nature unleashed

the untamed world of missouri ponds, forests and prairies

MDC DISCOVER nature SCHOOLS

TEACHER

nature unleashed

the untamed world of missouri ponds, forests and prairies

teacher guide

Serving nature and you®

Missouri Department of Conservation

foreward

Teachers all over Missouri field tested and unleashed this unit into the lives of their students, and now nature is about to be unleashed for you and your students!

Before you begin...
- please read through the wealth of information packed into the introductory materials
- have students read each chapter (outside when possible!) before beginning each lesson.
- adapt activities to suit the needs of your students!

Activities are intended to provide teachers and students with ample opportunities to have fun while learning outdoors. AND... GLEs are aligned with objectives, content, essential activities and assessment items!

Now, unleash your students outside and into nature and let the learning begin!

An entire population of Missouri Department of Conservation employees and outside contributors made this project possible. We appreciate the time, effort and expertise that each of these human organisms dedicated to unleashing nature into the lives of students.

Illustrator: Mark Raithel (except for artwork in *Optional Activities 4.B* and *5.A*)
Designer: Marci Porter

Serving nature and you

Missouri Department of Conservation
PO Box 180
Jefferson City, MO 65102-0180
www.MissouriConservation.org

Copyright © 2009, 2010 by the Conservation Commission of the State of Missouri. Revised 10/2009, 1/2010, 7/2013.

Equal opportunity to participate in and benefit from programs of the Missouri Department of Conservation is available to all individuals without regard to their race, color, national origin, sex, age or disability. Questions should be directed to the Department of Conservation, PO Box 180, Jefferson City, MO 65102, (573) 751-4115 (voice) or 800-735-2966 (TTY), or to the U.S. Fish and Wildlife Service Division of Federal Assistance, 4401 N. Fairfax Drive, Mail Stop: MBSP-4020, Arlington, VA 22203.

table of contents

teacher notes 3

Discover Nature Schools 3
Unit Overview 4
Unit Time Frame 6
Lesson Plan Components 7
Student Science Notebooks 9
National Science Teachers Association Article 9
Field Investigations 11
Recording Outside Temperature with Students 13
Wrap-Up/Formative Assessment Strategies 14
Reference Materials 15

alignment to missouri standards 16

Missouri Science Concepts / Show-Me Process Standards / Communication Arts Standards 16
Science Grade Level Expectations Alignment 17

lesson 1 : it's all connected 23

Outline of Answers to Objectives—Lesson 1 24
Activity 1.1 : Living or Non-living? 25
Activity 1.2 : Space—It's a Basic Need, Too 27
Activity 1.3 : Organism, Population, Community, Ecosystem? 29
Activity 1.4 : Schoolyard Ecosystem Interactions 36
Activity 1.5 : Making Connections 37
So, What Do You Know?—Lesson 1 Questions and Answers 39

lesson 2 : it's what's inside that counts 41

Outline of Answers to Objectives—Lesson 2 42
Activity 2.1 : It's What's Inside That Counts 44
Activity 2.2 : There's No Place Like Home 50
Activity 2.3 : What Are You Doing Here? 52
Activity 2.4 : Is There a Difference? 55
Activity 2.5 : It's For the Birds 56
Optional Activity 2.A : MDC video segments 58
So, What Do You Know?—Lesson 2 Questions and Answers 59

lesson 3 : having what it takes—to survive! 61

Outline of Answers to Objectives—Lesson 3 63
Activity 3.1 : Where Do You Want to Eat, Bird? 65
Activity 3.2 : Now You See Me Now You Don't 69
Activity 3.3 : Finding the Right Place at the Right Time—Staying Comfortable When You Are Cold-blooded 74
Activity 3.4 : Specialized Structure Game 78
Optional Activity 3.A : MDC video segments 90
Optional Activity 3.B : Bird Migration—Human Style 91
Optional Activity 3.C : Winter "Rap" 94
Optional Activity 3.D : Leaves for Survival 95
So, What Do You Know?—Lesson 3 Questions and Answers 99

lesson 4 : chain of foods 101

Outline of Answers to Objectives—Lesson 4 102
Activity 4.1 : Basic Food Chain Paper Links 103
Activity 4.2 : Food Chains 110

Activity 4.3 : Schoolyard Ecosystem Food Chains 123
Optional Activity 4.A : MDC video segments 124
Optional Activity 4.B : Owl Pellet Dissection Practice 125
Optional Activity 4.C : Owl Pellets—The Real Deal 128
Optional Activity 4.D : Beaks, Seeds and Places to Eat 131
So, What Do You Know?—Lesson 4 Questions and Answers 133

lesson 5 : you eat what?! 135

Outline of Answers to Objectives—Lesson 5 137
Activity 5.1 : Are There Any "Free" Pond Lunches? 138
Activity 5.2 : Are There Any "Free" Forest Lunches? 156
Activity 5.3 : Are There Any "Free" Prairie Lunches? 174
Activity 5.4 : Schoolyard Ecosystem Investigation 196
Optional Activity 5.A : Animal Teeth—It's All About the Food 198
Optional Activity 5.B : Life on the Forest Floor 202
Optional Activity 5.C : Worms in School 204
So, What Do You Know?—Lesson 5 Questions and Answers 208

lesson 6 : you want flies with that? 209

Outline of Answers to Objectives—Lesson 6 210
Activity 6.1 : Predators and Prey in the Food Chain 211
Activity 6.2 : Predators—They're Part of the Picture 214
Activity 6.3 : Humans—At the Top 216
Optional Activity 6.A : Hike Through the Regulations 220
So, What Do You Know?—Lesson 6 Questions and Answers 221

lesson 7 : it all makes sense 223

Outline of Answers to Objectives—Lesson 7 224
Activity 7.1 : What's the Big Deal About Interaction? 226
Activity 7.2 : Bird Interaction—Survival! Survival! Survival! 227
Activity 7.3 : Human Interactions 229
So, What Do You Know?—Lesson 7 Questions and Answers 231

lesson 8 : humans are organisms, too 233

Outline of Answers to Objectives—Lesson 8 234
Activity 8.1 : Humans Interactions Continued 235
Optional Activity 8.A : Can They Live Here? 237
Optional Activity 8.B : Interactive Web 239
Optional Activity 8.C : MDC video segments 255
Optional Activity 8.D : What Is Going On in Your Neighborhood? 255
Optional Activity 8.E : Conservation Programs 255
So, What Do You Know?—Lesson 8 Questions and Answers 256

appendices 259

Appendix A : Depth of Knowledge Chart 260
Appendix B : Elementary Performance Event Template 261
Appendix C : Writing Prompt Scoring Guide 267
Appendix D : Writer's and Speaker's Checklists 268
Appendix E : Summary Paragraph Guidelines and Scoring Key 268
Appendix F : Fahrenheit/Celsius Comparison Chart 269
Appendix G : Planning a Successful Field Trip 270
Appendix H : Assessments 272
Pre- and Post-test with Answers and Scoring Key 273
Assessment Item Bank / Assessment Item Bank with Answers and Scoring Key 281
Appendix I : Ecosystem Cards Comprehensive Key 291

teacher notes

discover nature schools

Discover Nature Schools (DNS) is a science/conservation education program at its best Instructional units comprise the backbone of the DNS program and include exciting and engaging hands-on activities designed to bring students in grades K–12 outdoors and closer to nature

Each unit includes colorful and engaging student books as well as teacher guides with activities designed to meet Missouri Department of Elementary and Secondary Education (DESE) state standards and Grade Level Expectations (GLEs) Use of science notebooks by students is an important and integrated component

