The Importance of Traditional Knowledge in Science Education: ARM Education Uses Interactive Kiosks as Outreach Tool

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Introduction

Science is a basic part of the human experience and whether or not most people know it, science has relevance for everyone. Everyone can experience excitement from learning about the world in which they live. Western science is the objective testing of hypotheses with data collected from an experiment, and in our case the experiment is the environment. Western science is based upon the principles of repeatability and predictability. Until recently, western scientists have typically rejected the traditional knowledge of indigenous peoples as anecdotal, non-quantitative, and unscientific. Today the scientific importance of traditional knowledge is recognized and valued by those carrying out research in areas that are inhabited by indigenous peoples. Educators also recognize the importance of using traditional knowledge in the classroom and there are currently many efforts to develop culturally relevant curricula for classrooms all across the globe. Using traditional knowledge in science lessons, activities, and class projects gives added depth and meaning to difficult concepts, and builds communication and respect with the community. Science taught in conjunction with local traditional knowledge brings not only a sense of place, but also helps to make science less foreign to students. From the Indian Education Act of 1972 to the presidential Executive Order 13096 in 1998, a series of laws have resulted in funds and research for the betterment of Native education. And reports from the research arena, such as William Demmert's *Improving Academic Performance Among Native American Students: A Review of the Research Literature* and the U.S. Department of Education's *American Indian and Alaska Native Education Research Agenda*, show that culturally congruent curriculum and practices can pay big dividends in student learning (NRWEL 2003).

Members of the Nuvukmiut dance group perform at the Iñupiat Heritage Center in Barrow, Alaska

Traditional or native knowledge can be defined as knowledge which is acquired and preserved through generations in an original or local society, and is based on experience in working to secure subsistence from nature. According to Berkes 1999, traditional ecological knowledge (TEK) is "[a] cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through

generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment."

Including TEK in educational materials and outreach efforts demonstrates cultural sensitivity to communities where ARM sites are located. Western education has been failing these communities as can be seen by student's poor test scores and high drop out rates. Studies show that 25.4 percent of American Indian/Alaska Native students who should have graduated in 1992 dropped out of school—the highest percentage of all racial/ethnic groups in the U.S. (National Center for Education Statistics, 1994, p. 34). However, it has been shown that teaching methods and curricula which incorporate indigenous knowledge and ways of knowing into the formal education system show an increase in student achievement scores, a decrease in drop-out rates, and an increase in university attendance (AKRSI 2002). Including traditional knowledge also allows local community members and elders to share their knowledge with the students and be involved in an effective way of teaching place-based science.

