

SCHOOLYARD LTER CURRICULUM DEVELOPMENT

Brenda McMurphy

Konza Field Study

A class of 4th grade "Konzaologists"= Tall Grass Prairie Kid Scientists

I. Pre-trip activities

- A. Study guide, including vocabulary list
- B. Class visit by a Stream Biologist or a Kansas State entomology grad. Student
- C. Parallel study and practice at a Topeka area creek
 1. Purpose
 - a. To learn skills that will be used at King's Creek
 - b. To work as scientists in the field, by keeping and recording data, and to share and compare their work with others
 - c. To experience similarities and differences of the Topeka area and Konza ecosystems
 - d. To determine the health of a stream, as decided by the diversity of macroinvertebrate benthics found
 - e. To learn to identify stream insects and crustaceans from three taxa groups (pollution tolerant) most found in Kansas streams
 2. Activities
 - a. Practice skill to be used at King's Creek
 1. Visual survey
 2. Chemistry tests (pH, nitrates, phosphates, dissolved oxygen)
 3. Measure water temperature and turbidity
 4. Calculate stream flow
 5. Sampling/collecting techniques (rubbing rocks, net use)
 6. Record data on data sheet
 7. Labeling collection containers
 - b. Input data to Kan Cern Web site and also share with Konza Schoolyard LTER program
- D. Plant Research-Native tall grasses and wildflowers
 1. Students choose one plant to research
 2. All students present a report to the class on their plant/wildflower
 3. Draw/color your plant/wildflower
- E. Parent letter (Dress, Lunch, Who, What, When, Where and Why)

II. Konza Field Study Trip with 24 Konzalogists!

A. Schedule

1. Pick-up from school at 8:45 am, arrive at Konza at 10:00 am
2. 10:00am-11:30am>Field Study Tour of Konza with Docents
3. 11:30am-12:00pm>Lunch, R.R. break
4. 12:15pm-2:15pm>Stream Investigation/Collection/Labeling
5. 2:30pm-3:30pm>Travel Home

B. Bus Talk to Konza

1. Point out geological features and land use
 - a. flinthills
 - b. vegetation
 - c. watersheds
 - d. land use
 - e. water ways
 - f. rock layers
2. Review vocabulary list

C. Konza prairie tour with docents

1. Learn natural history of Konza and the prairie
 - a. Size, management of prairie by fire and grazing
 - b. How the ecosystem effects the watershed
 1. Living: plants and animals
 2. Non living: sun, water, soil, rocks, fire
2. Identify examples of sedimentary rocks
 - a. Limestone
 - b. Flint
3. Identify plants they have researched and reported on
4. Learn King's creek history and knowledge
 - a. Where it begins, its tributaries, where it flows into larger body
 - b. Miles of watershed it drains
 - c. Oxbows formed
 - d. Other geological features (tallest bank, highest water marks)
 - e. Mammal tracks found near it

D. Stream Investigation and Sampling

1. Equipment Needed
 - a. Rubber boots, hand disinfectant, nets, chemistry sets, white trays, forceps, collecting jars, labels, thermometers, bucket for fish, clipboards, pencils, data sheets, laminated identification guides, measuring tape, plastic golf balls, and drinking water in water bottles.
2. Practice activities for King's Creek
 - a. Visual Survey
 - b. Chemistry tests
 - c. Water temperature, turbidity
 - d. Stream Flow
 - e. Sampling/Collecting
 - f. Identifying/Labeling
 - g. Record Data

III. Post-trip activities

A. Send 'thank you's' to Konza's participating docents and researchers

B. Student Reports

1. My Trip to Konza Report
2. 10 new things that I learned or experienced.
3. Careers I learned about...

Geologists, biologists, entomologists, hydrologists, chemists, ranchers, agronomists, range biologists, etc
4. What I've learned to keep and protect our natural resources of land and water...