Lesson plans guide teachers toward utilizing immediate school grounds as important resources for student learning At the heart of the DNS program is the belief that the more students equate the outdoors with learning, the more comfortable they become outdoors and the more in tune and familiar they become with outdoor environments As students become more comfortable and familiar with learning and documenting outdoor experiences, the more they begin to think and act like observant scientists sensitive to and inquisitive about changes in outdoor environments

Student books and teacher guides (as well as training in their use) are available to all Missouri educators However, teachers who enroll formally in the DNS program are eligible for additional resources including grant opportunities for field experiences and classroom materials to support each instructional unit

DNS units

Nature Revealed — Pre-school (in development)
Nature Unfolds — Kindergarten–2nd grade
Nature Unleashed: The Untamed World of Missouri Ponds, Forests, and Prairies — Grades 3–5
Conserving Missouri's Aquatic Ecosystems — Grades 6–8
Nature Unbound: The Impact of Ecology on Missouri and the World — Grades 9–12

unit overview

Nature Unleashed: The Untamed World of Missouri Ponds, Forests and Prairies (*Nature Unleashed*) is a unit designed to be taught at the elementary grade level Fourth grade Ecology GLEs are the primary targets, but this unit also addresses fourth grade GLEs for Matter and Energy, Living Organisms and Inquiry

Several GLEs included in the unit apply to the third and fifth grades Third grade GLEs included address food chains Fifth grade GLEs related to Inquiry and are included to assist in preparing fifth grade students for the Science MAP test

Essential activities should guide students toward designing a field trip; gathering, recording and organizing data while on the field trip; and presenting the data from the field trip The field trip is a culminating activity intended to allow students to demonstrate their ability to think and act like scientists

This Teacher Guide contains introductory materials addressing the integration of science notebooks into all activities and scientific inquiry and field investigations into most activities

Lesson plans with activities for teaching each chapter in the student book are provided (see *Lesson Components Overview* for more details) as well as charts showing alignment with GLEs and state standards

Nature Unleashed activities are designed to be adapted easily by teachers to meet student needs Most activities in this unit are designed to get students outdoors and exploring, investigating and asking questions about immediate areas around their school However, a variety of activities have been included to provide more tools to meet diverse learning styles of students and to allow for teaching styles and preferences

Detailed teaching strategies are provided to guide beginning teachers through an understanding of the content matter and of how to teach the content matter A detailed outline of answers to objectives is included with each lesson for teacher reference Science notebooks are a key component of every lesson, and science notebooks designed specifically for use with the *Nature Unleashed* unit are available for every student The "Test" serves as both the pre-test and the post-test and is provided as Appendix H

The "So, what do you know?" sections at the end of each lesson provide lesson assessment opportunities An *Assessment Item Bank* is also included to provide additional assessment pieces for the Unit for teachers who wish to use the them

big charts

Student science notebooks include headings on pages with lines and blank space to allow students to keep notes and create charts, graphs, sketches, labeled drawings, etc Each science notebook also includes four *Big Charts*, one for each ecosystem studied including the "Schoolyard" ecosystem

Students begin filling in their *Big Chart: Pond Ecosystem*, *Big Chart: Forest Ecosystem* and *Big Chart: Prairie Ecosystem* in Lesson 2 Large pond, forest and prairie posters available from MDC are used in Lesson 2 along with the same posters with keys in Chapter 2 of the student book

Big Charts for ponds, forests and prairies contain:

1 "Living Things" section which includes:
   - a column to list each organism illustrated on the specific ecosystem poster
   - b check-off columns to indicate whether an organism is:
     - i plant
     - ii animal
     - iii producer
     - iv consumer
     - v herbivore
     - vi carnivore
     - vii omnivore
     - viii decomposer
     - ix scavenger
     - x predator
     - xi prey
2 "Non-living Things" section to list non-living things for each ecosystem

Big Chart: Schoolyard Ecosystem contains the identical columns and sections as the other *Big Charts* but is created entirely by students to represent the living and non-living things they observe in their own schoolyard/outside area

Big Chart keys are provided for all but the schoolyard ecosystem

safety precautions

Most activities for *Nature Unleashed* lessons are designed to be held outdoors Students should become comfortable outdoors working alone or in groups and should regard the schoolyard and accessible areas around the school as their natural classroom and laboratory Students should also respect any boundaries and rules set by teachers while working in these outdoor natural classrooms/laboratories

Preparatory walks prior to bringing students outside are suggested primarily for teachers to familiarize themselves with examples of living and non-living things students will be asked to observe and investigate later that day during one or more activities However, these preparatory walks also help teachers determine if there are any objects or areas they will require students to avoid during *Nature Unleashed* activities, such as openings in fences; areas beyond school property; areas that are slippery, muddy or wet from recent storms; maintenance activities; etc It is advisable for teachers to help students recognize and avoid poison ivy bushes and vines

Extreme weather aside, outdoor exploration and observation during light rain and snow can provide students with surprising and unusual information about the behavior of organisms found in their schoolyard ecosystem and offer insight into new and interesting interactions among living things and non-living weather factors (water, air temperature, wind) Well-established clothing and behavior guidelines will reduce or eliminate any potential hazards to students while outdoors in any weather

unit time frame

Nature Unleashed unit (all lesson activities)—approximately 13–15 days (1 hour/day) excluding summative assessments

"Estimated Time" section suggests how much time it may take to teach each lesson and activity Actual time will be affected by the following factors:

- grade level
- daily schedule of the school
- need for review of previous learning based on the extent of student prior knowledge
- need for reteaching based on the results of formative assessments
- additional resources/knowledge of teacher
- time allotted for group presentations based on class size
- time allotted for cooperative learning activities
- number of activities given as homework rather than completed as class activities
- availability of resources for student use
- number and type of "Extension Activities" and "Optional Activities" used
- number of additional outdoor bird behavior observation periods (recommended)

Lesson Title	Estimated Time
1 It's All Connected	**Activities 1.1, 1.3, 1.4**—30–40 minutes **Activities 1.2, 1.5**—20–30 minutes
2 It's What's Inside That Counts	**Activity 2.1**—30 minutes to one hour depending on number of ecosystems covered **Activities 2.2, 2.3, 2.4**—20–30 minutes **Activity 2.5**—Varies but could be up to 2 hours for discussion, research, design and creation of feeders, etc
3 Having What It Takes—To Survive	**Activities 3.1, 3.2, 3.3**—30–40 minutes **Activity 3.4**—20–30 minutes
4 Chain of Foods	**Activities 4.1, 4.2, 4.3**—30 minutes
5 You Eat What?!	**Activities 5.1, 5.2, 5.3, 5.4**—30–40 minutes
6 You Want Flies With That?	**Activities 6.1, 6.2, 6.3**—30 minutes
7 It All Makes Sense	**Activity 7.1**—30 minutes **Activity 7.2**—30–40 minutes **Activity 7.3**—20–30 minutes
8 Humans Are Organisms, Too	**Activity 8.1**—30–40 minutes

lesson plan components

A lesson is defined as a logical grouping of information to be taught Individual lessons will most likely be taught over several days A lesson in this teacher guide does not necessarily equate to a daily lesson plan

components

Estimated Time—This indicates the approximate time to teach the lesson including all Essential Activities

Science GLEs—Only the GLEs that are specifically addressed in the lesson are listed If a portion of a GLE is not addressed, that portion is shown with the strike-through font

Vocabulary—Listed terms reflect the terms bolded in the corresponding chapter in the student book These are the key terms that students must master in order to fully comprehend the concepts being addressed These terms are listed in the GLEs and will be assessed They are defined in the student book chapters and in the student book glossary Note that the glossary also includes other terms used in the student book that students may not know

