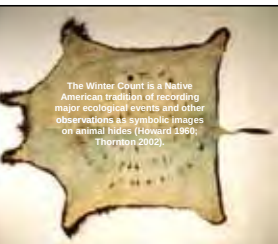


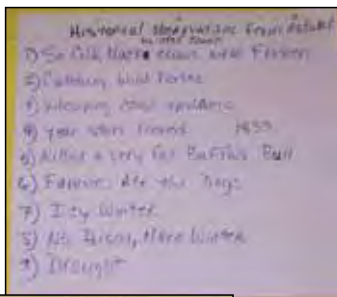
Traditional Ecological Knowledge (TEK):

- Comprised of the knowledge, practice, and beliefs regarding relationships of living and non-living beings (e.g. rocks, geological features, weather, and celestial features) to one another within the physical environment (Kimmerer 2002).
- Recognized as a source of information that can contribute to biological studies and management plans for natural resources (Berkes et al. 2000).

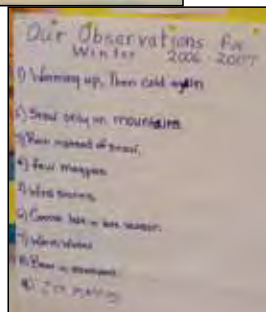


1. We used the Winter Count as a model for teaching 5th grade students, on the Flathead Indian Reservation, Montana, about the crucial role of **observation** in learning about the local environment. It is an excellent illustration of recording keen **observations**, which is a fundamental basis of western science and ecological investigation.

2. Students were provided with images of historic Winter Counts. They analyzed the images and gleaned historic ecological information from these accounts.



3. They were asked to draw images to represent their own interpretations of historic and current ecological **observations**.



4. During the winter, students recorded **observations** and major events. These observations were then depicted by symbolic images to create their own Winter Count.



5. The Winter Count model proved to be an insightful tool for teaching elementary students about the role of **observation** in ecological inquiry, and integrating TEK in science education.

Transcending boundaries to improve science education: Legitimization of TEK as a scientific way of knowing in a fifth grade classroom.

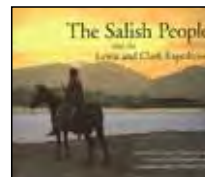
Matthew Corsi and Florence M. Gardipee, The University of Montana

Abstract

Traditional ecological knowledge can be used in the classroom as an avenue to demonstrate how science can be personally and socially relevant to students. Through the University of Montana GK-12 ECOS program, we developed two student-driven ecological research projects appropriate for upper elementary school students and implemented for fifth-graders on the Flathead Indian Reservation, Montana. In the first investigation, students investigated major ecological events artistically recorded on animal hides by interpreting data recorded during historical "Winter Counts", a traditional Native American practice of recording significant events in a particular year. The students are also completing their own winter count to record the major ecological events of 2006-2007. The second investigation demonstrated scientific methods more typical of western science to answer basic ecological questions about organism responses to seasonal change and phenology. We bridged the two investigations by emphasizing the importance of observation and natural history using TEK in the form of Coyote Stories. These stories are an excellent source of pre-European ecological information and human ecology. This set of investigations was ideal for meeting both the National Science Standards and the unique "Indian Education for All" standards in Montana by bridging ecology, natural history, the scientific method, and human interactions with the natural world. This approach and these investigations also can serve as a model for the development of similar projects to highlight the benefits of using TEK as an ecology education tool.

Bridging The Gap with Literature:

We used traditional Salish stories to generate excitement for making **observations**. We also emphasized the historical and ecological significance of each story. Making observations became a heroic thing to do!



➤ Advantages of Using TEK to Teach Science in Elementary Classrooms:

- ❖ Provides a creative approach for meeting the National Science Education Standards while crossing cultural boundaries;
 - ❖ Life Science, Earth and Space Science, Science in Personal and Social Perspectives, History and Nature of Science (National Academy Press 2004).
- ❖ Incorporation of TEK in Science Education ...
 - ❖ Is especially effective for engaging students from indigenous communities in traditional western science education (Aikenhead 1997).
 - ❖ Demonstrates that science is a humanistic endeavor in which anyone can participate.
 - ❖ Introduces non-indigenous students to new cultural perspectives with respect to the natural world, and provides extensions to other topics such as social studies and history.
- ❖ Fosters ecological and cultural Literacy of Young Students by generating excitement for ecological observation.
 - ❖ "I learned about the gigantic bison... a big part of the Native American Culture." - Isaiah
 - ❖ "...I can use the scientific method for nature observations." - Nichole
 - ❖ "...it is a great experience to go outside and do your best to do your own experiments." - Cheyenne

➤ Summary:

- Students gained insight into the key role of **observation** in both the acquisition of TEK and the process of using the western scientific method to test hypotheses.
- We provided an innovative approach for incorporating TEK into science curricula.
- Tribal students gained a sense of validation, while non-tribal students gained respect and appreciation, with respect to the contribution of TEK to ecological studies.

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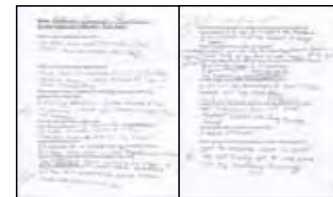


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"Western" Scientific Approach

- Systematic approaches to answering hypothesis-driven questions using the scientific method.
- Western science strives for objectivity and seeks to answer only those questions that pertain to humanity's perceived reality of the Universe.

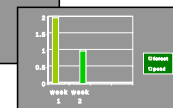
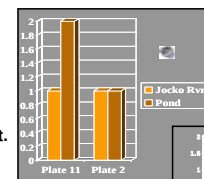


1. We used research projects to demonstrate the utility of **observation** in modern scientific approaches. Students explored ecological research questions that could be answered in a nearby riparian restoration area. Students produced their own study protocols in the form of a proposal worksheet.

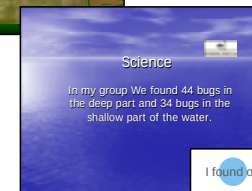


2. Students maintained **observation** journals while collecting data from their projects.

3. The students analyzed **observations** and data collected during their project.



4. Each team created presentations of the results and conclusions of their study



- I found out...
- I found out by going down to the Joeko River every Wednesday afternoon that watching birds is not only fun but is very hard work. My group and I also had to find out if there is more bird diversity in winter or spring.
 - My group and I found out that there is more bird diversity in spring. The birds are not usually around for winter and in spring they are coming back.
 - We met up with a bird guide from the tribe and he said that woodpeckers are one of the birds that stay here in winter!