

Animosh Tracks on the Playground, Minnows in the Sensory Table

Incorporating Cultural Themes to Promote Preschoolers' Critical Thinking in American Indian Head Start Classrooms

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Arriving at school to find fish, tadpoles, and shrimp swimming in the sensory table is not a common occurrence in Head Start classrooms. However on this day, the children in the Naytahwaush Head Start Center, located on the White Earth reservation in northwest Minnesota, are excited. Teacher Nette has brought in these live creatures to prepare for the class ice-fishing trip. The children gather around the sensory table observing the animals, as Nette asks, "What do you see? Do they all look the same, or are they different?"

At the Pine Point Head Start Center, also on the reservation, the children arrive in the morning to discover paper cutouts of different animal tracks all over the classroom. The amazed children run from one track to another and point out the tracks to their friends. Their teacher, Carolyn, is pleased. Her attempt to create an environment that will engage the children's interest and curiosity about the new unit of animal tracks seems to be successful.

Both Nette and Carolyn took part in *Ah neen dush* ("Why?" in Ojibwe), a three-year professional development program for Head Start teachers on the White Earth reservation. The program, a collaboration between the White Earth Head Start program and the University of Minnesota, was funded by the Office of Head Start to mentor and support teachers as they developed inquiry-based science

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and mathematics activities that incorporated Ojibwe language and culture.

Forty teachers and administrators from the six Head Start centers across the reservation were involved in the program. The participants engaged in activities about science and mathematics, cognitive development, questioning strategies, the teaching and learning cycle, and the process of inquiry. The program included extensive professional development and classroom support. Teachers were involved directly in various math and science activities, which helped them understand the role teachers play in planning and implementing a developmentally appropriate math and science curriculum. For example, while investigating the properties of water, the teachers built a structure using pipes and connectors, pumped water into it, and explored how the water traveled through the structure—just like the children in their classrooms would do. Workshop leaders asked the teachers probing questions. Later the teams of teachers discussed the activity, reviewed questioning strategies, and determined how to use the activity to support the children's critical thinking. During the program, University of Minnesota project staff and Head Start teachers collaboratively developed a number of inquiry units on topics of cultural relevance to families on the reservation, such as wild rice, nature walks, fall harvest, and maple syrup.



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a unique spearing method to catch fish through the ice. The hunter would lie under a blanket or hide with a spear and use a fish decoy to attract fish to his hole. As the fish came close, he would lower the spear slowly into the water and throw it slightly in front of the moving fish. A cord attached to the handle of the spear was tied to the wrist so that the fish could be retrieved. Today, only a few people on the reservation practice these old spearing methods, but the modern traditions of ice fishing bridge generations and bring families together.

Trapping is another winter tradition, which, unlike ice fishing, is conducted by only a handful of people on the reservation. Winter is the time when animal furs have the best quality and animals can be followed by their tracks in the snow. Trappers set trap lines and check them daily (traditionally on snowshoes but today by snowmobile). Trappers stretch skins over wooden frames to dry before selling them to fur shacks on the reservation. Hides are also used for traditional costumes that are worn in ceremonies and at pow-wows. Many of the Ojibwe clans are represented by different animals, such as the pine marten or beaver clans. These animals are reflected in the artwork seen throughout the reservation. The meat that both fishermen and trappers catch is also used for cooking.

In this article we present the advantages of teaching a culturally based curriculum, and we describe the format we used to develop culturally based inquiry units. We also share two sample units, Nette's ice fishing unit and Carolyn's animal tracks unit, to illustrate the types of activities that can be included in a culturally relevant, developmentally appropriate science investigation.

Connecting to cultural traditions

The Ojibwe or Anishinaabe (the original people) are the largest American Indian group in Minnesota. Additional Ojibwe tribes live in Canada and the northern United States from Michigan to Montana. In addition to their modern lifestyle, members of the White Earth community continue to engage in traditional outdoor activities specific to the northern climate. The long, cold Minnesota winter does not keep adults or children indoors. Frozen lakes are occupied by ice fishers, and the thick layer of snow allows for tracking animals. Both activities are closely connected to the cultural traditions of the Ojibwe people.

Today ice fishing is a popular outdoor activity conducted with modern equipment, but its origins are tied to the original people living near the Great Lakes, who developed

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Why culturally based education?