Lesson Objectives—Specific student objectives addressed in the lesson are listed

Essential Questions for the Lesson—These questions could be used by the teacher to set the stage for the lesson Teachers may elect to put them on the bulletin board, blackboard, whiteboard, etc They are intended to help students think and address questions and ideas as scientists Essential questions are provided to guide students toward field investigations that have the potential to provide rigorous and engaging inquiry experiences for young learners

Teacher Notes—This section provides information to help teachers prepare for the lesson It may contain additional content information for the teacher, notes or comments about the lesson, any advanced teacher preparation as well as suggested references for teacher background information

Outline of Answers to Objectives—Content addressed by each objective has been outlined and included in each lesson The page numbers included at the end of each objective refer to the relevant pages in the student reference

Transparency Masters—Transparency masters should be printed onto clear overhead acetate sheets This section heading only appears when transparency masters are included in a lesson

Essential Activities—Most lessons have more than one Essential Activity, and all of these Essential Activities are essential in order to meet lesson objectives Essential Activities include:

- Estimated time
- Objectives
- Teacher preparation
- Materials
- Procedure
- Wrap-Up/Formative Assessments
- Extension Activities—These are the only optional portions of an Essential Activity Some Essential Activities are followed by Extension Activities Extension Activities enhance the Essential Activities but are not required to meet the lesson objectives

Optional Activities—These activities do not necessarily enhance specific activities nor are they required to meet lesson objectives, but they do provide opportunities for further study related to the lesson Optional activities may include viewing video segments or investigating one piece of a lesson further If there are no optional activities for the lesson, this section heading will not be listed

Summary—This is the summary provided in the corresponding chapter in the student book

So, what do you know?—An opportunity for teachers to evaluate and adjust/revisit their instruction through assessment of student learning

At the end of each lesson, a "So, what do you know?" section has been provided Some or all of the items for each section may be used in different ways depending on teacher preference and student needs An answer key with points possible for each item is provided This section has been provided to help answer the question, "What needs to be re-taught before moving on to the next lesson?"

Examples of some ways to use "So, what do you know?" include:

Advanced Organizer—Students would complete chosen items as they read the corresponding chapter Teachers could collect and review the items to determine student learning and understanding Teachers may choose not to collect the items but have students use them throughout discussion of the content and revise answers as needed

Cooperative Learning—Various items could be used for group discussions

Worksheet—All or part of the section could be used as an in-class activity or as homework when appropriate The answer key may be used if items are graded

Quiz—All or part of the section could be graded for points after completing all essential activities for each lesson

student science notebooks

Science notebooks are an extremely useful tool for students and teachers alike They promote good data collection and record-keeping habits as well as reference tools for students For teachers, they provide ample opportunity for assessment of student work and data organization

An excerpt from *Using Science Notebooks in Elementary Classrooms* by Michael P Klentschy published in *NSTA Reports* (monthly newspaper of the National Science Teachers Association), September 2008, Volume 20, Number 1, has been reprinted and included below with permission of NSTA This excerpt provides useful information on different approaches to and support for the use of science notebooks

Klentschy states in the excerpt cited above that "scientists keep notebooks; students should do likewise Scientists' notebooks include what worked and what did not work in the investigation They sometimes learn much more from what did not work " Activities in this Teacher Guide encourage students: 1) to develop their own methods of collecting, recording and presenting data from investigations and long-term observations; 2) to share, compare and discuss their methods and findings with other students; 3) to re-evaluate their methods, discuss whether or not their investigation was a "fair test" and discuss possible alternatives to their methods; and 4) to maintain permanent records of all their discussions, observations, data recording methods, etc In this way, students are provided "with the opportunity to use science notebooks in much the same way scientists do" (Klentschy, 2008), and students begin to recognize science notebooks as useful resources for future methods whether the methods were successful or not in the past

For use with the *Nature Unleashed* unit, science notebooks are provided for each student Students will be required to use their science notebooks for most lesson activities for data collection, organization of field investigation data, recording of group brainstorming ideas, reflective writing exercises, sketching, etc

Heading information may vary, but the following, basic information is included for *each* activity heading entry Repetition of this process will reinforce good record-keeping and data collection techniques useful to students throughout their school experiences as well as their lives

- Date (Month/Day/Year)
- Time of Day
- Brief Description of Weather
- Location
- Outside Temperature

Klentschy, M P, *Using Science Notebooks in Elementary Classrooms*, NSTA Press (Arlington, Virginia), 2008

Additional Resources

Britsch, Susan and Daniel P Shepardson "The Art of Reviewing Science Journals " *Science and Children*, Nov–Dec 2004 pp 43–45

Campbell, Brian and Lori Fulton *Science Notebook: Writing About Inquiry* Portsmouth, NH: Heinemann 2003

Campbell, Brian and Lori Fulton "Student-Centered Notebooks " *Science and Children*, Nov–Dec 2004 pp 26–29

Calhoun, Jeri and Ellen Mintz "Project Notebook " *Science and Children*, Nov–Dec 2004 pp 30–34

Leslie, Clare Walker and Charles E Roth *Nature Journaling* Vermont: Storey Books 1998

Moriarty, Robin, Jeff Winokur and Karen Worth "Capitalizing on Literacy Connections " *Science and Children*, Feb 2004 pp 35–39

national science teachers association article

Article from NSTA reports—September 2008

Editor's Note:

NSTA Press publishes high-quality resources for science educators This series will feature just a few of the books recently released The following excerpt comes from Using Science Notebooks in Elementary Classrooms *by Michael P Klentschy, edited for publication here NSTA Press titles are available online through the NSTA Science Store at* www nsta org/store

Student science notebooks are advocated by researchers who believe that writing in science enhances student understanding of science content and process skills Student science notebooks can be embedded into the science curriculum as a natural part of the goal to assist students in making evidence-based explanations of their science investigations

The student science notebook is more than a record of data that students collect, facts they learn, and procedures they conduct It is also a record of students' reflections, questions, predictions, claims linked to evidence, and conclusions, all structured by an investigation

leading to an understanding of "big ideas," not just factoids in science As such, a science notebook is a central place where language, data, and experience work together to form meaning for the student This form of competence or expertise is developed through active construction of knowledge Students need time and practice using science notebooks to attain expertise

Student science notebooks, used well, become an embedded element in the curriculum and thus serve as a ready source of recorded data for both the student and the teacher They become a direct measure of student understanding of the implemented curriculum and an important means for formative assessment The science notebooks also reflect an accounting of the progression of an investigation as students formulate and record questions; make predictions; develop a plan of action; record observations, measurements, and data; link claims to evidence; and finally reflect on the investigation They are the students' personal record that can be referred to and revised throughout an investigation or even an entire unit of study The science notebooks also serve as the evidence used in group and class discussion

There are many different approaches to having students create and utilize science notebooks: composition books, blank lab books, lined sheets of paper stapled together or loose-leaf binders

In primary grades, class or group science notebooks may be created for a unit of study instead of individual student notebooks Classroom teachers often form covers in the shape of the unit of study, such as a round cover if the students are studying the planets or the Moon Students as early as kindergarten should be encouraged to keep a record of science investigations Often these entries will come in the form of scribbles or drawings only decipherable to the student These form the foundation for later work, when more specific criteria and writing prompts or sentence starters are more formally introduced The main objective is for teachers to initially provide students with the opportunity to record their science investigation Figure 2 1 is a sample page from a flip chart a third-grade student created during an investigation of brine shrimp