- a. Follow instructions and/or use less chemicals as pesticides or herbicides
- b. Use landfills, not dumps
- c. Dispose of hazardous waste properly (oil, gas, explosives, etc.)
- d. Reuse, reduce, recycle (oil, newsprint, cardboard, glass, plastics, aluminum and tin cans, etc.)
- e. Buy products made of recycled products

Brenda has also included a vocabulary list (from the KPRNA brochure) and a series of questions that the students will be able to answer after their visit.

Debbie Roberts

Long-term changes in stream

I would complete a unit on geology at 5th grade level. We would learn the hardness scratch tests, discuss that compared to the common rocks in our area. I have geological cross-sections of the rock layers in Kansas and would discuss which layers would be harder and erode less easily, comparing limestones and shales. They would learn to test limestone with acid for identification.

We would tie-in with social studies discussing the Mississippi River Drainage system and the tributaries involved.

We would invite the County Extension agent to bring Wabaunsee County aerial maps of Dragoon Creek by Harveyville, and Mill Creek by Dover, and Mission Creek by Mission Valley.

The class would hike to Dragoon Creek bridge, note watershed drainage from fields, erosion of gullies in fields, terracing and cropland control of erosion.

I would have to check but I think there is a spot on Dragoon Creek by a Boy-Scout Camp and waterfall that is on a bend that would lend itself to a photography spot for long-term changes.

Echo Cliff on Mission Creek would be a second spot we would establish a permanent photography spot. It has a 150 ft. limestone cliff which is undercutting right at the park area. Since I have lived there huge boulders have broken off and fallen to the base of the cliff (although the rumors are some high-school boys threw a stick of dynamite and initially started the rock fall).

The Echo Cliff field trip would include a fossil key and questionnaire worksheet about the flood plain, the size and order of sediments dropped as the water slows around the bend (big rocks, gravel, sand, and silt), which side of the creek is slower and making deposits versus cutting away the bank.

Finally we would consider the Konza Prairie King's Creek area, discuss how all the water drains from the Konza, discuss springs as sources of water, buffalo wallows. We would do the activity on King's Creek of photographing the stream channel.

Inventory of Stream Invertebrates

While we were at Konza doing the Stream Photography, we would also want to take advantage of the opportunity to be in the stream. Students always have found

memories of the science involved in projects like this and good feelings and enthusiasm for science is one of a science teacher's goals.

I would need expert help the time we did this project because I am not yet confident in my ability to identify the larva and macroinvertebrates we would catch. Also I do not have the equipment.

In preparation for this activity, students would need exposure to the life cycles of insects. In the fall, they could catch and develop several caterpillars to adults. I need to make more butterfly cages this summer for that purpose.

We would need a practice session at the Dragoon Creek or at Mission Creek in collecting and analyzing macroinvertebrates.

What is a good homemade collecting tool for water?

Finally we would do this project at Konza.

Prairie Flowers

I can see this activity being broadened to have students begin a local resource of plant and flower identification, over the years expanded to include local trees. Our schoolyard has a huge back section used for prairie hay, plus I own the pasture that adjoins the schoolyard, so we could use that as a resource also. Carol Mossman now lives in Eskridge and I would use her help for identification of difficult species and verification of accuracy.

I would love to write a grant for a digital camera for this purpose and the topography changes.

There is the possibility of making a walking trail through the back of the schoolyard, perhaps planting some plots of prairie wild flowers, or creating a butterfly garden. It seems a butterfly garden would be most active in the summer when no students are there. Is there enough continued activity in the fall to make it a worthwhile project?

I would need to access plant presses, paper for blotters, and the photography paper.

Mostly for this year, I guess we could take nature hikes and practice identification. This would enhance their abilities to observe similarities and differences upon which classification is based. They would need to learn how to use identification keys, and resource books-especially use of an index.

Students would select a plant found locally and on the Konza Prairie if possible, or on the Konza. They would do a report on their flower.

Connie Walker

Konza stream invertebrates

SCIENCE:

Students will begin to learn what makes up a prairie stream, etc. Water eco-systems.

Students will learn to identify some of the living creatures in water environment.

Students will learn what contributes to the creatures being able to live in the different prairie water environments.