Research shows that cultural contexts affect young children's cognitive, social, and emotional development, as well as their approaches to learning (Bowman, Donovan, & Burns 2001; Genishi & Goodwin 2008). A school's culture may differ greatly from a minority group's home culture. This cultural context difference may explain why many Native American children struggle in school, most specifically in science and mathematics. Matthews and Smith (1994) suggest that the disconnect between children's culture and science topics makes science less relevant to their lives. Sharon Lynch, a distinguished science education scholar, claims that "science for all" does not mean "one size fits all," and that educators must recognize and incorporate children's unique background into the science curriculum (Lynch 2001). New (1999) calls for early childhood teachers to embrace children's home culture and model the coexistence of home and school cultures. This allows children of minority cultures to value their home culture and the school's (and the majority's) culture and learn to celebrate both identities.

Culturally based education recognizes the language, experiences, values, and knowledge of children, their families, and their communities. It includes elements of children's home culture into the daily curriculum—counting in the language spoken by children's families in addition to counting in English, choosing themes that reflect the local environment, building on children's prior experiences, and encouraging community members to take an active part in supporting children's learning. Research about the influences of culturally based education on the academic performance of Native American children shows that interweaving cultural topics with daily activities strengthens their identity and leads to better outcomes for all students (Demmert & Towner 2003).

In its position statement on developmentally appropriate practice, NAEYC states that effective and appropriate teaching must recognize children's culture and incorporate elements of the culture in everyday teaching (2009). This is especially important as US early childhood classrooms become more and more culturally diverse.

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Goals of a culturally based inquiry unit

An inquiry unit built on cultural themes supports three goals. First, it helps children develop critical thinking and problem-solving skills. Teachers model those skills as they ask children to investigate, question, and solve a problem. Second, familiarity with a topic related to their culture empowers the children and engages them to adopt the skills modeled by their teachers. The knowledge children bring about the topic allows the teachers to push children's conceptual understanding further. Third, it strengthens home-school connections. Since families are familiar with the topics, they can reinforce children's inquiry at home, which deepens children's thinking.

Critical thinking and problem-solving skills. How does a child become a critical thinker? A problem solver? With practice. Teaching through inquiry provides a structure for teachers to model the process of thinking and problem solving. They encourage children to ask questions, make predictions, investigate, record, and discuss. Teachers' questions help children consider cause-and-effect relationships and reasoning. By engaging in the investigation of topics rooted in their own culture, children tend to become fully engaged in the process and remember and use these thinking strategies when inquiring about other everyday topics.

The inquiry portion of a unit—questioning, predicting, and investigating—allows children to think beyond what they touch or see.

Conceptual understanding. Children learn through experience. Allowing time for exploration of a topic through books, pictures, and authentic materials provides opportunities for sensory learning. The inquiry portion of a unit—questioning, predicting, and investigating—allows children to think beyond what they touch or see. Investigating such questions as “What would happen if . . . ?” or “How?” or even “Why?” allows children to purposefully observe, compare, integrate, and discuss, and to get a better understanding of concepts related to the topic. When learning about higher-level concepts that are embedded in their culture or environment, children are better able to understand and use new information because they have more background and familiarity with the topic.

Home-school connection. Choosing a topic that is important to families elevates the level of discussion that takes place at school and at home, since the families and children are likely to have prior experience with the topic. When families are familiar with topics children are learning about, they can be equal partners in educating the children. Extension activities allow the families to contribute their knowledge and experience and provide teachers with opportunities to learn new information about families and their culture.

Designing a culturally based inquiry unit

As part of *Ah neen dush*, the project’s staff developed a model for designing culturally based inquiry units. The model expands the teaching and learning cycle from Bredekamp and Rosegrant (1992, see 32–33), by adding planning before and reflection after teaching. The Bredekamp and Rosegrant model includes continuous or overlapping cycles of awareness, exploration, inquiry, and utilization. Here are the three steps as used in Nette’s and Carolyn’s inquiry based units.

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1. Planning

- a. Choose topics that reflect local cultural themes.
- b. Collect pictures, children’s work, books, and other culturally relevant materials to use in an interactive learning center.
- c. Invite family or community members to share their knowledge with children.
- d. Allow ample time for children to explore materials and engage in activities that promote critical thinking. Inquiry activities take time! Plan a flexible schedule.

