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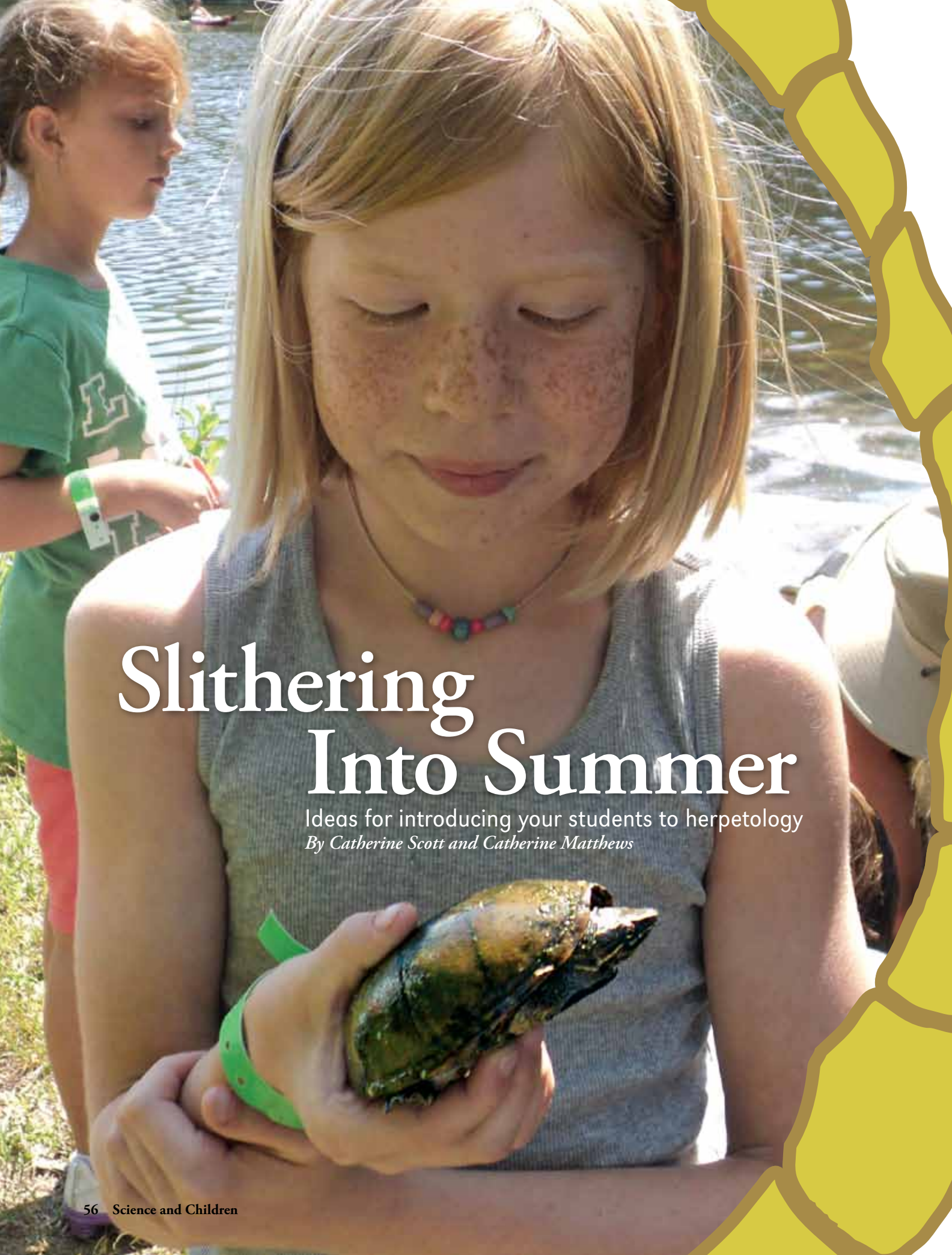

Slithering Into Summer

Ideas for introducing your students to herpetology

By Catherine Scott and Catherine Matthews

The summer provides a unique opportunity for children to further their interests in science, especially science in the out-of-doors. Once school is out for the summer, there is seemingly unlimited time, with no strict curriculum guidelines to follow. For students with a passion for the out-of-doors, summer science camps and school-based summer science programs can provide opportunities to become engaged in nature through hands-on experiences and interactions with organisms in various environments. Herpetology is a great topic for a summer science program. In the past, our experiences teaching elementary school children about reptiles and amphibians have shown that children have a natural curiosity about the slimy and slithery! The more flexible structure of an informal summer science program enables opportunities for participants to engage in outdoor exploration and interactions with animals, experiences that may be limited by strict curriculums and the time limitations placed on typical elementary school classrooms. For many children, the opportunity to see snakes, frogs, salamanders, lizards, and turtles provides a chance to enhance both their interests in science and their scientific and mathematical content knowledge. The same holds true for teachers. You might choose to attend a summer science camp for teachers, or you might like to run your own summer science camp for students.

