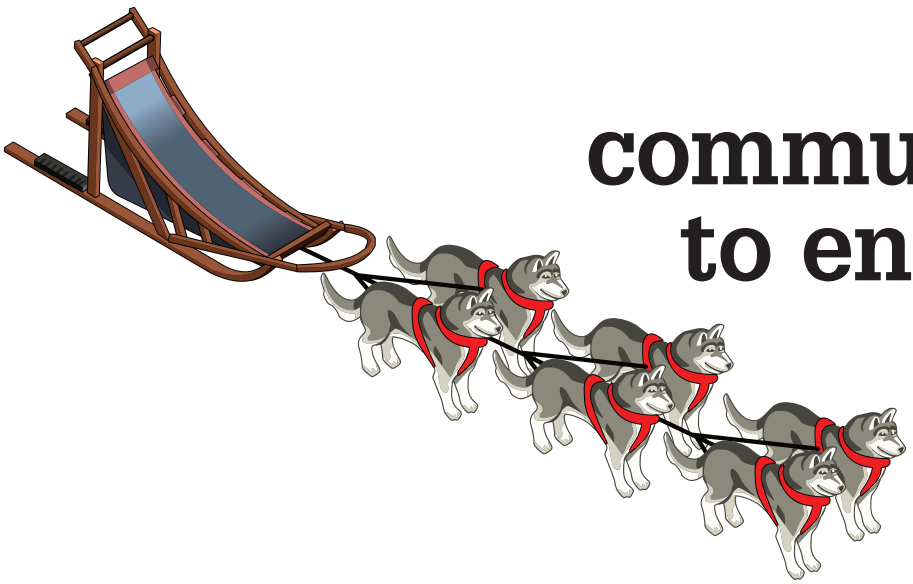
Michelle Daml



Using community events to enliven STEM education

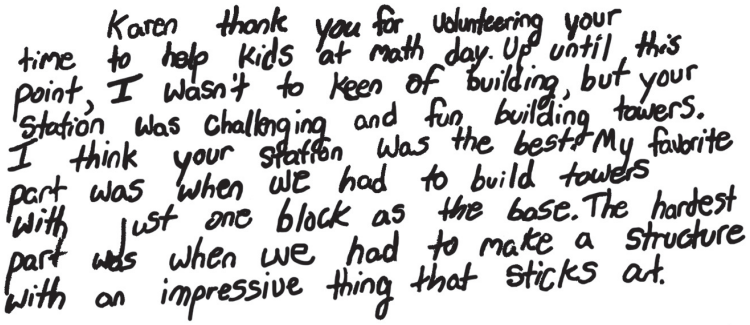
Curriculum reform in science and mathematics calls for a new look at using community resources. The national standards in science and mathematics suggest that good programs require access to the world beyond the classroom so students will see the relevance and usefulness of science and mathematics both in and out of school. Incorporating STEM activities into lessons that explicitly involve the local community is a great way to access the world beyond the classroom.

The many events and activities that bring us together as a community are so much more than just a time to gather. Fairbanks, Alaska, is a place of contrasts: light and dark, snow and sun, cold and warm. With the summer sun shining nearly twenty-four hours a day, the city is simply bursting with energy. In contrast, the winter can have as little as three hours of daylight. Strike it rich panning for gold; float the Chena River; see reindeer and musk oxen; cool off in an ice museum; take a refreshing hike; or be inspired by art galleries, museums, dog mushing, snow sports, and historical sites. In our community, we have events that keep us sane in the winter and also provide a perfect avenue to teach about math and other STEM-related content. You can easily find math standards and mathematical practices embedded in all these events (see **fig. 1**). Encouraging children to see math and science all around them is vitally important and helps answer the question, "When will I ever need to use this?"

Showing students how useful math skills are to so many aspects of our community's success and fun is a great way to boost excitement. Changing the educational experiences of children by moving beyond the classroom walls can diversify the array of learning opportunities and connect school lessons with daily life and real problems.

