



BioKIDS: Kids' Inquiry of Diverse Species

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Credits

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Letter from the Project Directors

Dear BioKIDS teachers,

Welcome to the BioKIDS Project! We are very excited to be working with you this fall. We hope that both you and your students will enjoy tracking animals in your schoolyard and investigating scientific questions related to animal diversity and animal habitats. All activities are matched to the DPS and Michigan standards.

Our program starts in early September and runs for eight weeks. Very soon, we will be sending a BioKIDS project staff member to your school to introduce you to the curricular program and to assist you in setting up the technology to be used with this project. In addition, we will be supporting LeTUS teacher workshops for ongoing curricular support. We hope that in addition to these opportunities for feedback, you will feel comfortable providing us with your suggestions, comments, and concerns with this new inquiry-based biology program. As always, your comments are very important to us, particularly comments about the ways we can improve the program for you and your students. The best ways to reach us are telephone (Elena at 734-647-2262) and email (ejurasai).

We thank you for your willingness to explore schoolyard biodiversity with us this fall!

Sincerely,

Project Directors,

Dr. Nancy Songer
School of Education

Dr. Philip Myers
Ecology and Evolutionary Biology

And the entire BioKIDS Team,

Michelle Astolfi
Elisa Collins
Cesar Delgado
Tanya Dewey
Karen Dvornich
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The BioKIDS Curriculum and the Science Education Standards

The National and State Content Standards addressed in the BioKIDS curriculum:

National Science Education Standards Fundamental Concepts	NSES Page Number	BioKIDS Learning Set/Lesson
<i>Science as Inquiry — Content Standard A:</i> <i>All students should develop the abilities necessary to do scientific inquiry and understandings about scientific inquiry (p.143).</i>		
Identify questions that can be answered through scientific investigations.	145	LS1/1
Design and conduct a scientific investigation.	145	LS2/2 LS4/2
Use appropriate tools and techniques to gather, analyze, and interpret data.	145	LS2/2 LS4/2
Develop descriptions, explanations, predictions, and models using evidence.	145	LS2/2 LS3/2 LS4/2
<i>Life Sciences — Content Standard C:</i> <i>As a result of their activities in grades 5-8, all students should develop understandings of structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and diversity and adaptations of organisms (p. 155).</i>		
Structure and Function: Living systems at all levels of organization demonstrate the complementary nature of structure and function.	156	LS1/2
Regulation and Behavior: • All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history.	157	LS2/2 LS3/2 LS4/2

Populations and Ecosystems:

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some microorganisms are producers—they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
- For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

157-158

LS2/2
LS3/1
LS3/2

*History and Nature of Science — Content Standard G:
As a result of activities in grades 5-8, all students
should develop an understanding of science as a
human endeavor, nature of science, and history of
science (P.171).*

Nature of Science:

Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.

171

LS2/2
LS4/2

Michigan Curriculum Framework Science Benchmarks (Approved Summer 2000)

Michigan Benchmarks Page Number	BioKIDS Learning Set/ Lesson
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Constructing New Scientific Knowledge (C) I.1

Develop solutions to problems through reasoning, observation, and investigations. — <i>Key concepts:</i> (K-2) gather information, ask questions, think; (3-5) observe, predict, collect data, draw conclusions, conduct fair tests; prior knowledge.	2-3	LS2/2 LS3/2 LS4/2
Manipulate simple devices that aid observation and data collection. — <i>Tools:</i> Various data collection tools suitable for this level, such as hand lenses, wind direction indicators, grids for sampling areas of the sky or landscape.	2-3	LS1/2 LS2/2 LS2/5
Use simple measurement devices to make measurements in scientific investigations. — <i>Key concepts:</i> Measurement units—milliliters, liters, teaspoons, tablespoons, ounces, cups, millimeters, centimeters, meters, grams.	2-3	LS1/2 LS2/5
Develop strategies and skills for information gathering and problem solving. — <i>Tools:</i> Sources of information, such as reference books, trade books, magazines, web sites, other people's knowledge.	2-3	LS2/2 LS3/1 LS3/2
Construct charts and graphs and prepare summaries of observations. — <i>Key concepts:</i> Increase, decrease, no change, bar graph, data table.	2-3	LS4/2