Students will learn how the creatures are indicators of the health of the environment.

Students will learn what effects water levels.

*This goes well with our Globe study of water.

SOCIAL STUDIES:

Focus on the interaction between prairie water life and humans.

Try to determine where else in the world there are similar prairie water ecosystems.

LANGUAGE ARTS:

Research life cycles of stream/water creatures.

Creative writing-put self into the place of one of the water creatures.

Write descriptions of water creatures.

Effect of Fire on Plant Diversity

SCIENCE:

Students will become aware of the role fire plays in making the prairie what it is.

Students will learn to identify prairie plants.

Students will learn how humans control fires and manage fires.

-on trip to Konza, possibly have students see fire equipment.

-possibly watch a small burn.

-if possible come out a few times after a burn to see how plants come back.

SOCIAL STUDIES: Human/Environmental interaction

Students will learn why humans use fire on the prairie.

Students will learn the historical value of prairie fires.

Learn about problems that can be created by human interaction.

LANGUAGE ARTS:

Students will read stories about fire on the prairie.

Students will read myths/folklore about fires.

MATH:

Collecting and graphing plant counts.

Stacey Cooke

Effect of Fire on Plant Diversity

I've had students at Fort Riley Middle School give me the reason for burning Fort Riley's range land as "a means to control snakes".

It would be beneficial and informational to have the students view the sample burn plots, count plants and observe diversity in the various sample plots.

The science book we use at FRMS is the BSCS series. Our 7th grade focus is Limits and Diversity so tying in anything dealing with diversity should and does happen very easily.

Students use various data collection methods and are also required to graph the data collected. In most cases they are required to create their own data tables. With many of LTER data tables already available to use, I believe it would give students a change to other methods of collecting information.

Something I am realizing that I have failed to do is keep records of data collection over long periods of time; ie. results from investigation done in different years by different classes of students.

Research done on Konza would give use comparisons over years of time.

One emphasis in our curriculum is controlling the variables. On the prairie the variables are constantly changing and students will learn to work within averages. Accounting for those variables and recognizing their impact on this ecosystem are also valuable learning tools and besides some things need to be experienced, true knowledge does not come from books.

Below Ground

"Nature shows us surfaces, but she's a million phantoms deep".

There are so many roots and animal communities in the soil that, I believe again, that data collection, cataloguing and graphing, averaging, would go along with what our BSCS curriculum is doing.

Just like when we were counting forbs and grasses, there is more here than just what meets the eye.

The knowledge students can gain once they realize that the prairie is more than the grass, forbs, and trees and the creatures living on, in them but also the soil, roots and the creatures living in, around them, microscopic or otherwise. They will gain the understanding that the new housing development, golf course, is affecting the life of something. Something they might never have realized existed before being exposed to it in this way.

Stream Diversity

All I've said so far also holds true with the stream activity.

Data collection (Surber sampler), cataloging, graphing, and comparison.

Water quality not only on Konza but also within the students own community can be emphasized.

Again the awakening of student curiosity as to what all is living in the stream and what it means to stream quality is a valuable lesson.

The art of discovery and students becoming excited at making those discoveries is the most wonderful teaching tool and needs to be capitalized on, whenever possible. *Ask students prior to field study to be able to list ten new things or experiences never had before today.

Grasshopper Activity Diversity again fits into BSCS. I'm pretty certain that the majority of my students have never looked as closely at grasshoppers as we did on Wednesday.

Kathleen Jones

First Choice = Long-Term Inventories of Tall Grass Prairie Insects

OBJECTIVE: Students will learn and demonstrate techniques for insect netting, collection of insects, and insect mounting for display.

OBJECTIVE: Students will demonstrate how to classify a group of objects and how to use a dichotomous key to identify unknown insects using insects collected and mounted.

OBJECTIVE: Students will become involved in the processes of research to the extent that they:

- a. can develop a "testable" question related to differences in burn treatment plots and kinds of insects present.
- b. state a hypothesis that suggests a defensible answer to their question, and
- c. carry out a procedure that produces data which can be used to verify their hypothesis.