As former K–5 science specialists, we have seen how excited students get about lessons on reptiles and amphibians. Students particularly loved holding the animals, watching them in their habitats, and taking care of the animals by feeding them, cleaning their tanks, and monitoring overall well-being. While many students are excited to learn about these animals, to see them up-close and personal and even hold some of them proved to be a meaningful learning experience for all involved. In this article, we cover points to consider when designing and implementing your own summer science program that focuses on herpetology, as well as when vetting and recommending a summer science program for your students.

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Herpetology: It's Elementary

Focusing on reptiles, amphibians, and their habitats can be closely tied to the National Science Education Standards for life science, which focus on the characteristics of living organisms and their environments. In addition, a program focusing on herpetology can also address Core Idea LS2.A from *A Framework for K–12 Science Education*, which states that students will learn that organisms survive in environments where their needs are met, and that healthy ecosystems allow multiple species to meet their needs in a stable web of life (NRC 2011).

These lessons also provide students with the opportunity to learn about the valuable role that reptiles and amphibians play in the food chain (as both predator and prey) and in monitoring ecosystem health (certain kinds of frogs and salamanders are excellent bio-indicator species of water quality and air quality).

Program Structure

Last summer, we worked with two different herpetology programs for young children. Both programs were offered through local environmental education centers, but similar programs are offered across the United States through local universities and nature centers (see NSTA Connection for a list). These programs all offered activities that could easily be implemented in classroom instruction during the regular school year. The type of herpetology experience offered varies greatly from program to program, with some offering full immersion in herpetological studies and others offering traditional

Safety First

When snakes are mentioned, one of the first things to come up is safety. When working outdoors, particularly with reptiles and amphibians, there is always an inherent risk of injury if children are not properly prepared. We like to tell our students, "If it has a mouth, it can bite." Children need to be instructed on how to properly hold animals to protect both themselves and the animals from injury. Instructors should be knowledgeable about how to hold species (for example, knowing to keep hands moist when handling salamanders and frogs) and about what species are safe to handle. Animals must also be returned to the exact location where they are found. It should be reiterated to children that they should not pick up animals independently on the premises or at home, unless they are with an adult who is certain that the species is not dangerous to handle. Finally, because of the risk of contracting salmonella from reptile species, children must wash their hands thoroughly with soap and water after handing animals. Vinyl gloves are recommended in cases where students may have an immune suppressed medical status. As always, follow your school or district guidelines for outdoor exploration, and see a list of field trip safety preparation tips online (see NSTA Connection).

"turtle in a tank" activities where campers are introduced to animals living in aquariums and terrariums through a show-and-tell structure (Figure 1, p. 58).

The structure of a summer program greatly affects the experiences that children have and the meanings that they take from such experiences. While some children might enjoy the opportunity to be outdoors and immerse themselves in a program mirroring ecological fieldwork, others may be more comfortable in a more traditional summer camp program involving arts and crafts, hikes, and time spent handling captive-bred animals. For an overview of both camp programs, see Figure 2, page 60.

Turtle in the Field

The field-based herpetology program that we followed involved children in asking research questions and collecting data on reptiles and amphibians. Students who had just completed grades 2–5 helped local university educators explore cover boards (pieces of metal and wood laid in the woods to attract reptiles and amphibians), aquatic turtle traps, and vernal pools. The children helped collect specimens, recorded and analyzed data, and developed and explored their own research questions.