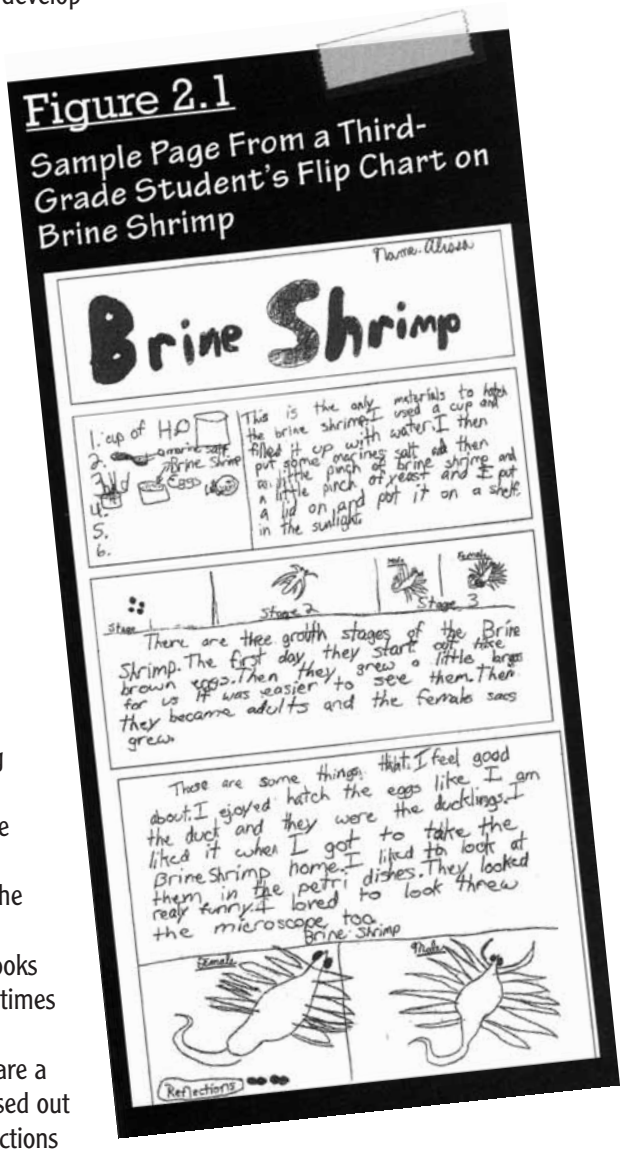


Figure 2.1
Sample Page From a Third-Grade Student's Flip Chart on Brine Shrimp

This page is an example of a student just starting to use a science notebook The classroom teacher was focusing on observation and recording data with this investigation The sample shows the procedures this child followed in hatching the brine shrimp It also depicts an understanding of the growth cycle of the brine shrimp with drawings and observations recorded Finally, the sample page includes a reflection of how the student felt about the investigation

Scientists keep notebooks; students should do likewise Scientists' notebooks include what worked and what did not work in the investigation They sometimes learn much more from what did not work These notebooks include data, drawings, charts, and reflections, as well as new questions Scientist entries are a record of what was learned at the time of the investigation and are not crossed out or erased when new discoveries take place Newer ideas, thoughts, and reflections are added as new entries Classroom teachers should adjust their teaching to provide students with the opportunity to use science notebooks in much the same way scientists do The chapters that follow provide teachers with the support necessary to accomplish this task

citations

- Amaral, O , L Garrison, and M Klentschy 2002 Helping English learners increase achievement through inquiry-based science instruction *Bilingual Research Journal* 26 (2): 213–239
- Campbell, B and L Fulton 2003 *Science notebooks* Portsmouth, NH: Heinemann
- Klentschy, M , and E Molina-de la Torre 2004 Students' science notebooks and the inquiry process In *Crossing borders in literacy and science instruction: Perspectives on theory and practice*, ed W Saul, 340–354 Newark, DE: International Reading Association
- Rivard, L , and S Straw 2000 The effect of talk and writing on learning science: An exploratory study *Science Education* 84 (5): 566–593
- Shepardson, D , and S Britsch 2001 The role of children's journals in elementary school science activities *Journal of Research in Science Teaching* 38 (1): 43–69

Credit: NSTA Reports September 2008 Used with permission from the National Science Teachers Association www nsta org/

field investigations

Use of science notebooks and field investigation techniques by students are integrated components of the *Nature Unleashed* unit The following excerpt from *Field Investigations: Using Outdoor Environments to Foster Student Learning of Scientific Processes* developed for the Association of Fish and Wildlife Agencies' North American Conservation Education Strategy and developed by the Pacific Education Institute is included here to provide teachers with background information on the importance of field investigations and how it relates to student learning

***

Field investigations help students become **systems thinkers**, learn the skills of scientific inquiry, and understand that science **doesn't only happen in a laboratory or classroom** Outdoor experiences in natural settings increase students' problem solving abilities and motivation to learn in social studies, science, language arts and math

When planning and conducting field investigations, students and scientists grapple with the difficulties of working in a natural system and at the same time develop an understanding of its complexities and subsystems Systems-thinking involves thinking about relationships, rather than about individual objects A system can be defined in a number of ways:

- An assemblage of inter-related parts or conditions through which matter, energy, and information flow
- An organized group of related objects or components that form a whole
- A collection of things and processes (and often people) that interact to perform some function The scientific idea of a system implies detailed attention to inputs and outputs and interactions among the system components

State and national science education standards encourage instruction that focuses on problem-solving and inquiry—activities which characterize the pursuits of scientists In field investigations, students pose a research question then plan and conduct an investigation to answer that question Students use evidence to support explanations and build models, as well as to pose new questions about the environment Students learn that the scientific method is not a simple linear process and, most importantly, experience the difficulty of answering essential questions such as:

What defines my environment?
What are all the parts and interrelationships in this ecosystem?
What is a healthy environment?
What is humans' relationship to the environment?
How has human behavior influenced our environment?
How can our community sustain our environment?
What is my role in the preservation and use of environmental resources?

Field investigations help students become informed citizen scientists who add knowledge to the community's understanding of an area in order to make issues of concern visible and share differing points of view about the preservation and use of community natural resources

Classroom science often overemphasizes experimental investigation in which students actively manipulate variables and control conditions In studying the natural world, it is difficult to actively manipulate variables and maintain "control" and "experimental" groups, so field investigation scientists look for descriptive, comparative, or correlative trends in naturally occurring events Many field investigations begin with counts (gathering baseline data) Later, measurements are intentionally taken in different locations (Ex: urban and rural, or where some natural phenomenon has created different plot conditions), because scientists suspect they will find a difference In contrast, in controlled experiments, scientists begin with a hypothesis about links between variables in a system Variables of interest are identified, and a "fair test" is designed in which variables are actively manipulated, controlled, and measured in an effort to gather evidence to support or refute a causal relationship

For conceptual clarity, we have identified three types of field investigations—descriptive, comparative, and correlative

Descriptive field investigations involve describing and/or quantifying parts of a natural system	**Comparative** field investigations involve collecting data on different populations/organisms or under different conditions (Ex: times of year, locations) to make a comparison	**Correlative** field investigations involve measuring or observing two variables and searching for a relationship

Each type of field investigation is guided by different types of investigative questions Descriptive studies can lead to comparative studies, which can lead to correlative studies These three types of studies are often used in combination to study the natural world

Ryken, A E , Otto, P, Pritchard, K , & Owens, K (2007) Field Investigations: Using Outdoor Environments to Foster Student Learning of Scientific Processes *Pacific Educational Institute*

*Reprinted with permission from Dr Margaret Tudor, Co-Executive Director of the Pacific Educational Institute, Market Place Office Building, 724 Columbia St NW, Suite 250, Olympia, WA 98501 (*mtudor@wfpa org*)*

recording outside temperature with students

Consider the following when purchasing thermometers for student use:

- Provide one thermometer for every two or three students
- If only a few thermometers are available, rotate temperature-reading responsibilities among students However, all students should record temperature readings taken prior to each activity
- Choose thermometers that are protected with some sort of plastic outer shell to prevent shattering or cracking when dropped
- Choose thermometers that are calibrated in Celsius alone or in conjunction with Fahrenheit The Missouri Department of Elementary and Secondary Education requires students to use Celsius when recording temperature
- Choose thermometers with calibrations that are large and clear enough for students to read
- Provide a box or container in which to store thermometers safely
- Wipe thermometers carefully with a soft, damp cloth when necessary before storing

Procedure for gathering outdoor temperature:

1. Instruct students to hold thermometers carefully at the top (where the highest numbers are located) or by the plastic shield
2. Students should not shake or swing thermometers but should hold thermometers steady
3. Have students take an initial thermometer reading to serve as a base line
4. While holding the thermometer up and away from their bodies, students should check every few minutes for changes in the thermometer reading
5. When students notice that no change in the reading has occurred after several checks, they should record the final reading in their science notebook heading
6. To determine temperatures of various locations around the schoolyard or field experience area, students should take the initial, base line thermometer reading and then carefully place the thermometer in the specific location to be measured (under a bench; under a rock ledge; on top of a rock; on the grass in the shade of a tree; etc)
7. Students should check every few minutes for changes in the thermometer reading
8. When students notice that no change in the reading has occurred after several checks, they should record the reading in their science notebook next to the description of the location(s) to be measured
9. Students should carefully wipe dirt, leaves, etc from thermometers with a soft, damp cloth
10. Thermometers should be returned carefully to the designated storage box or container

wrap-up/formative assessment strategies

There are many different strategies available to teachers to determine whether students have grasped and understand concepts addressed by the objectives indicated for each lesson and activity A few suggested strategies are listed below and referenced throughout the unit where specific, formative assessment strategies have not been included

Regardless of the strategies used to gather information about what students know and what they can do, it is important to use the information gathered to inform and enhance teacher instruction. Students may remain anonymous for some strategies

exit note

Ask students to write an exit note that includes a question they still have about what they learned in the activity and/or a question they would like to investigate Exit notes can be written on a piece of paper and placed in an "Exit Note" box placed near the classroom door, written on a Post-it note and stuck to a designated spot on the wall near the door, written on a piece of paper and stuck to a self-stick bulletin board, etc Determine whether student submissions should remain anonymous **Exit notes should be reviewed to determine what concepts need to be re-taught before moving on to the next activity.**

group report with presentation

Divide the class into groups of four students Number each group's team members 1–4 Within each group, give each group one or more questions to answer related to the activity Activity objectives and the questions students are being asked will determine the length of time required for this strategy Explain that all group members should be prepared to give a brief presentation of the answers to their question(s) Roll a dice for each group to determine who will give the presentation for the group

popcorn balls or snowballs

Prepare question(s) in advance or pose one based on any problem areas arising during the activity Ask students to answer one multiple choice question and have each student write an explanation of his/her answer choice on a piece of paper Instruct students to crumble up their paper like a snowball or ball of popcorn When ready, have students toss their snowballs/popcorn balls to other students Repeat tosses at least three times to ensure balls of paper are thoroughly mixed up Ask a student to read the answer and explanation on his/her paper Call upon other students to do the same before asking students if they agree or not with the answer selected and explanation given Discuss as needed

think-pair-share

Assign a question or problem for the class Allow time for individuals to think silently about it and then have students pair up and exchange thoughts Have the pairs share their responses with the class

open-ended inquiry questions

Ask a student an open-ended inquiry question Ask the rest of the class whether they agree or disagree with the student's answer and why? Ask additional questions and discuss as needed

summary

At the completion of a lesson or an activity, have students summarize what they learned Students can record this information in their science notebooks by writing and/or drawing Teachers should collect science notebooks Teachers can then determine what students really understand and determine content that needs to be re-taught The content of students' science notebooks can be graded or not depending on teacher's preference for each activity *Summary Paragraph Guidelines and Scoring Key* are provided as Appendix E

reference materials

teacher and classroom resources

Note: These materials are available free of charge from the Missouri Department of Conservation *

Posters * *(It is recommended that posters be laminated for classroom use)*
Animal Cards poster (E00077)
Forests: Layers of Leaves poster (E00126)
Life on the Forest Floor poster (E00004)
Missouri's Natural Communities: Forests (SCI049) **
Missouri's Natural Communities: Prairies (SCI048) **
Missouri Pond Life poster (E00002)
Prairie: Life Among the Grasses poster (E00088)

References *
Butterfly Gardening & Conservation (E00471)
Common Missouri Spiders (E00429)
Feeding Backyard Birds (E00450)
Fifty Common Trees of Missouri (F00088)
Introduction to Missouri Fishes (FIS020)
Introduction to Missouri Furbearers (SCI138)
Missouri Owls (E00455)
Missouri's Most Irritating Plant (Poison Ivy) (E00055)
Missouri's Raptors (Eagles, Hawks, Falcons & Vultures (E00452)
Missouri's Toads and Frogs (E00430)
Missouri's Turtles (E00468)
Native Plants for Your Landscape (E00594)
Snakes of Missouri (E00448)

References for supplemental lessons *
Conserving Missouri's Caves and Karst (SCI002)
Exploring Missouri Wetlands poster (E00003)
Missouri's Natural Communities: Glades (SCI047) **
Missouri's Natural Communities: Karst (SCI050) **
Outside In: Amazing Glades (E00123)
Rivers & Streams poster (E00509)

* Missouri Department of Conservation free publications can be ordered by sending an e-mail to *pubstaff@mdc mo gov* or writing to Publications, Missouri Department of Conservation, PO Box 180, Jefferson City, MO 65102-0180 Many publications can be downloaded from the Web The main address is: *www MissouriConservation org*

** These publications contain posters as well as additional detailed background information for teachers

recommended classroom resources

(Publications with numbers in parentheses are available for purchase from the MDC Nature Shop)

Amphibians and Reptiles of Missouri Tom R Johnson 2000 (01-0190)
Birds of Missouri Stan Tekiela 2001
Field Guide to Feeder Birds: Eastern and Central North America Roger Tory Peterson 2000
Field Guide to Backyard Bird Song: Eastern and Central North America Richard K Walton and Robert W Lawson 1999
Golden Guides from St Martin's Press: Birds Herbert S Zim and Ira N Gabrielson 2001
Golden Guides from St Martin's Press: Insects Clarence Cottam and Herbert S Zim 2001
Golden Guides from St Martin's Press: Mammals Herbert S Zim and Donald F Hoffmeister 2001
Key to Missouri Trees in Winter Jerry Cliburn and Ginny Wallace 1990 (01-0081)
Missouri Wildflowers Edgar Denison 2008 (01-0021)
Peterson Field Guides for Young Naturalists: Backyard Birds Jonathan Latimer and Karen Stray Nolting 1999
Peterson First Guide to Insects of North America Christopher Leahy 1998
Peterson First Guide to Mammals of North America Peter C Alden 1998
Peterson First Guide to Urban Wildlife Sarah B Landry 1998
Shrubs and Woody Vines of Missouri Field Guide Don Kurz 2009 (01-0292)
Trees of Missouri Field Guide Don Kurz 2005 (01-0092)

alignment to missouri standards

missouri science concepts (strands 1–6) addressed

- **EC.1.A.** All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem
- **EC.1.D.** The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes
- **EC.2.A.** As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use
- **EC.3.C.** Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem
- **LO.1.A.** Organisms have basic needs for survival
- **LO.1.E.** Biological classifications are based on how organisms are related
- **ME.2.C.** Electromagnetic energy from the sun (solar radiation) is a major source of energy on Earth

alignment to missouri show-me process standards

1 8 Organize data, information and ideas into useful forms (including charts, graphs, outlines) for analysis or presentation (*Activities 2 3*; *3 1*; *3 3*; *5 1*; *5 2*; *5 3*)