(Note: Student hypothesis may not match that of LTER project; therefore, this approach allows students to recognize the variety of questions arising from a circumstance, the variety of approaches to answering these questions, and the data they collect can still be useful to researchers attempting to answer a question or hypothesis that is different than their own.)

TIME FRAME

Background:

This activity would be part of a field trip experience students enjoy after the following classroom background preparatory work has been done.

1. 8 Days—Students have completed a unit of study on classification on living things (taxonomy, use of taxonomic keys, binomial nomenclature).
2. 10 Days—Students have completed a unit of study on the scientific method which dwells on developing controlled experiments.
3. 1 class session—Students have seen demonstrated and practiced insect netting and collecting.

ACTIVITY

After the background ground work has been accomplished students will carry out the insect inventory activity on the Hulbert Test plots.

TIME FRAME

1 hour—with students working in pairs from groups of 30 or less, students can sweep for insects, and put them in killing jars and collect groups of insects from each plot in labeled baggies to be frozen so the mounting can be accomplished back at the school.

2 class sessions—Once the mounting and identification has occurred in the classroom, student teams can submit data using the on-line capabilities of the internet.

FOLLOW-UP

2 class sessions--Class data (individual classes) can be compiled for students to graph on a histogram (either bar or pie graph). Then a graph from compiled data from the web site can be printed to compare to student graphs. This could lead to discussion of why there are differences, if they are significant, how would a graph of all classes compare?

2nd CHOICE=Long-Term Inventories of Konza Stream Invertebrates

OBJECTIVE: Students will learn and demonstrate the sampling technique using Surber samplers for collecting stream invertebrates.

OBJECTIVE: Students will determine water quality of stream from which samples are collected by noting the type and quantity of invertebrate species.

OBJECTIVE: Students will observe the variety, sizes, and number of invertebrate animals (often maligned and ignored) in stream ecosystems.

TIME FRAME

BACKGROUND:

This activity would be part of a field trip experience to Konza Prairie after the following background preparatory work has been done.

1. 12 Days—Students have completed a unit of study on general ecology including food chain, food web, and ecological inter-dependence.
2. 8 Days—Students are currently studying a unit on the earth's major biomes including aquatic ecosystems. This activity would allow students to experience a freshwater ecosystem.
3. 1 Day—Students have seen the equipment they will be using.
4. Students have discussed, read about, and seen examples of invertebrates they will likely see and how they are indicators of water quality.

ACTIVITY:

2 to 2 ½ hours: After the background work is completed students will carry out the Konza Stream Invertebrate Sampling activity with students working in pairs from groups of 30 or less. Completion of this activity includes archiving invertebrates and recording data.

Joleen Yaap and Eric Koppes

Even Years

Grasshopper Activity

Prior Knowledge

- introduce 3 types of grasshoppers and katydids.
- catch some at school and identify.
- discuss importance of research, respect of land and insects.

Field Study to Konza (possibly 2 days)

- catch grasshoppers
- pin and label
- hike

Wrap-up "Backyard Experience"

- individual and class bug collections (catch, identify, pin, label).

Skills

- graphing, averaging
- diversity in different burns, environmental affects
- diversity of grasshoppers-classification, technology, predictions.

Plants

Prior Knowledge

- conservation of tall grass prairie ecosystems
- plants: parts of and reproduction

Field Study to Konza

- count/collect and identify
- effects of burning/fire

Wrap-up "Backyard Experience"

- collect and identify plants in field near school.

Skills

- graphing/averaging heights
- % of stems
- effects of burning-observations
- classification
- technology
- comparisons
- predictions

Other

- art-draw plants
- uses of plants (medicinal, food, etc.)

ODD YEARS

Stream Activity

- importance of water
- sources of
- conservation-county extension office

Konza Field Study

Wrap-up

- do activity in our stream. Dr. Jay Nicholson at High School for help.
- jobs with water management

Skills

- observation
- classification/sorting
- compare/contrast of Konza using Scott Springs
- graphing