of students, those further removed from mainstream society with somewhat different daily knowledge and experiences may find traditional ways of learning math difficult. So instead of math lessons about skyscrapers and supermarkets, MCC employs culturally-relevant examples such as berry-picking and salmon fishing. “Students are able to identify with the material we created. We tap into what they know.”

Lipka has conducted two studies with the American Psychological Association’s Robert J. Sternberg to assess the three kinds of intellect: academic, creative, and practical. Students taught in a way that uses all three areas outperform their peers, Lipka said. Sternberg’s stellar research confirmed what Lipka already knew. “I know it works,” he said. “But Sternberg’s study added credibility.”

In 1999 Lipka received an American Book Award for Transforming the Culture of Schools, a plan for how to implement Native knowledge into the classroom. Teachers have responded positively to the program. MCC Instructor Nicolle Gilsdorf was teaching in Tuluksak, a village north of Bethel, when she first heard of MCC. “I knew I could get behind it,” she said. Working with sixth graders as a brand new teacher, Gilsdorf realized MCC would allow her to teach math, social studies, and science skills while connecting the children to their ancestral culture. She even noticed increased attendance when she used the curriculum. “That’s a powerful indication this works,” she said.

Because subsistence activities are “incredibly rich,” Gilsdorf said, they are ripe for educational opportunities. Teachers learn the vocabulary associated with subsistence activities and attach this to the concepts, making math interesting and fun. “I love it and the kids respond to it,” she said. “It allows them to feel competent and it’s about



sharing stories, which is a big part of Yup'ik culture.” MCC has an expert apprentice teaching model and it has a clear structure. Plus, students are allowed to make mistakes and learn from them. “They get to explore through their culture math concepts.”

Gilsdorf noted that students who had not been interested in math, including children with special needs and Alaska Native youths, began to take on leadership roles after getting familiar with MCC concepts, due in part to the project’s intentional use of multiple modalities and different forms of intelligence.

The project has conducted twenty studies, finding in every instance that MCC students outperform control groups at statistically significant levels and with good effect on project tests. This occurred in all trials except for one urban subgroup. Control group curricula included *Everyday Math* and *Saxon*. Skills tested included numeration, measuring, representing data, data organization, analysis, interpretation, perimeter, area, geometrical shapes, proof and properties, and fractions. Lipka believes the following factors affect student performance:

- culturally and socially relevant materials that Alaskans can relate to
- integrated approach helps students to identify with the material
- a project-oriented approach
- students become engaged; barriers are reduced because of the relevant material, the hands-on approach, respect of the teacher and the student to explore and engage in mathematical thinking
- constructing math tools that allow students to understand math concepts, such as a Yup'ik abacus, personal rulers, geometrical pieces, and finding their own ways of organizing data
- students and teachers find MCC challenging
- students learn to think mathematically, learn to conjecture, and physically and logically prove their points

UA Geography Program Director Mike Sfraga says MCC is a natural fit for his department. “It puts science and math in a geographic context,” he said. “It all works.” While Western educational efforts tend to divorce the cultural context from the curriculum, Lipka found a wonderful formula that is culturally relevant, regionally applicable, and teaches mathematics in a way that makes sense to teachers and children, all the while weaving in traditional knowledge, Sfraga said. “It’s probably the best example of the mother of invention to me; it is the perfect geography K-12 program. It blends a lot of traditions together and the results are fantastic.”

Sfraga is particularly excited that the program appeals to young Native males who may not always find education

exciting. Math that relates to such things as navigation and the mechanics of a fish wheel are appealing to Native boys, Sfraga said.

Sfraga went so far as to say MCC is one of the best stories UAF has in its efforts to assist rural schools in Alaska. “In the future people will look back and call this a legacy program.” Its potential is unlimited, he said, predicting that MCC will continue to be implemented in more communities. “It is internationally replicable; it could be tweaked for Africa or the Navajo Reservation, anywhere there are strong traditional ties and knowledge. When others understand the value they will say ‘me too.’”

For more about the MCC program, go to www.uaf.edu/mcc/ or contact Dr. Lipka at rjfm1@uaf.edu, (907) 474-6439. The program offices are located at 2175 University Avenue South, Suite 101, Fairbanks, Alaska, 99709.

MCC GOALS

- to improve the math performance of elementary school students, especially Alaska Native students
- to provide professional development to Alaska school districts
- for school districts to adapt and adopt MCC modules
- to research the effectiveness of the modules in improving students’ math performance
- study specific impacts by math subscales and by other factors
- to study contextual factors that contribute to the effectiveness of implementing MCC

AWARDS

2008, *Annie Blue’s Stories*, HAIL Award (Honoring Alaska Indigenous Literature)

2006, Best proposal from US Department of Education, Alaska Native Education

2006, MCC’s grant proposal to the US Department of Education, Institute of Educational Sciences, number one in a nationwide campaign

2004, Building Engineering and Science Talent Initiative Report acknowledged MCC as notably effective in increasing math performance of under-represented pre-kindergarten through twelfth grade students

1999, American Book Award for *Transforming the Culture of Schools: Yup’ik Eskimo Examples*