2 1 Plan and make written, oral and visual presentations for a variety of purposes and audiences (*Activities 1 4*; *3 1*; *3 3*)

alignment to communication arts standards

Writing 2 D 5 a Compose text using words that are specific, accurate, and suited to the topic (*Activity 6 2*)

Writing 2 Compose well-developed text – paper (*Activities 1 2* and *8 1*)

Writing 3 A 5 Compose a variety of texts c including a summary (narrative or informational) (*Activity 2 3*)

science grade level expectations alignment

In this unit, students develop the Science Grade Level Expectations (GLEs) listed in the Targeted Learning column below While supporting students in the development of these skills, teachers should consider students' prior learning and keep in mind their future learning The GLEs listed in the Targeted Learning column may be addressed in more than one lesson In the Lesson # column, the lesson number(s) are listed followed by which GLE or which portion of a GLE is covered by the lesson The Depth of Knowledge (DOK) coding indicated in the row directly below the GLE is from the Missouri Department of Elementary and Secondary Education (DESE) For the assessment column, SR means selected response, CR means constructed response and the number refers to the test item number

The GLE number coding is in the format used by DESE The first two letters refer to the strand (LO=Living Organisms, EC=Ecology, ME= Matter and Energy, IN=Inquiry) The first number refers to the "Big Idea" number under the strand Next, the single uppercase letter refers to the "Concept" under the Big Idea The following number refers to the grade level The lower case letter refers to the specific GLE for that grade See example below

LO 1 A 3 a = Living Organism 1 There is a fundamental unity underlying the diversity of all living organisms A Organisms have basic needs for survival 3rd grade a Describe the basic needs of most plants (i e , air, water, light, nutrients, temperature)

Lesson #	Assessment	Prior Learning	Targeted Learning	Future Learning
Lesson 1 LO 1 A 3 a Foundation for EC 1 A 6 a & EC 1 B 6 a -c	CR 8 CR 9 CR 10	LO 1 A 1 a Identify the basic needs of most animals (i e , air, water, food, shelter) LO 1 A 1 b Identify the basic needs of most plants (i e , air, water, light)	LO 1 A 3 a Describe the basic needs of most plants (i e , air, water, light, nutrients, temperature) Note: This lesson lays the foundation for abiotic and biotic factors by addressing living and non-living things It also has students demonstrate how organism, population, community, non-living things and ecosystem are connected	LO 1 A 6 a Describe the common life processes necessary to the survival of organisms (i e , growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste) EC 1 A 6 a Identify the biotic factors (populations of organisms) and abiotic factors (e g , quantity of light and water, range of temperatures, soil composition) that make up an ecosystem EC 1 B 6 a Identify populations within a community that are in competition with one another for resources EC 1 B 6 b Recognize the factors that affect the number and types of organisms an ecosystem can support (e g , food availability, abiotic factors such as quantity of light and water, temperature and temperature range, soil composition, disease, competitions from other organisms, predation)
			[DOK a 1]	

Lesson #	Assessment	Prior Learning	Targeted Learning	Future Learning
Lesson 2 EC 1 A 4 b **Lesson 3** EC 1 A 4 a only camouflage, migration & hibernation **Lesson 7** EC 1 A 4 a all except for migration & hibernation	SR 1, 4 SR 2 SR 6	EC 1 A K a Describe how the seasons affect the behavior of plants and animals	EC 1 A 4 a Identify the ways a specific organism may interact with other organisms or with the environment (e g , pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism) EC 1 A 4 b Recognize that different environments (i e , pond, forest, prairie) support the life of different types of plants and animals	EC 1 A 6 a Identify the biotic factors (populations of organisms) and abiotic factors (e g , quantity of light and water, range of temperatures, soil composition) that make up an ecosystem
			[DOK a 1; b 1]	
Lesson 3 EC 3 C 4 a EC 3 C 4 b EC 3 C 4 c EC 3 C 4 d	CR 11 CR 12 SR 5 SR 7	EC 1 A K a Describe how the seasons affect the behavior of plants and animals	EC 3 C 4 a Identify specialized structures and describe how they help plants survive in their environment (e g , root, cactus needles, thorns, winged seed, waxy leaves) EC 3 C 4 b Identify specialized structures and senses and describe how they help animals survive in their environment (e g , antennae, body covering, teeth, beaks, whiskers, appendages) EC 3 C 4 c Recognize internal cues (e g , hunger) and external cues (e g changes in the environment) that cause organisms to behave in certain ways (e g , hunting, migration, hibernation) EC 3 C 4 d Predict which plant or animal will be able to survive in a specific environment based on its special structures or behaviors	EC 3 C 6 a Relate examples of adaptations (specialized structures or behaviors) within a species to its ability to survive in a specific environment (e g , hollow bones/flight, hollow hair/insulation, dense root structure/compact soil, seeds/food, protection for plant embryo vs spores, fins/movement in water) EC 3 C 6 b Predict how certain adaptations, such as behavior, body structure, or coloration, may offer a survival advantage to an organism in a particular environment
			[DOK a 2; b 2; c 1; d 2]	

Lesson #	Assessment	Prior Learning	Targeted Learning	Future Learning
Lesson 4 EC 2 A 3 a & ME 2 C 3 a LO 1 E 5 b EC 2 A 3 b EC 2 A 3 c EC 2 A 3 d **Lessons 5 & 6** EC 2 A 3 d	SR 3 CR 13 CR 17 CR 14 CR 18 CR 18	ME 2 C 1 a Identify light from the Sun as a basic need of most plants	EC 2 A 3 a Identify sunlight as the primary source of energy plants use to produce their own food ME 2 C 3 a Recognize the Sun is the primary source of light and food energy on Earth LO 1 E 5 b Distinguish between plants (which use sunlight to make their own food) and animals (which must consume energy-rich food) EC 2 A 3 b Classify populations of organisms as producers or consumers by the role they serve in the ecosystem EC 2 A 3 c Sequence the flow of energy through a food chain beginning with the Sun EC 2 A 3 d Predict the possible effects of removing an organism from a food chain	EC 2 A 6 a Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships EC 2 A 6 b Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem EC 1 B 6 c Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem ME 2 C 6 b Recognize the Sun is the source of almost all energy used to produce the food for living organisms
			[DOK EC a 1; b 1; c 1; d 2] [DOK ME a 1] [DOK LO b 1]	