Kiosk Development

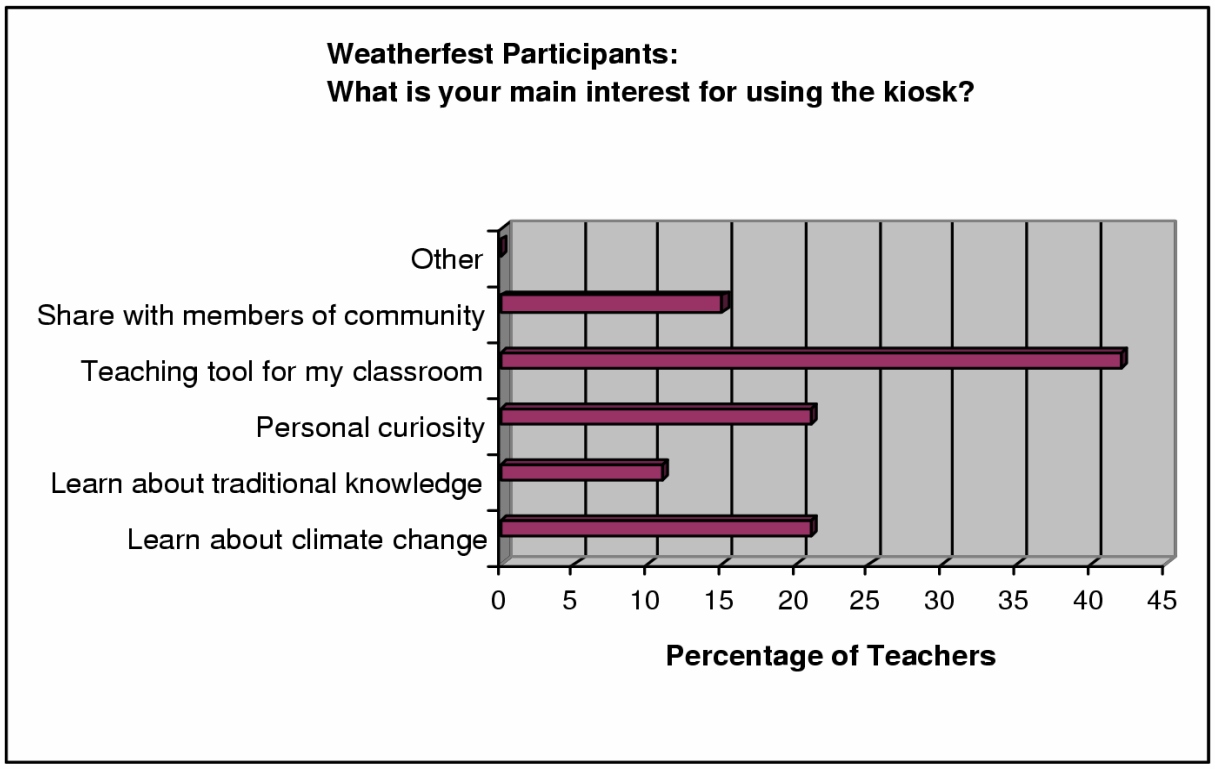
ARM Education and Outreach is committed to integrating traditional knowledge into science education curricula for students, educators, and the community at each of the ARM site locations. We initiated this integration effort after discussions with community leaders in Barrow, Alaska revealed that their highest priority was to develop a museum display on climate change and environmental impacts in the Arctic. The community requested that we include impacts on their culture and traditions, and an emphasis on the importance of elder knowledge in educating their youth. We subsequently started development of an interactive museum kiosk for the students and community of Barrow. The kiosk features interviews about climate change with educators, subsistence hunters, and elders from the Barrow community accompanied by interviews with anthropologists, ARM researchers, and other scientists. Currently ARM Education is working on a similar climate change kiosk for the Tropical Western Pacific, which will also include local traditional knowledge, thus offering a diverse perspective on climate change.

The first completed version of the North Slope of Alaska interactive kiosk entitled "Climate Change: Science and Traditional Knowledge" was produced by Yaza Design and ARM Education and Outreach. Installation in the display hall of the Iñupiat Heritage Center, October 9, 2003, was marked by an opening ceremony and dedication of the kiosk. About 100 people attended this event. Welcome remarks and an invocation by Iñupiat leaders opened the ceremony, followed by speeches from Dr. Wanda Ferrell, ARM Program Director; Dr. Michael Ebinger, ARM Education Director; and Marja Springer, Kiosk Project Leader. The unveiling of the kiosk, refreshments, and a performance of traditional dancing by the Nuvukmiut dance group followed.