The use of cover boards is an easy activity to establish on wooded school grounds or nearby local parks for year-long observation. After laying sheets of plywood and aluminum in the woods, children can periodically check for reptiles and amphibians. Use caution in handling cover boards; plywood can cause slivers and aluminum sheets can cut or puncture skin. The warmth and dryness of aluminum sheets will attract snakes, something to be considered if you or your students are leery of these reptiles. Plywood, in comparison, provides damp, cool, dark spaces preferred by toads and salamanders. Animals collected under the cover boards may be identified using field guides and dichotomous keys (see NSTA Connection). Additionally, squeeze boxes may be used to measure the length of small, docile snakes such as worm snakes, earth snakes, milk snakes, green snakes, or ring-neck snakes. While the snake is gently pressed between a sheet of foam and a piece of Plexiglas, the student draws a line on the Plexiglas down the snake's spine. The student can then take a string and ruler to determine the length of the snake (Scott, Tomasek, and Matthews 2010).

Aquatic turtle traps and vernal pool studies provide opportunities for students to explore aquatic species. Turtle traps are set using bait such as sardines, and then checked each morning. Turtle species in the traps are identified and processed by weighing the animal and then measuring *plastron* (a turtle's bottom shell) and *carapace* (a turtle's top shell) length and width. Minnow traps and dip nets

Figure 1.

are used in vernal pools to collect tadpoles, salamanders, and newts, which can also be weighed and measured.

After experiencing each of these activities, participants spent the last two days developing research questions to study. Questions included, "Which cover boards attract more species, metal or wood?"; "Which bait do turtles prefer, hot dogs or chicken?"; and "Can we catch more animals at the middle or the edge of the vernal pool?" With guidance from the instructors, the children developed methods to collect and record data, analyze their findings, and share these findings with the other camp participants.

Turtle in a Tank

The second herpetology program we worked with focused on daily themes, such as Turtle Day, Ecology Day, and Alligator Day. Participants went on daily morning walks looking for evidence of reptiles and amphibians. Although campers encountered a variety of lizards and some tortoise and turtle species, the only animals that were held were those that were raised in captivity and owned by the program leader. Taking students on hikes to look for organisms provides opportunities to develop their observation skills, a valuable process skill in scientific inquiry.

In the afternoons, campers completed arts activities, such as making a turtle music shaker (see Internet Resource), completing coloring pages on reptiles and amphibians, and listening to the program leader talk about the common reptiles and amphibians in their area. The activities were designed around the theme of the day; for example, on Turtle Day, participants reconstructed a turtle skeleton out of bones, had their pictures taken with a snapping turtle, cleaned out the center's box turtle pen, and watched a movie on turtles.

Common Threads

Prior to the programs, participants were given an assessment to determine their knowledge of herpetology (see NSTA Connection). The assessment was administered again at the end of each program to measure participant growth. The children involved in both programs left with an increased knowledge of local herptofauna in their area, demonstrated by their abilities to identify species found throughout the week, as well as a significant increase in their scores on the assessment.

Although the programs that we worked with varied greatly in the types of activities for campers, discussions with the children in each camp indicated common themes about what made each camp enjoyable:

- Direct experiences handling and investigating reptiles and amphibians

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Students carefully lift a cover board and look for animals below.

- Opportunities to hike outdoors and go on "adventures"
- Opportunities for children to collaborate with their friends in the programs

The opportunity to hold snakes, salamanders, turtles, and frogs had a profound impact on many of the participants. When asked why he liked holding the snakes, one boy pointed out that since his teacher, mom, and dad do not like snakes, he did not have many opportunities to normally do so! Children in both camps would frequently ask about keeping the animals captured or seen, giving them names and talking to the animals as they collected data.

Children also enjoyed their experiences outdoors, hiking along the paths and through the woods at both natural areas. The idea of heading out on an "adventure" and exploring the unknown excited the children. In addition, the opportunity to explore the unknown with their friends and to engage in these activities alongside children with similar interests was important to the participants in both programs.

The children in the field-based camp repeatedly indicated that the ability to investigate topics of interest and collect data, including measuring and weighing organisms, made them "feel like a scientist." Because this was a recurring theme among the children in the program, and these children showed significant increases in their understanding of scientific practices (as measured through assessments, interviews, and observation), we believe that such practices could be critical in engaging students in meaningful science throughout the summer

and would therefore recommend similar programs to our own students.

Finding and Creating Programs

Program structure is not the only factor to consider when looking for summer programs for students; in addition, location, price, and safety should all be considered when searching for the "perfect" program (See NSTA Connection for a checklist of things to look for in developing or recommending a program). Based on our own experiences, we have found the following helpful points to consider:

Find and/or develop financially feasible experiences. Many summer camp programs come with a hefty price tag, limiting the number of children exposed to such opportunities. However, programs funded through local public education institutions, local centers for environmental education, and even traditional camp programs may offer scholarship opportunities. Both herpetology programs we evaluated were located at facilities that offered financial assistance to families, opening doors to children from families with greater needs. In addition, make note of whether facilities offer day camp versus residential options, as day camps can be less costly than those where students spend the night.