FIGURE 1

This journal entry is in response to a bridge-building activity.



Dogsled races and dog mushing

The Iditarod, Yukon Quest, and sprint dogsled races are a big part of our winter activities. Every part of dogsled racing can be tied to STEM: the biology of animals and humans, the engineering of the sleds, the mileage and calories spent, and the various technologies it takes to survive distance and environmental elements.

The 1000-mile Yukon Quest, which goes over a frozen ocean, has the most change in elevation of any dogsled race. Unlike the

AURIELAKI/THINKSTOCK

endurance that 1000-mile races call for, sprint races are for speed. Mathematical concepts are involved in all these races, ranging from building the sled, the weight of supplies, the distance traveled, the amount of food for the dogs, temperature changes, calories expended, and monetary cost to succeed. Students can look at the differences in sled design, weight, and distance. Mushers come to classes with their dogs, and they give rides, show us how to build a high-performance sled, and talk about weight and food. Students can go to the start of the races and meet the mushers. Then they "follow" them along the trail either by email or social media. In our classrooms, we adopt a musher and follow him or her. When the race ends, we figure out whether we would have made or lost money. If our musher did not place or win money, we determine how much we would have lost just to run the race. Was it an economically sound decision?

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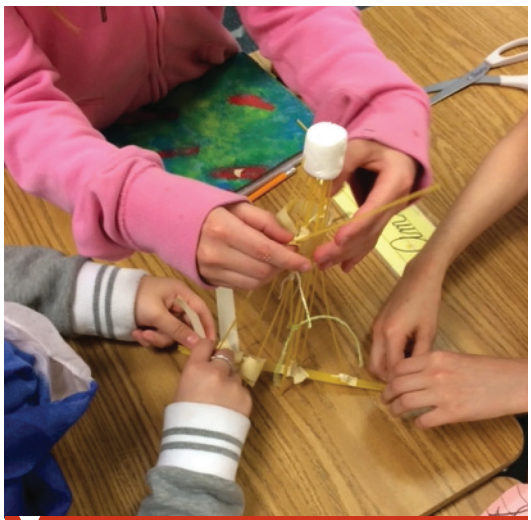
Effie Kokrine Charter School students built a sled with help from a local sled builder.

The Tripod Ice Classic

Every year, one of our small towns holds a contest to see who comes closest to predicting when the ice on the river will break. Town folk build a tripod and set it out on the ice with a wire and a trip. When the ice breaks, the tripod starts to move or it falls, tripping the wire and instantly stopping a clock inside wooden a tower on the dock. Those who have purchased tickets for the exact time win the contest and the money.

In our class, we do our own classic event. No money is involved, but we look at all the past years' ice thickness, dates when the ice broke, and weather temperatures this year compared to prior years. Students analyze previous statistics and trends of the Ice Classic and then make predictions. Students can build their own tripod models. I typically overhear group discussions about structure, design, and correct angles. Students experiment with different designs and measurements to see what will withstand nature's elements. Student comments range from, "How can it still be standing; it's been sunny and warm this week!" to "The ice on the pond in my yard is already melted; why isn't the river?" Every aspect of this event involves thinking about STEM topics.

Each year, a town holds a contest to predict the exact time the ice will break on the river. People build a tripod like this Nenana Ice Classic tripod and set it on the ice. It connects to a clock inside a wooden tower on the dock. When the ice breaks, the tripod starts to move, trips a wire, and instantly stops the clock.



MICHELLE DAMI (2)

We can encourage children to see math and science all around them, as in this bridge-building activity.

Moving students beyond their classroom walls can diversify the array of learning opportunities, connect school lessons with daily life and real problems, and change children's educational experiences.