Lesson #	Assessment	Prior Learning	Targeted Learning	Future Learning
Lesson 5 EC 2 A 4 a EC 2 A 4 b **Lesson 6** EC 2 A 4 c	 CR 17 CR 15, 17 CR 16, 17		EC 2 A 4 a Classify populations of organisms as producers, consumers, decomposers by the role they serve in the ecosystem EC 2 A 4 b Differentiate between the three types of consumers (herbivore, carnivore, omnivore) EC 2 A 4 c Categorize organisms as predator or prey in a given ecosystem	EC 2 A 6 a Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships EC 2 A 6 b Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem
			[DOK a 1; b 1; c 2]	
Lesson 6 EC 1 D 4 a only hunting/ conservation of species **Lesson 8** EC 1 D 4 a	 CR 19 CR 19	EC 1 A 1 a Identify ways man depends on plants and animals for food, clothing, and shelter	EC 1 D 4 a Identify examples in Missouri where human activity has had a beneficial or harmful effect on other organisms (e g , feeding birds, littering vs picking up trash, hunting/ conservation of species, paving/ restoring greenspace)	EC 1 D 6 a Describe beneficial and harmful activities of organisms, including humans (e g , deforestation, overpopulation, water and air pollution, global warming, restoration of natural environments, river bank/coastal stabilization, recycling, channelization, reintroduction of species, depletion of resources), and explain how these activities affect organisms within an ecosystem EC 1 D 6 b Predict the impact (beneficial or harmful) of a natural environmental change (e g , forest fire, flood, volcanic eruption, avalanche) on the organisms in an ecosystem EC 1 D 6 c Describe possible solutions to potentially harmful environmental changes within an ecosystem
			[DOK a 1]	

GLE	Assessment	Prior Learning	Targeted Learning	Future Learning
Inquiry GLEs are aligned to specific activities that include inquiry The coding used in the assessment column refers to the specific activity by number For example, 3 2 refers to the 2nd activity in Lesson 3 Assessing inquiry GLEs is at the teacher's discretion				
IN 1 A 5 a	3 1	IN 1 A 4 a Formulate testable questions and explanations (hypotheses)	IN 1 A 5 a Formulate testable questions and explanations (hypotheses)	IN 1 A 6 a Formulate testable questions and hypotheses
			[DOK a 3]	
IN 1 B 5 a IN 1 B 5 b IN 1 B 5 c Thermometers IN 1 B 5 c Hand lenses IN 1 B 5 d	1 1; 1 3; 1 4; 2 3; 2 4; 3 1; 7 1; 7 2 1 1 All except 1 2, 1 5, 3 4, 4 1, 6 2 5 4 7 1 All	IN 1 B 4 a Make qualitative observations using the five senses IN 1 B 4 b Make observations using simple tools and equipment (e g , hand lenses, magnets, thermometers, metric rulers, balances, graduated cylinders, spring scale) IN 1 B 4 c Measure length to the nearest centimeter, mass using grams, temperature using degrees Celsius, volume to the nearest milliliter, weight to the nearest Newton	IN 1 B 5 a Make qualitative observations using the five senses IN 1 B 5 b Determine the appropriate tools and techniques to collect data IN 1 B 5 c Use a variety of tools and equipment to gather data (e g , hand lenses, ~~magnets~~, thermometers, ~~metric rulers, balances, graduated cylinders, spring scales~~) IN 1 B 5 d Measure ~~length to the nearest centimeter, mass to the nearest gram, volume to the nearest milliliter,~~ temperature to the nearest degree Celsius, ~~weight to the nearest Newton~~	IN 1 B 6 a Make qualitative observations using the five senses IN 1 B 6 b Determine the appropriate tools and techniques to collect data IN 1 B 6 c Use a variety of tools and equipment to gather data (e g , microscopes, thermometers, computers, spring scales, balances, magnets, metric rulers, graduated cylinders, stopwatches) IN 1 B 6 d Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, temperature to the nearest degree Celsius, force (weight) to the nearest Newton, time to the nearest second
			[DOK a 1; b 2; c 1; d 1; e 2]	
IN 1 D 5 a	2 3 3 1 3 3	IN 1 D 4 a Communicate the procedures and results of investigations and explanations through: ■ oral presentations ■ drawings and maps ■ data tables ■ graphs (bar, single line, pictograph) ■ writings	IN 1 D 5 a Communicate the procedures and results of investigations and explanations through: ■ oral presentations ■ drawings ~~and maps~~ ■ data tables ■ graphs (bar, ~~single line, pictograph)~~ ■ writings	IN 1 D 6 a Communicate the procedures and results of investigations and explanations through: ■ oral presentations ■ drawings and maps ■ data tables (allowing for the recording and analysis of data relevant to the experiment, such as independent and dependent variables, multiple trials, beginning and ending times or temperatures, derived quantities) ■ graphs (bar, single line, pictograph) ■ writings
			[DOK a 2]	

lesson 1: it's all connected

estimated time
2–3 hours

science GLEs
LO.1.A.3.a. Describe the basic needs of most plants (i e , air, water, light, nutrients, temperature)

vocabulary
Living things
Non-living things
Organism
Population
Community
Environment
Ecosystem

lesson objectives
1 Describe the basic needs of most plants and animals
2 Identify the living and non-living components of an ecosystem
3 Explain why non-living components of an ecosystem are important for the living components
4 Demonstrate how organism, population, community and ecosystem are connected

essential questions for the lesson
1 How are plants and animals connected to the air, light, soil, rocks, water and other non-living things?
2 What's the "recipe" for an ecosystem?

teacher notes
Students should have read Chapter 1, "It's All Connected," on pages 2–3 in their student books prior to engaging in these activities This lesson includes a review of the basic needs of most animals from grade 1 GLE LO 1 A 1 a

Since students will be using the schoolyard for many activities in this lesson and throughout the *Nature Unleashed* unit, it is very important that the teacher be thoroughly familiar with the schoolyard and any safety issues or concerns Students will begin using science notebooks in Lesson 1 and will continue using them throughout the unit Refer to *Student Science Notebooks* section and the *National Science Teachers Association Article* in the Teacher Notes section

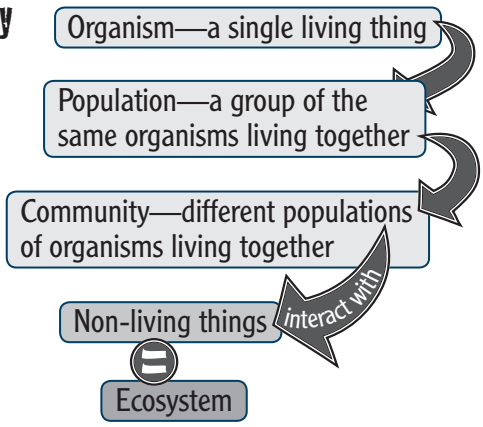
outline of answers to objectives See following page

transparency masters
Transparency 1.1: Organism
Transparency 1.2: Population
Transparency 1.3: Community
Transparency 1.4: Non-living Things

essential activities
Activity 1.1: Living or Non-living?
Activity 1.2: Space—It's a Basic Need, Too
Activity 1.3: Organism, Population, Community, Ecosystem?
Activity 1.4: Schoolyard Ecosystem Interactions
Activity 1.5: Making Connections

so, what do you know?—Lesson 1 questions and answer key

summary



outline of answers to objectives—lesson 1

1 Describe the basic needs of most plants and most animals (page 2)
   a Plants need air, water, light, nutrients, space and temperature
   b Animals need air, food, water, shelter and space

2 Identify the living and non-living things of an ecosystem (page 2)
   a Living—plants and animals
   b Non-living—sun, air, rocks, soil, water, temperature and landforms (hills, valleys, mountains) are examples of non-living things

3 Explain why non-living things are important for the living things (page 2)
   a Living things cannot live without the non-living things
   b Living things interact with the non-living things in their environment

4 Demonstrate how organism, population, community and ecosystem are connected (pages 2, 3)
   a An organism is a single living thing that can grow and reproduce
   b Two or more of the same organism living in the same area at the same time forms a population
   c Multiple populations of organisms living together in the same place at the same time forms a community
   d Populations of plants and animals living together in communities interact with each other, or act on each other, and with the non-living things in their environment (Environment is the immediate area around a plant or animal) Living and non-living things that interact in an environment form an ecosystem

activity 1.1 : living or non-living?

estimated time 30–40 minutes

objectives

Students will be able to

1 Describe the basic needs of most plants and animals
2 Identify living and non-living components in the schoolyard

teacher preparation

Students should have read Chapter 1, "It's All Connected," on pages 2–3 in their student books prior to engaging in these activities.

