Panamá T.R.E.E.E.S.

Unit 4: Inquiry and science process skills – bringing BCI home

In this introductory study of ecology, students will learn about the ecology and climate of Barro Colorado Island (BCI), Panama and the ecology and climate of Milwaukee, Wisconsin. Within this context students will review how ecosystem and climate are determined, examine the importance of healthy ecosystems, study how organisms meet their basic survival needs, consider how organisms have evolved, demonstrate ecosystem interactions, analyze the relationship between omnivores and herbivores and justify the importance of forest conservation.

Students will also engage in learning about how humans understand and explain the natural world through an interactive web-based resource that was built with interviews of scientists and students working on BCI during the summer of 2010. They will realize their ability to pose questions and conduct research, in the same way scientists do on BCI, by participating in a performance task that assesses student understanding of climate and species diversity in partnership with the Urban Ecology Center (UEC) in Milwaukee, WI.

Students will develop and apply inquiry-based research to make comparisons between Milwaukee and BCI. In a culminating performance task, students will present their understanding of the similarities and differences of the climate and biodiversity of BCI and Milwaukee. Students and teachers will work with Urban Ecology Center staff to census the flora and fauna of Riverside Park and compare that data to what they have learned and what is published about BCI. The product will clearly display similarities and differences between a temperate climate, flora and fauna, and a tropical climate, flora and fauna. Each student will also have the opportunity to conduct a student driven inquiry project that may be inspired by the work they have done in the unit or scientists they have learned about from BCI. The unit concludes with students persuading their peers of the importance of habitat conservation.

Curricular Goals

National Science Content Standard:

A. Science as Inquiry

WI State Standard:

Essential Question:

How do people study their environment in order to understand it better?

Oszuscik & Thome 2011

Students will understand that...

- people can pose questions, design studies, conduct research, and collect and interpret data in order to draw conclusions or answer questions.

Students will know. . .

- how to design and implement an experiment to answer questions.
- overarching questions that ecologists are interested in and are researching.

Students will be able to. . . (skills)

- conduct a student-driven inquiry experiment and share their data and conclusions with peers.

performance task

- Students will develop a student-led inquiry project that is shared with peers. Students can work in small groups, with a partner or individually.

other evidence

- Studnets will conduct a research project to compare and contrast biodiversity and climate of Milwaukee, WI with BCI in partnership with Urban Ecology Center.
- science notebook

Oszuscik & Thome 2011

Assessment Task Blueprint (for teacher use only)

Understandings or goals will be assessed through this task:

Students will understand that...

- people can pose questions, design studies, conduct research, and collect and interpret data in order to draw conclusions or answer questions.
- tropical forest conservation and the potential impacts of global change on tropical forests.
- maintenance of species diversity is important to healthy ecosystems and the human endeavor.

Criteria are implied in the standards and understandings, regardless of the task specifics. Qualities student work must demonstrate to signify that standards were met.

Students generate research steps that can be repeated.

Students organize and interpret data.

Students accurately describe climate, geography and species diversity of specific locations.

Students create a final product that is interesting and engaging to peers.

Authentic performance task for students to demonstrate understanding: (task overview)

Sample prompt using the class project:

Since we have been researching and learning about the climate, geography and biodiversity of Barro Colorado Island, Panama, the Urban Ecology Center has asked us to help them describe the climate, geography and biodiversity here in Milwaukee. They would like us to help them conduct research on their grounds to assess Milwaukee's species diversity. They want to be able to share our results with all of the students at La Escuela Fratney. You will compare our findings here in Milwaukee with what we have learned about BCI and present your findings to another third grade class. You will create a PowerPoint presentation or a brochure that will convince our school community of the importance of conservation in our world.

Student products and performances to provide evidence of desired understandings:

PowerPoint presentation,

Brochure,

OR

Book-making to assemble 'field guide'

Criteria by which student products and performances be evaluated:

MPS oral presentation rubric

Accuracy of information

Connectedness within and among locations

Please find 3-5th grade version of this assessment as separate document.

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Learning Activities

Lesson number	WHERE TO	activity, learning objective
4.1	**W**here and **W**hy **H**ook and **H**old	Work with students to differentiate between Common knowledge questions (can find immediate answers) vs. researchable questions (can be pursued in investigation). Tell them that they will be posing questions, designing a study, collecting and interpreting data. View interview clips of researchers on BCI about asking questions. Students select 2-3 questions they would like to work on. Have students select questions on their own, write them on a piece of paper and then submit them to the teacher. The teacher should then organize groups of 1-4 that match interest and compatibility.
4.2	**E**ngage	View interview clips of researchers on BCI about their work with methods. Work with each research group to establish and develop methods for research for particular projects.
4.3	**E**ngage	View interview clips of researchers on BCI about making observations and collecting data. Students should start collecting data. If appropriate, do a mini lesson on data collection with whole group. Work with research groups as needed to facilitate data collection and methods to maintain experiment.
4.4	**E**ngage	View video clips of researchers on BCI: Do you always get the answers you were expecting? Have groups start to analyze their data and draw conclusions. Include a mini lesson on how to create a table, graph or other visual representation of data in order to interpret and analyze data and draw conclusions.
4.5	**R**eflect and **R**ethink	View interview clips of researchers on BCI: How do you share you work? Students begin work of 'publishing' their findings. Review and discuss expectations for poster presentation. (We suggest a checklist or rubric.)

4.6	**E**valuate	Students share their work. Hold a classroom science fair or participate in a school or district wide science fair. Invite other classes to visit. You might want to look for science fairs online that are accepting electronic submissions. (Google did this in spring 2011.) Video tape 'talks' by research group and post them on your school-secure site or Student Learning Community (SLC)
		ABIOTIC FACTOR MANIPULATION – Some examples of student inquiry As a class we conducted a preliminary methodological trial that involved manipulating abiotic factors: sunlight, soil, temperature, and precipitation. (Science A – Z) Students randomly selected an amount of sunlight, type of soil, temperature range, and amount of precipitation. In pairs, they prepared their planting and we maintained them for one week. Students monitored how many sprouted, how tall they grew, and any other interesting observations. Many students informally made observations of others' plants and by the end of the week we sat in a circle and shared observations. Many questions arose from this basic informal investigation. One group of students wanted to carry out a more formalized – student-lead inquiry project. She thought that the most important factor of seed sprouting and growth was sunlight. We worked together to create an experimental design to test her hypothesis We set up trials in 3 replicates of each permutation of the abiotic factors and then put them in 3 different levels of sunlight (near window for medium light, under table in corner for low light, and in light box for high light conditions).
		GROWTH AND REPRODUCTION Grow Wisconsin Fast Plants and observe and record data throughout the six-week life cycle. During the project, students learn about the cycles and processes – germination, pollination and reproduction. Keep a chart of questions that arise throughout. Students may wonder about germination conditions, water or light treatments, fertilizer amount, pollenization methods or herbivory. Many methods for doing experiments are found in the Bottle Biology book.
key vocabulary		methods, data, observation, hypothesis, inquire, analyze, chart and graph
print resources		Williams, Paul H. 1993. *Bottle Biology*. Kendall/Hunt Publishing Company, Dubuque IA. Inquire Within by Douglas J. Llewellyn
online resources		Carolina Biology - WI Fast Plants scilinks.org