The World Ice Art championships

Every March, our city holds the World Ice Art championships for three weeks. Artists from all over the world come to chisel and carve away at giant blocks of ice, fashioning remarkable creations that sometimes reach 25 feet high. Mathematical calculations and the science of the ice—where it is harvested, its weight, and the engineering design of the sculpture—all play a large part. Many artists carve blocks of ice not just at the competition but also around town at schools and local businesses, providing wonderful opportunities for students to watch and experience how math plays a vital part in the planning process of a sculpture.

Local and native sports

As in most communities, we have access to local college and semiprofessional sports teams. Our students attend many of the events all year long. How does math figure into their strategies, gear, equipment, and the playing surface? Players and coaches come and speak to students about the engineering of the equipment, the temperature of the ice for hockey, the length of skis for cross-country and downhill skiing. Students look at statistics regarding the sports teams and their opponents. Ticket sales and the cost to open the arena help students understand how much money it takes to support a sporting event.

The Athabascan Indian community is native to our location. Every year, we hold the World Eskimo Indian Olympics (WEIO). At the event, mathematical questions can be asked:

- How does a high kicker get so much vertical height?
- Does gravity affect the (Nalukataq) blanket toss acceleration?

Many other events can also serve as venues to ask mathematical questions: the Ear Pull, Knuckle Hop, One-Foot High Kick, Two-Feet High Kick, Alaskan High Kick. It is not uncommon at an event to see age and wisdom defeat youth and strength. Distance, weight, height, and statistics play a large part in the success of the competitors. In our schools, the physical education teachers and the Alaska Native Education teachers educate our students on how to perform these games.

Birch tree tapping

Students find the Tapping into Spring project a perfect antidote for spring fever after a long winter. Everyone enjoys the fresh air, sunshine, and walking around the woods, observing and learning all that the boreal forest ecosystem has to offer. At the same time, teachers are mixing in fundamental math skills and lessons in economics, nutrition, plant lore, and local history. Students learn about sugar-to-water ratios (100:1 in birch sap vs. 40:1 in maple sap), and temperatures of the soil and air before you can tap a tree.

One student said her favorite parts of the project were the birch tree drilling as well as hammering in the metal tap. "Overflow is sometimes a problem," remarked another student as teachers helped her to the "sugar shack" with her bucket full of sap. Students make observations of the tree's circumference, diameter, and distance to its nearest neighbor. They also observe tree stem and crown types and the percentage of canopy cover in the forest. Many students stop by with their families after school hours and on weekends to check on "their" tree.

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Understanding informational text is a key focus of the Common Core State Standards in English Language Arts. Informational text as it applies to math can also be integrated with all these community events. Students read math articles on consumer math, plants, fishing (low and high tides); sports articles on speed, distance, score, and averages; technical manuals regarding equipment; and interviews about sports, engineers, and so forth. In our small community, we are able to use many local events to promote math and science and STEM-related content. Our students live in a world of instant knowledge access via computers and smart phones. We want them to realize the importance of understanding basic mathematical concepts as well as having experiences that take them beyond basic mathematical skills.

MICHELLE DAML

This student is demonstrating a Two-Feet High Kick in the World Eskimo Indian Olympics.

Reminding students of the science and math involved to make an event successful provides them with solid reasoning about the importance of learning STEM concepts. Students can become local STEM ambassadors for younger grades, tourists, and community fairs. These young STEM experts can share what they have learned about these community events. So, look to your own community to find the many events that you can involve your students in while incorporating STEM.

Michelle Daml, michelle.daml@k12northstar.org, is the elementary curriculum and library media coordinator for the Fairbanks North Star Borough School District in Fairbanks, Alaska. She taught elementary school for fourteen years and is passionate about professional development for teachers to encourage STEM topics and lessons in their classrooms. Edited by **Meredith J. C. Swallow, Meredith.swallow@maine.edu,** an assistant professor of elementary education at the University of Maine in Farmington; and **Susan Hennessey, susan.hennessey@uvm.edu,** who works for the Tarrant Institute for Innovative Education at the University of Vermont.