2. Teaching (follows the teaching and learning cycle [Bredekamp & Rosegrant 1992])

- a. **Awareness**—Plan an interactive way to introduce the topic and new vocabulary to the children.
- b. **Exploration**—Design a selection of activities that will give children the opportunity to learn through all their senses.
- c. **Inquiry**—Focus on a question for investigation with the whole class, a small group, or on individual child. The question, which can come from the teacher or the children, is the first step of the inquiry process. Help the children to follow the steps of prediction, investigation, recording, and discussion.
- d. **Utilization**—Create extension activities that encourage the children to apply the new knowledge (concepts and skills) to other situations or other topics.

3. Reflecting

Provide time for the teaching team to deepen its understanding about what works with its particular group of children and what needs to be done in order to support the children’s learning. Consider questions such as, Did we meet our objectives? How do we know? What did the children in the classroom enjoy most? Which concepts did they not seem to grasp? What did we learn about the children’s culture? How can we use what we learned to plan future activities?

Using culturally based inquiry in the classroom

The first step in planning—choosing a topic with cultural themes—is critical, so that children can share their experience and parents can contribute to the learning experience. Each teacher is different. Each classroom is different. Carolyn and Jody, her teacher assistant, and Nette, Cheryl, her teacher assistant, and Kim, the Family Service Advocate (FSA) in Nette's classroom, all participated in *Ah neen dush* workshops, but each team approached the planning and execution of the inquiry units differently. Still, each teacher selected a topic that reflected cultural and environmental themes that children and families in the community valued.

Ice fishing is very popular among White Earth families. Every year the Head Start classrooms go on an ice-fishing trip organized by the Tribal Natural Resources Department. This year, Nette decided to enrich the ice fishing unit with inquiry activities, with the purpose of deepening the children's conceptual understanding of the properties of ice and familiarizing them with the concept of catching fish with bait (including the types of animals she placed in the sensory table).

Carolyn chose to focus on animal tracks. Animal tracks are frequently seen on the snow-covered playground, as well as around children's homes. Tracking animals is relevant to Ojibwe language and traditions.

Prepare the environment

A rich, exciting classroom environment helps engage children and stimulate their thinking about the new topic.

On the first morning of the inquiry activity, the children in Nette's classroom discovered minnows, tadpoles, and shrimp in their sensory table. Nette had laid out books about ice fishing on a table. On the previous day, the children had made ice by filling different containers with water and placing them outside.

In Carolyn's classroom the children arrived and saw animal tracks all around the classroom. Carolyn had taped cutouts of bear, deer, raccoon, and wild turkey tracks to the classroom's floor and carpet. The sensory table was full of snow and animal prints made with paw models. In addition, the Ojibwe corner—a permanent learning center that features cultural materials such as feathers, the Ojibwe color wheel, wild rice, and so on—included new books and a list of the new vocabulary words that would be introduced during the unit.

Build awareness and engagement

During the awareness phase, teachers introduce the new topic and vocabulary in an interactive way and at the same time gauge children's prior knowledge and experiences.

A question, a mystery, or a perplexing event can engage the children and spark their curiosity to learn more. Clearly defining the theme helps the children understand the new concept and connect it to prior experiences and their culture.

Nette announced that the class would be going on an ice-fishing trip the following week. She asked the children to share their ice-fishing stories. Some children were very familiar with ice fishing and shared stories about going with a family member. Through the sharing process, Nette also learned that some of the children had not gone ice fishing before. Nette then presented pictures related to ice fishing and explained each picture. The children saw the drills used to make holes in the ice, the small structure (or fish house) that ice fishers use to protect them from the cold, the bait, and the tire tracks made by driving vehicles on the ice. She introduced a Native American tale called "How Bear Lost His Tail," which tells the story of Bear falling asleep while ice fishing with his tail (see the resources section, page 29, for a link to the full story). Nette used the awareness building activity to introduce new vocabulary about objects and processes that the class would explore during the ice-fishing unit. She emphasized words like *bait*, *drill*, *fish house*, *frozen*, and *melting*.