Reflecting on Scientific Knowledge (R) II.1

Develop an awareness of the need for evidence in making decisions scientifically. — <i>Key concepts:</i> (K-2) observations; (3-5) data, evidence, sample, fact, opinion.	5-6	LS3/3 LS2/2 LS3/2 LS4/2
Show how science concepts can be illustrated through creative expression such as language arts and fine arts. — <i>Key concepts:</i> Poetry, expository work, painting, drawing, music, diagrams, graphs, charts.	5-6	LS3/2 LS4/2

Develop an awareness of and sensitivity to the natural world. — <i>Key concepts: Appreciation of the balance of nature and the effects organisms have on each other, including the effects humans have on the natural world.</i>	5-6	LS1/1 LS3/1 LS3/2
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Organization of Living Things (LO) III.2

Explain characteristics and functions of observable body parts in a variety of animals. — <i>Key concepts: Observable characteristics—fur, scales, feathers, horns, claws, eyes, quills, beaks, teeth, skeleton, muscles, exoskeleton; functions—insulation, support, movement, food-getting, protection.</i>	9-10	LS1/2 LS1/3
• Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics. — <i>Key concepts: Plant and animal parts—backbone, skin, shell, limbs, roots, leaves, stems, flowers, feathers, scales.</i>	9-10	LS1/2 LS1/3
Compare and contrast food, energy, and environmental needs of selected organisms. — <i>Key concepts: Life requirements—food, air, water, minerals, sunlight, space, habitat. See LEC-III.5 e.2.</i>	9-10	LS2/2 LS3/1 LS3/2

Evolution (LE) III.4

Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web. — <i>Key concepts: Producer, consumer, predator, prey, decomposer, habitat, community.</i>	14-15	LS3/1 LS3/2
Describe the basic requirements for all living things to maintain their existence. — <i>Key concepts: Needs of life—food, habitat, water, shelter, air, light, minerals. See LO-III.2 e.4.</i>	5-6	LS3/2 LS4/2

CyberTracker Instructions

(For your reference related to Learning Set 2)

(Abbreviated instructions are also included in the student worksheets.)

CyberTracker is a program that runs on a hand-held device, such as a Palm Tungsten or a Pocket PC. Originally developed for trackers in South Africa, you have a version that has been customized for schoolyards in Michigan cities. The basic idea is that you step through a series of screens to record observations of animals you see in your schoolyard.

When we use the term “**PDA**,” we mean a personal digital assistant hand-held device, typically made by Palm. “**Tap**” is the word that means you should press something on the PDA screen (you click with a computer mouse, but tap on a PDA). “**Screen**” means all the things you see on your PDA screen at once. You go through a series of screens when you use CyberTracker. By “**tracking session**,” we mean any time you are using the program (you might be out in your schoolyard or walking around your neighborhood). “**Tracker**” or “**student**” refers to the person using the PDA.

Once you understand the basic idea and a few tricks, the software is easy to use.

There are two major sections to using CyberTracker: the “start screens” and the “sequence.” Some things will change very little during a tracking session, such as zone, tracker team name, and class ID. You fill out these screens at the start of the tracking session and probably won’t need to change them. These “start screens” are the first component of CyberTracker. After you have entered all this common information, you will cycle through a series of screens that help you track the animals you see. This “sequence” is the second component.

General Tips

Here are some overall tips to using the CyberTracker program. You will want to show these to your students as they are learning the program – either individually or as a class.

◀ ▶ Forward and backward buttons appear on the bottom of the screen. You tap the forward button after making a selection. You can use the backward button to review or edit previous choices, but please note that the choices you step back through will be forgotten. When a list is too long to fit on one screen, a scrollbar appears at the right side of the screen. You can tap on these icons or use the up/down button on the PDA to scroll.



On some screens, when you tap on an icon in central portion of screen, a name appears at the top. When you are not sure what an icon represents, you can tap and hold it to see this name.

Numbers are entered on a screen that looks somewhat like a calculator. “<” is used to delete numbers entered.



Using CyberTracker

Turn on your PDA. Tap on the Home icon (bottom left side of the screen) to see all the programs on your PDA. If you don’t see CyberTracker right away, switch to “All” using the list in the upper right corner. Tap on the CyberTracker icon to start up the program.

The Start Screens (Introductory Section)

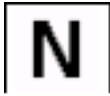
The first screen has five options. You can fill out everything here just once and it will stay the same for all your sightings until you change one of them. **In this screen (and other icon-only screens) you will see text at the top of the screen if you tap and hold the pen on the icon.** To make a choice, tap an icon (or later, a menu item) and then tap on the small rightward triangle at the very bottom of the screen. You can always back up in the sequence by choosing the back triangle.