For school-based programs and science centers on a tight budget, the possibility of field trips, buying data collection equipment, and resources for fieldwork may not be realistic. However, teachers can creatively bring these experiences to their students in a variety of ways.

Figure 2.

Description of camps.

DAY	Camp 1	Camp 2
1	**Vernal Pool Study** Introduction to vernal pools Practice tool use (minnow traps, waders, dip nets, spring scales) Data collection on salamanders (mass) Species identification	Introduction Overview herpetology Preserve hike Captive snake presentation
2	**Cover board Study** (Looking for snakes, frogs, salamanders) Introduction to cover boards Safety when lifting cover boards Collect data (mass, length) Using dichotomous keys to identify frog and toad species	Turtle study Hold snakes Morning hike Reconstruct turtle shell Learn about state turtle species
3	**Aquatic Turtle Study** Introduction to aquatic turtles (how to collect and bait traps, getting turtles out) Practice tool use (calipers, spring scale) Data collection (plastron length and width, Carapace length and width, mass) Species identification	Ecology of amphibians and reptiles Morning hike Discuss alligator behavior/length Clean box turtle pen Terrapin board game
4	**Free Choice:** Students pick a topic to research, go to their area (vernal pool, cover boards, aquatic turtles) to collect data. Develop a research question Devise a method to collect research data Record data in journal	Habitat conservation Hold snakes Non-native species presentation Afternoon hike Turtle arts and crafts
5	**Concluding Activities:** Collect data at research site; present findings in mini-conference. Student research questions included: • Do aquatic turtles prefer hot dogs or chicken for food? • Are more reptile and amphibians species found under wood or metal cover boards? • Are more salamanders caught in the middle or along the edge of the vernal pool?	Day hike Look for wildlife/signs of wildlife Scat identification

Mini squeeze boxes can be made with Plexiglas and foam bought at the local hardware store; many employees are willing to cut the Plexiglas for free if you explain your purpose. Rubber snakes, lizards, frogs, and salamanders may be used if you do not have the resources to set up herpetology stations on your school grounds. Children can use these models to collect data, including using the rubber snakes in the squeeze boxes and weighing and measuring the length of other species using spring scales and rulers.

Think safety. With a herpetology program, the chances that the children are going to encounter a snake are fairly likely! When looking for summer programs for students, be sure that the people leading the program are experienced. In both herpetology programs, the leaders were local herpetologists and environmental educators with extensive field teaching experiences. All members of the teams had an in-depth knowledge of local species and knew what reptiles and amphibians children could and could not handle. For opportunities involving animals, it is important that instructors have experience and knowledge, minimizing the chances of causing harm to children or animals!

Many facilities have websites that provide extensive knowledge of the facilities, staff, and programs offered. Exploring these sites may help you determine the adult-to-child ratio for the program, background information on the staff, as well as an idea of the structure of each day in the program.

Know what interests your students! There's nothing worse for a child (or the program leader) to be stuck in a program in which he or she has no interest. Knowing what your students enjoy also provides you with opportunities to seek out targeted programs for each of them.

Final Thoughts

The summer is a great time to further student and teacher interest in and passion for science. However, it is also important to make sure that the experiences in which students and teachers are immersed provide them with meaningful opportunities to engage in scientific topics such as herpetology. By looking for opportunities for your students, paying attention to program structure as well as instructor knowledge, you will be better able to ensure both a fun and educational learning opportunity for all involved! ■

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Internet Resource

Turtle Music Shaker Craft
http://bluedaisieskidsclub.blogspot.com/2010/11/turtle-music-shaker-craft.html

NSTA Connection

Download a list of herpetology programs, field trip safety tips, dichotomous keys for animal identification, an assessment, and a checklist for herpetology programs at *www.nsta.org/SC1204*.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Standard C: Life Science

Grades K–4

- Characteristics of organisms
- Life cycles of organisms
- Organisms and environments

Grades 5–8

- Structure and function in living systems
- Populations and ecosystems
- Diversity and adaptations of organisms

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.