In Carolyn's class the children gathered as a group and tried to guess which animals left the tracks in their classroom. Carolyn recorded their predictions and announced that this week they would be learning about animal tracks, then go on a tracking mission at the end of the week. She asked children to draw different tracks that they have seen at home or around the school, to gauge their prior



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knowledge and experience with the subject. Carolyn introduced new words—*paws, claws, hooves, toes*. The children compared the number of toes in each track in the classroom and searched for claws and hooves. Carolyn introduced different pictures of animals and their corresponding prints. She introduced the Ojibwe name of each animal, then asked the children to find the correct track and state the English name of the animal.

Encourage exploration

During the exploration phase, teachers plan a variety of activities for different learning centers and daily routines that will support children's interest and engagement with the topic, allowing children to explore the new topic using all their senses. Related activities can be planned for small groups, free play time, snack time, and outdoor time as well as across curriculum areas (art activities, props for dramatic play, items for the science and math centers, and so on).

Nette had embedded relevant activities throughout the day and throughout the classroom. During choice time, the children could explore the creatures swimming in the sensory table. The children used cups and bug-catchers to capture and examine the animals. The teachers asked the children questions and encouraged them to notice differences between the creatures. The children had various opportunities to explore the properties of ice. They used frozen paint cubes for painting, ate orange sections frozen inside an ice cube for snack, and explored

ice and snow in the water table, where they discovered that the fish preferred to swim under the ice. The children touched, tasted, and observed the ice and began forming theories about the way ice is formed and the way it changes as it warms up. Having the opportunity to explore unique items related to ice fishing thoroughly engaged the children and prompted them to ask questions and respond enthusiastically to the teacher's prompts with their own observations, theories, and ideas.

The children in Carolyn's classroom had many opportunities to explore animal tracks. One of the stations available during choice time was a sensory table with snow and plaster models of animal tracks. The children experienced pressing the tracks into the snow and making track prints. Books and pictures of tracks were accessible during free play as well as other activities, including a memory game with pictures of animal tracks and animal track printing activities at the art center. These activities strengthened children's understanding about the differences and similarities among different animal tracks. In one activity children used animal track molds (paws, hooves), dipping them in paint and making prints on paper, which provided them with an additional opportunity to examine the shape of each animal's print, as well as count the number of toes and look for the presence of claws.



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Guide Inquiry

The inquiry and utilization phases are crucial for the development of critical thinking and problem-solving skills as they engage the children in higher order thinking tasks. When children gain experience with the topic and begin asking questions, it is time to enter the inquiry phase by focusing on a question for investigation. This could be done by following up on one of the children's questions or by posing a new question. Inquiry questions should match the cognitive level and conceptual understanding of the child, and elevate the level of thinking that the child has reached during exploration. Good inquiry questions require the child to observe, compare, and analyze: "Will it float or sink?" "Which one will melt first? Why?" "Which direction did the animal go? How do you know?" "Here is a big fish house. Can you build a small one with the blocks? Which blocks would you use? Why?"

Teachers need to support children as they go through the steps of the inquiry process: making predictions, investigating, recording their actions or their findings, and discussing their findings with the large group. The inquiry process may last 20 minutes to a few days or weeks, depending on children's interest. It is important to continue to follow the children's lead.

On the second day of the ice-fishing unit, Nette filled a big container with water and placed two different chunks of ice in it. She asked the children what would happen to the ice in the water. The children voiced different ideas.

The majority thought that the large chunk of ice would sink and the small one would float. To their surprise, both ice chunks floated. The experiment continued as they predicted which ice chunk would melt first. The children used their discoveries from the previous day to predict that the smaller ice would melt first, which they found out to be correct. Later, the children conducted an experiment and tried to answer the question of which ice cube would melt first: an ice cube placed in an empty cup or an ice cube placed in a cup with water. Each child put his or her cube in a different location and periodically checked on it.

Unfortunately, due to extreme cold weather, Nette's ice-fishing trip was canceled. Twice. However, other children that did go ice fishing drilled holes in the ice, used the minnows and shrimp as bait for fishing, and even caught a few fish. The children's enthusiasm for these investigations seemed linked to the context of ice fishing. The children were naturally drawn to think about them. Every year they observe the adults in their community participate in this winter activity, which makes investigating this topic relevant and meaningful to their lives.