On this initial screen, the history bar at the top shows the choices you’ve made in the various start screens.

When you first go outside, you should fill in every start screen before you choose the BEGIN arrow. The start screen introductory section options are:



Class ID. Teachers will tell their classes what number to enter. Each class will have a unique ID number, and BioKIDS staff will assign these. The unique IDs allow data to be compared across classes and schools.



Tracker name. Teams chose tracker names in Learning Set 1. If you don't recognize your icon while in the CyberTracker program, refer back to Learning Set 1 for a reminder.



Zone. Use this to enter the location within your schoolyard where you will focus your research efforts. One of the first activities your class will do is make a map of your schoolyard. You will divide it into zones and give each a letter. At the start of each tracking session, choose the zone you are working in. If you move between zones during a tracking session, change this zone code.






Begin arrow. This arrow takes you to the tracking sequence, the second part of the program where you will record animal sightings.








The Sequence










When all the start screens have been filled with data, choose the BEGIN arrow to start recording a particular observation. Work through the screens until you have the best identification you can make. You will only be able to record information on one kind of animal at a time.

How do you sense it?	
<input type="checkbox"/>	See 
<input type="checkbox"/>	Hear 
<input type="checkbox"/>	Smell 
<div></div>	

Sighting Method: See, Hear, Smell. Mark how you are sensing the animal or its sign. You can select one, two, or all three of these options, depending on how you observe the animal. (For example, you might smell a skunk but not see it.)

Sighting type: Live animal, track, carcass, scat, or sign. Indicate exactly what you are sensing. You can select one or more of these options.

What do you sense?	
<input type="checkbox"/>	Live animal 
<input type="checkbox"/>	Track 
<input type="checkbox"/>	Carcass 
<input type="checkbox"/>	Scat 
<input type="checkbox"/>	Sign 
<div></div>	

What animal group is it in?				
				
 9 LEGS	 6 LEGS	 8 LEGS	 10+ LEGS	

◀ ▶

Animal Group: Choose the group that is appropriate for the animal you sense.

Your choices here are: *birds, mammals, amphibians, reptiles, fish, annelids & mollusks, insects, arachnids, or myriapods & crustaceans.*

The screens change after this point, based on which animal group your organism is in, but the general process is the same for all groups. When you choose a group, you will see a list of the common species in your area. The list usually starts with “unknown X” (such as “unknown bird” or “unknown mammal”). The rest of the list consists of common animals in that group, and includes “other X”. You should use “other” if you know for sure the animal you are looking at is not on the list (for example, you know for sure it is a Muscovy Duck but Muscovy Duck is not on the list) and “unknown” when you are unsure of the species.

Choose an animal, then tap on the rightward arrow ▶ to go to the next screen.

Note about **invertebrates**: Because there are so many invertebrates in the world and in your schoolyard, some of these groups use more than one screen for identification. Whenever you see “...” in a name (such as “Slugs and Snails...” or “Butterflies...”, that means it links to another screen with more choices.

How many? Enter the number of individuals you observed. If you saw only a footprint or sign of an animal, such as a web or a nest, enter 1.

How many?			
			0.
7	8	9	<
4	5	6	.
1	2	3	0

◀ ▶

The icons are explained below, but remember that when you tap on an icon, you can see its name in the top section of the screen. When you are done making your choices, click on right arrow.



Moving – the animal was moving (flying, crawling, walking, running, etc.) The icon is a person running.



Signaling – the animal was making sounds or making a visual display. The icon is a bird singing and displaying its wings.



Resting or sleeping – the animal was quiet or sleeping. Icon is a person resting.



Feeding – the animal was gathering or chewing food. Icon is a cow eating.



Drinking – the animal was drinking. Icon is a cow drinking.



Fighting – the animal was behaving aggressively with another of its own kind. Icon shows two antelopes fighting.



Building – the animal was making a nest or mound. Icon is a person building a house.




Grooming – the animal was cleaning itself, for example, licking its fur or preening its feathers. Icon is a deer with a comb.



Courting – the animal was attracting or mating with another. Icon shows two birds doing a courtship dance.