Marja Springer at the unveiling of the kiosk at the Iñupiat Heritage Center

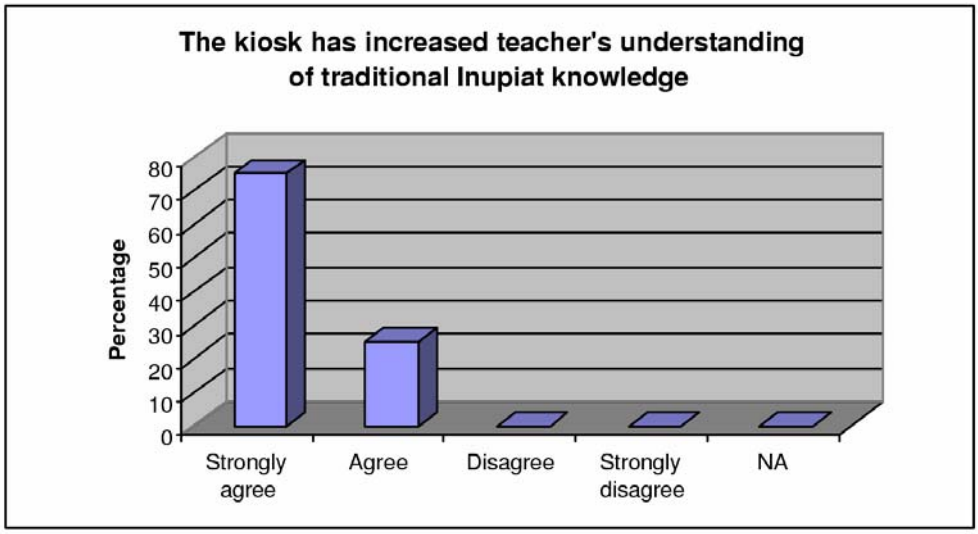
Education

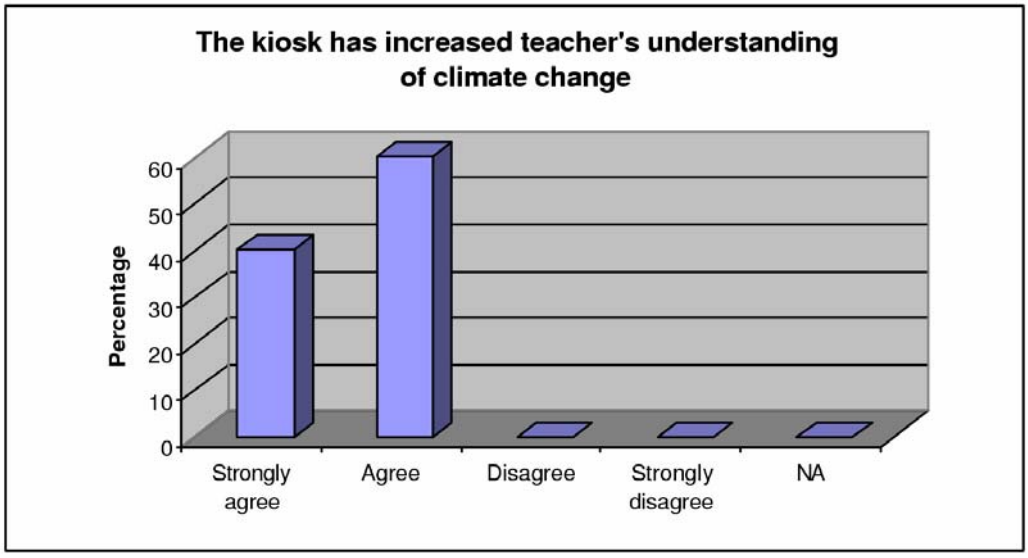
Preliminary reports from the IHC show that visitors enjoy navigating through the interactive touch screen to learn about climate change. Public attendees at the Barrow Arctic Science Consortium sponsored School Yard Talk on October 11, 2003, eagerly signed up to receive their own CD copy of the kiosk. Teacher and parent responses to viewing the kiosk at the January 11, 2004, Weatherfest convention at the AMS meeting in Seattle, Washington were very positive and said they would use the kiosk as a learning tool in their classrooms and share it with their families.



Many teachers at Weatherfest spent time looking at the kiosk and filled out evaluations. All teachers reported that the kiosk met their expectations, it was easy to use, and they liked the format of the kiosk. Teachers also reported that they would use the kiosk as a teaching tool and they all reported that they are now more likely to use ARM Education materials and website in the future.

Due to the success of the NSA kiosk, ARM Education and Outreach is now working with the TWP Office to develop and install community information kiosks in PNG, Nauru, and Darwin, Australia. ARM has contracted with Hans Andersen from Tradewind Communications (New Zealand) for the design and development of this kiosk. Stand-alone interactive computer kiosks will be located in each public location, and associated lessons on CD and handouts will be available for teachers and students. The kiosks will be in both English and local languages (Nauruan or Tok Pisin). The kiosks will provide community outreach education for the general public, and provide curriculum enrichment for K-12 students.





The content of these kiosks will include information on climate, weather, environmental issues, and ARM climate research relevant to the local community. This information will come from videotaped interviews of community members and scientists, as well as scientific concepts presented in computer graphics. The TWP kiosk plan was first drafted and contracts negotiated May-June 2003, and the first filming of community elders and leaders was completed in Nauru and PNG during July 2003. The first draft of the Nauru kiosk was completed in December 2003, and completion is anticipated for September 2004.Teachers Maureen Jumogot and Margaret Paso from Loniu Village School, PNG are interviewed for the TWP kiosk (July 2003).

ARM will continue to reach out to the local communities of the ARM sites and involve them in climate change education and outreach. The indigenous people at these sites recognize and value the importance of maintaining traditional knowledge in the younger generations. The positive feedback from creating kiosks for the NSA and TWP sites has inspired ARM Education to consider using kiosks as vehicles for outreach at all of the ARM sites as well as the Northern New Mexico area served by the Education Outreach office at Los Alamos National Laboratory.

References

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