A community member who was an expert animal tracker was scheduled to come and talk to Carolyn's class on the second day of the unit. He was to bring furs and animal feet so children could compare the actual foot with the track it makes. And he would share the signs he looks for to guide him when he is tracking animals during winter. Unfortunately, he had to cancel. Instead, Carolyn and the children explored the school's yard and looked for tracks. The children predicted which tracks they would find. While outside, one of the children called, "I found *animosh* (dog) tracks." Another child commented, "This one has claws, so it is not a cat." This analysis was based on what the children had previously learned: cats retract their claws when they walk. While outside, the teachers took pictures of the tracks the children found (some dog and cat prints), and when the class came back inside, the children recorded the kinds of tracks they saw and discussed their findings.

Support children's utilization of their new knowledge

During the utilization phase, teachers can engage the children in extension activities that will further expand their new knowledge (concepts and skills) to other situations or topics. Examples of utilization activities include going on a field trip or creating a book, a video, a play, a mini-museum (where children present their work to parents or other students), or a home activity in which children and parents work together to enhance the learned concepts and skills.

The planned ice-fishing trip was intended to provide opportunities for children to use their new concepts and experience with bait by fishing in a real-world situation.



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However, despite the cancellation of the trip, the variety of ice exploration and inquiry activities in the classroom provided opportunities for children to apply the new knowledge they had gained. When teacher Nette looked for a faster way to melt ice cubes, one girl suggested, “You can put some warm water in there.” During the weeks that followed the unit, Nette noticed that the children used the word melting and applied the concept of melting to explain why there was only a little snow on the playground.

At the completion of Carolyn’s unit, she created a “Tracks Book” that included the children’s drawings and photos taken by one of the teachers of the tracks they found. She displayed the book in the class library so children could revisit their learning. Carolyn sent home a follow-up activity in which children and parents were to examine the area around their home and look for animal tracks, then draw and try to identify the tracks. For a few weeks following the unit, the children were still interested in animal tracks. During their ride on the bus to and from school, Carolyn could hear conversation about the source of the tracks seen from the bus window.

Reflect

Following the completion of the inquiry units, the teaching teams reflected on the experiences. Nette, Cheryl, and Kim were pleased with the children’s understanding of the concept of melting, which had become a primary focus of the unit in their classroom, and the fact that they continued to talk about melting in other contexts. Nette reflected that due to the children’s high interest in the topic, next year she would arrange for a community member to bring a fish house into the classroom and talk to the children about ice fishing—a real-life experience that was less likely to be cancelled because of the unpredictable winter weather in northern Minnesota.

Carolyn and Jody were very impressed with how well the children acquired and used the new vocabulary and understood the concept of tracks. They were surprised that the children continued to look for tracks for weeks to come, and therefore decided to follow up with another tracking unit during the spring months, when the soil is muddy. They also felt that given the children’s interest, the class would benefit from a visit by the local trapper who could not come during the tracking unit. They invited him to visit in the spring.

Conclusion

As NAEYC notes in its position on developmentally appropriate practice, “Development and learning occur in and are influenced by multiple social and cultural contexts” (NAEYC 2009, 13). Culturally based education is a means to promote equality and narrow the achievement gap between minority and majority students (New 1999; Bowman, Donovan, & Burns 2001; Demmert & Towner 2003). The *Ah neen dush* project has presented a format for weaving Ojibwe themes with inquiry activities that promote critical thinking and problem-solving skills. The children in Nette’s and Carolyn’s classrooms had the opportunity to learn about culturally relevant themes and at the same time practice equally important higher level thinking skills. They learned to observe, ask questions, make predictions, investigate, record, and discuss their findings. They expanded

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their conceptual understanding of cultural themes and made discoveries about the physical properties of ice, bait, and the differences between various animals' tracks. Incorporating themes, projects, and activities that relate to parts of children's culture in the curriculum not only creates connections to children's heritage, but also enhances their thinking and learning in powerful ways.

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Resources

Animal Tracks

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- Footprints in the Snow*, by Cynthia Benjamin. Illus. by Jacqueline Rogers. 1994.
- Wild Tracks! A Guide to Nature's Footprints*, by Jim Arnosky. 2008.
- Environmental Education for Kids—www.dnr.state.wi.us/org/caer/ce/eeek/nature/track.htm
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Ice Fishing

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- Kitq Goes Ice Fishing*, by Margaret Nicolai. Illus. by David Rubin. 2002.
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Ah neen dush website

- Culturally based inquiry lesson plans and other resources. www.cehd.umn.edu/stem/Projects/Ah-Neen-Dush

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