If there is anything extra you want to describe about your observation, the last screen is the place for it. You can tap on the “ABC” in the graffiti writing area to get letters to tap on to spell out your note. For example, if you are recording a squirrel nest, you could record “sign” as the sighting type, and type “nest” in this note area in order to be more specific. A note can say anything you want.

Tap the ◀ button to save your data about this animal. (Note: your data will not be saved if you do not tap this button.) You will return to the first screen, where you tap on  to enter your next animal sighting.

Final Screen - Save Data

(write notes here)

Tap here

to save your data.

V

V

◀ ◀

We provide a CyberTracker training exercise where students learn how to record the animals in pictures. If you feel the students need more practice, let them record data for pictures in your room, or the following list: 3 robins, a lot of ants, a spider under a rock, and 1 squirrel that is eating nuts on a tree trunk.

Downloading Field Data

(For your reference related to Learning Sets 2, 3, and 4)

After your students have collected their observations in the PDAs, you need to gather the observations by syncing the individual PDAs to a computer and then uploading the combined data from all students to the BioKIDS server. You can then view or print a summary of the data for your students to use during other BioKIDS activities. To do this, you need to do four things:

1. **Sync** data from all of the individual student PDAs to a desktop computer.
2. **Export** the data as a text file using the CyberTracker software.
3. **Upload** the data to the BioKIDS website (<http://www.biokids.umich.edu>) using a web browser.
4. **Print** your summary.

1. Sync the data to your desktop computer

To sync the PDAs:

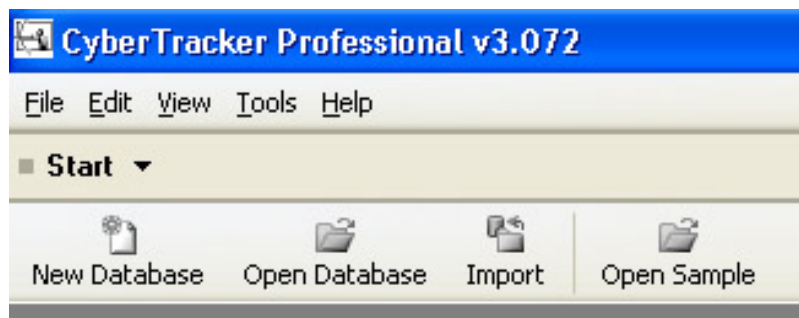
1. Make sure the CyberTracker desktop software is not running on your computer.
2. One at a time, put the PDA in the cradle and press the Sync button on the cradle.
3. A dialog box will appear indicating that the PDA is connecting to the desktop computer. You may be asked to identify which PDA you are syncing (They should correspond to an identifying number on the PDA).
4. Eventually another dialog box will appear indicating the number of observations being transferred from the PDA to the CyberTracker desktop software.
5. Repeat the process with all of the student PDAs.

2. Exporting your class data

To view a data table of your classes' data (zone summary tables) you need to export a text file containing the observations from the CyberTracker desktop software and upload the text file to the BioKIDS website using a web browser (e.g. Netscape or Internet Explorer). First, start the CyberTracker desktop software on your computer (by double clicking on the CyberTracker (Professional) icon on the desktop). Then:

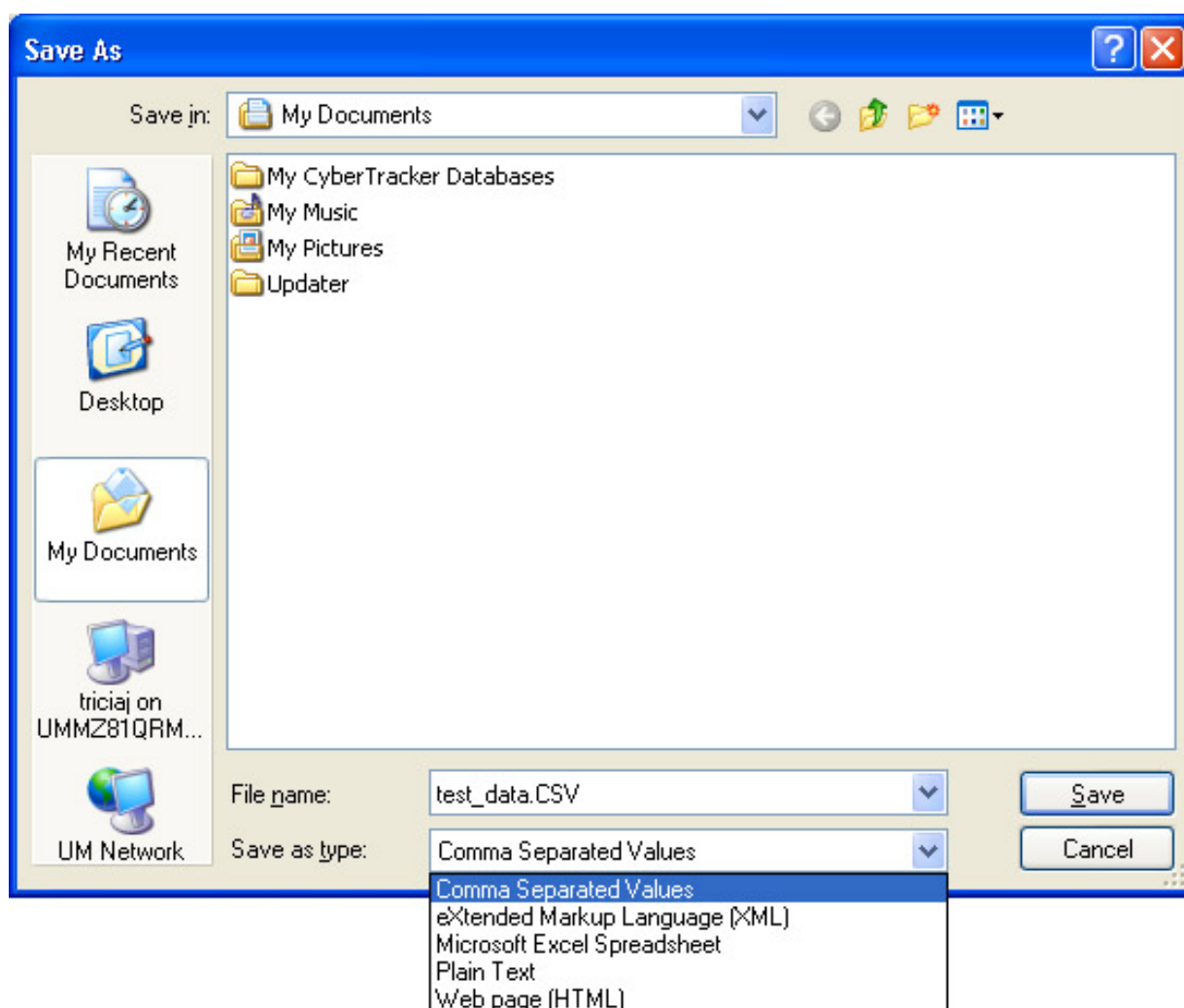
Open your database:

1. From the toolbar or the File menu, select Open Database.
2. In the Open dialog box, select your class database (e.g. BioKIDS_2006.MDB).
3. Click "Open".



Export your data:

1. Go to the **View** menu and select **Reports** or choose the **Reports** from the popup menu just below the **File** menu.
2. From the **toolbar** click on the **Export** button (see right).
3. Name the file with a name of your choice (e.g. first_period). Avoid using spaces in the name of the file, instead use the underscore character (as in the example).
4. In the **Save as type:** popup menu, choose “Comma Separated Values.” Your file will be saved in a specific format necessary for the (.csv).
5. Click “Save.” This will save a copy of your data in the *My Documents* folder. You can also save it to another location (e.g. the desktop) by choosing the location in the top menu (in the figure below, this has a folder with the label *My Documents*).



3. Upload data to BioKIDS website

Using an Internet browser (e.g. Netscape or Internet Explorer) go to the BioKIDS website: <http://www.biokids.umich.edu>, click on the link marked “CyberTracker Tools Login” and log in using your user name and password. From there:

1. Click on the **CyberTracker** link
2. Click on the **Upload Data** link
3. Find the file on your C: drive that you just exported (it should be in the *My Documents* folder if you have not saved it somewhere else)
4. Click **Upload**

After you do this you will receive a message: “Your data was uploaded successfully”.

4. Print the Habitat Summary Table or the Zone Summary Table

1. At this point you will be able to choose between printing the *Habitat Summary Table* (used in Learning Set 2 and 3) or the *Zone Summary Table* (used in Learning Set 4).
2. From the **File** menu of your browser choose **Print**

You should now have a complete summary table for the data your students have entered into their PDAs during their fieldwork data collection.