This will be the first time students use their science notebooks Provide time at the beginning of the activity to explain why they will use science notebooks and to guide them through the process of completing the headings for each entry *Student Science Notebooks* in the Teacher Notes section provides background information How outside air temperature readings are taken depends upon the number of thermometers available and the thermometer-reading skill levels of students It is recommended that enough thermometers be available to allow one for every three or four students This keeps everyone engaged in the process If fewer thermometers are available, have students take turns taking the outside air temperature and sharing the reading with the entire class All students should record outside air temperature in their science notebooks If students are unfamiliar with the process, provide several short outdoor sessions to explain and demonstrate the process to students and to allow them ample time to practice prior to beginning *Activity 1 1* The taking of outside air temperature should not consume more than a few minutes of class time

The first set of questions in the Procedure below serve as a review of GLEs from first grade regarding basic needs of animals Have students prepared for an outdoor field investigation (See *Field Investigations* in the Teacher Notes section)

Take a preparatory walk around the schoolyard and note where you find examples of living organisms as well as examples of non-living things (Ex: rocks; water; sunlight; soil*; air temperature; hills; sidewalks; buildings; playground equipment; fences, etc) During the course of the activity, if students are unsure and/or unable to find examples, refer to your notes and provide subtle prompts for students to discover examples

Students may have difficulty recognizing that the phrase "living things" refers to the living components of an ecosystem Living things are things that are able to grow and reproduce (create more of themselves) Living things that have died and are decaying are considered to be dead and may no longer be considered living because they cannot grow and reproduce However, dead and decaying things may still contain energy stored in their cells that may possibly provide food for things that are still living

materials

Science notebooks
Pencils
Thermometers
Field guides (optional)

procedure

1 Have student bring their science notebooks, pencils, and thermometers into the schoolyard or area of choice Explain to students why they will use science notebooks for this unit and guide them through the steps of completing the headings including the taking and recording of outside air temperature (See *Recording Outside Temperature with Students* in the Teacher Notes section)

   Date—should include the month, day and year
   Time of Day—should include the actual time
   Location—brief record of where the activity will take place (in schoolyard; near playground equipment; in butterfly garden; outdoor classroom, etc)
   Outside Air Temperature—should be recorded in Celsius
   Weather—brief description of current weather conditions (windy and cold; hot and sunny; rainy; snowy; snow flurries; cold and sunny, etc)

2 In their science notebook, have students note that there are two sections, one on top labeled "Living Things" and the other on the bottom labeled "Non-living Things " Explain that the other columns on the page will be used with another activity

Q. How do we know something is a living thing?

A Answers will vary: Living things grow and reproduce (make more of themselves); they need to eat and drink in order to survive; they breath; they can die; they need things to survive; they have basic needs, etc

3 Instruct students to observe their schoolyard carefully by standing in one place and turning to look all around or by moving slowly within a designated area

4 Instruct students to observe the living things they see and list them in their science notebook in the "Living Things" section

5 Instruct students to observe the non-living things they see and list them in their science notebook in the "Non-living Things" section

6 Allow students to list what they observe generically (bird, insect, plant, etc) unless they know the specific, common names (robin, ant, dandelion, etc)

7 Have students review their lists of living and non-living things [If students have placed "dead" leaves, flowers, insects, etc in the "Non-living" column Leaves, flowers, insects, etc that are dead are no longer living and no longer able to grow and reproduce Therefore, they belong in the "Non-living Things" column Dead and decaying animals and plants may still pass along energy left in their cells to other plants and animals that eat them Rocks are non-living because they NEVER had basic needs such as air, water, light, nutrients, space, temperature or shelter Plants and animals need those basic things to survive That's why plants and animals are considered living things—whether they have died or not]

Q. After looking over your science notebook lists (and/or understanding and revisiting lists to make the distinction explained above), how many things would you switch from one section to the other?

8 Have students circle the thing(s) they wish to change and draw an arrow from the circled thing(s) to the correct section Ask students to explain why they are making changes Follow-up/review distinctions as needed
[Explain that in addition to having basic needs, plants and animals grow and reproduce (create more of themselves) Non-living things do not have basic needs nor do they grow or reproduce Discuss as needed]

Wrap-up/formative assessment See *Wrap-Up/Formative Assessments* in the Teacher Notes section of the introductory material to choose a strategy that meets student needs

activity 1.2 : space—it's a basic need, too

estimated time 20–30 minutes

objectives

Students will be able to

1 Explain why all living things need space
2 Predict in writing what might happen to plants growing in severely crowded environments

teacher preparation

This activity may be done indoors or outdoors but does require enough open space for students to stand together comfortably Prepare a flat, open area by placing an X with chalk or place some flat item on the ground (a rubber baseball base or some other flat object that will not blow away or be moved easily by students standing over it) where students will be asked to gather Although this activity only addresses the need for space, it is an effective way to illustrate the importance of all basic needs of plants and animals **Be aware that this activity requires students to stand very close to each other.**

materials

Science notebooks
Pencils
Chalk (or flat object)
Writing Prompt Scoring Guide (Appendix C)

procedure

1 Stand facing the X and have students gather randomly in front of you and scattered around the X There is no need for students to gather in any formal arrangement, and at this point, they do not even need to be aware of the X

2 Point out the chalk X/flat object on the ground/floor in the middle of the students and explain to them that each time you clap your hands, they will take one step towards the spot/object Do not tell students why they are doing this The effectiveness of this activity depends on students slowly becoming aware of their shrinking space

3 Try one practice clap Repeat instructions, if necessary

4 Begin the activity and continue to clap your hands very slowly allowing students time to take each step, to stand for a moment, and to become aware of their new proximity to their classmates

5 Continue until students are sufficiently "starved for space:"
   Q. How comfortable are you right now?
   A Answers will vary: uncomfortable; squashed; etc
   Q. What would your life be like if you had to live it this way?
   A Answers will vary: unhappy; angry; uncomfortable; unhealthy from being too close to others; unable to move around enough to get food (hungry); etc
   Q. What do you need more than anything right now "to survive?"
   A SPACE! Explain that all living things such as animals do need air, food, water, and shelter, but they also always need the right amount of space to survive When people are crowded together, they are uncomfortable and spread diseases more easily Animals that live crowded together often have difficulty finding enough food and shelter, sometimes fight for space, and catch diseases more easily from each other

6 Allow students to move away from each other and give themselves some space
   Q. Now that you have been crowded humans, what might have happened if you had been a group of plants crowded that closely together?
   A Crowded that closely together, the plants might not have been able to get enough light, water or nutrients to survive

Q. As a plant in that crowd, what would you have needed to help you survive?

A Space! Plants need air, light, nutrients, water and temperature, but plants, like all living things, also need the right amount of space in order to survive

Wrap-up/Formative Assessment

Explain to students that they will put themselves in the place of a plant that is growing in very crowded conditions (in the middle of many, many other plants) and predict what might happen to that plant

Instruct students to use their science notebook to write three paragraphs about "A Day in the Life of a Crowded Plant " Students may approach the topic generically as a flower, tree, bush, etc or specifically as a rose bush, an oak tree, a daisy, etc Encourage students to keep in mind the basic needs of all living things, especially plants Give students a copy of *Writing Prompt Scoring Guide*

Evaluation

See *Writing Prompt Scoring Guide* in Appendix C of this Guide