

Down by the Bay

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The resources of a nature center help second-grade students become experts in their local environment.

“What is *THAT?!*” a student questioned aloud as she pointed to the monitor where a small jellyfish was being projected through a portable microscope. Although these Alabama second graders have visited this local nature center before, they entered with excitement and wonderment. The Pelican’s Nest, located near Mobile Bay in the Gulf of Mexico, is a science center supported by a local educational foundation. Programs are geared toward marine wildlife and the coastal habitat with an emphasis on hands-on learning for students in grades K–6. The director conducts daily classroom labs and discovery trips to the bay with students from the surrounding area. On this day, students participated in an indoor/outdoor experience entitled “Down by the Bay.” The field trip, which was accompanied with classroom activities before and after the trip, lasted approximately two hours and cost \$3 per student.

The development of an outdoor learning environment does not always require building a structure or garden. Sometimes, creating an outdoor space means using existing natural spaces for creative and engaging experiences. Through thoughtful planning and use of tools and volunteers, the beach that many students visit on a regular basis became an outdoor classroom ripe with new learning experiences. Therefore, this process of reimagining an existing outdoor space as an experiential classroom can be done in any environment. The key is to analyze the content standards for a particular grade level and then explore areas in which the surrounding natural environment can support student learning and engagement. For example, a fourth-grade class could test the temperature of sand in the shade compared to the temperature of sand in direct sunlight on the playground to explore the transfer of energy. In this instance, the only tools needed are thermometers.



This learning sequence was designed to encourage the notion that students, along with their families and neighbors, can be considered experts in their surrounding environment. In this case, the students' environment is a small community located on the Eastern Shore of Mobile Bay. The Estuary of Mobile Bay is formed by the merging of the Gulf of Mexico with five rivers. As the second largest river delta in the country, the Mobile-Tensaw River Delta is an impressive display of biodiversity, in which "Alabama ranks fifth among states in the United States and first among those east of the Mississippi" (Mobile Bay National Estuary Program 2008, p. 21). Such biodiversity provides an ideal learning environment for environmental and life science, if utilized properly.

In the following investigations, students explored water salinity and various species of marine organisms that exist in the local ecosystems. Through experiences such as this in their community and at school, students gain a deeper understanding of Mobile Bay, its wildlife, and their impact on the environment. Educational experiences outside of the classroom support student learning and result in a deeper understanding of subject matter (Kisiel 2006; Nadelson and Jordan 2012).



PHOTOS COURTESY OF THE AUTHORS

Engage

Students entered the Pelican's Nest and immediately began exploring during an unstructured discovery time. They walked around the lab, peering into tanks and touching various specimens. They explored preserved and live organisms including turtles, seahorses, fish, jellyfish, and other animals. Some students used magnifying glasses to carefully and closely observe the animals, discussing with their classmates, "Look at the fish scales!" and "I have caught one of these before!"

After several minutes of exploration, the students were invited to the carpet where Ms. Hardman was sitting with a large brown pelican puppet. The discussion began with a review of the concepts learned during the students' previous visit to the science center, "How is the brown pelican different from the other animals in our bay?" One student responded, "They're brown and they eat fish." Mrs. Smith probed, "Yes! What makes them unique?" As one student noted, "They scoop up food and swallow it whole!" This opened up a meaningful pathway into a discussion about the adaptive features of the brown pelican that contribute to its survival in its habitat. Students began using vocabulary such as *beak* and *gullet* and they described the process of "diving down and scooping up fish." With the word *habitat* on a flashcard, Ms. Hardman led a discussion on the habitat of Mobile Bay. *How is the habitat special and unique? How is Mobile Bay different from the nearby beaches and rivers that the students frequently visit with their families?* Building upon prior knowledge, the second graders were eager to share personal experiences of times they have been fishing, shrimping, and swimming in nearby rivers, creeks, or the gulf.

Using a map of Mobile Bay, the discussion continued in preparation for the first investigation. The students were able to explain that freshwater enters the bay from the rivers, while salt water enters the bay from the gulf. With



The day included field experiences like collecting specimens (left) and discussions back in the center.

probing, the students formulated the idea that the salt water and freshwater mix in the bay, churning up debris and sediment. Ms. Hardman introduced the term *brackish* water. While showing the word on the flash card, students repeated the term aloud several times as they familiarized themselves with the newly learned vocabulary word.

Explore

Investigation 1: Water

Students moved to tables to conduct the first investigation. On each table, three cups of water were labeled 1, 2, 3. Using their prior knowledge of salt water, freshwater, and brackish water, students were asked to observe each cup of water and identify which type of water was in each cup. Students used varying methods to observe and make deductions about the cups of water. Some picked up the cups and smelled the water, while others used magnifying glasses to carefully observe the visible properties. Sarah said, “I can smell the salt in this one!” Bryan explained his reasoning, “I think this is freshwater because it looks really clean!”

After the students wrote down their guesses, the group shared their observations as a class. After each student shared his or her idea, Ms. Hardman called on other students to agree or disagree based on the evidence they observed. Chip said, “I think number one is salt water because I have been in the gulf and it looks like this.” Meredith responded, “I disagree because number one looks dirtier than number three, so I think number one is brackish because it’s where the two get mixed together so it’s dirtier.” It was clear that students were able to connect this investigation to prior knowledge of Mobile Bay by discussing with each other how the different types of water look and smell. Then, students each wrote one complete sentence describing each type of water in their water investigation booklet. Students’ descriptive sentences varied. For example, Jeremy wrote, “Brackish water has a little bit of dirt in it,” while Kyla wrote, “Salt water smells salty and sour.”

Investigation 2: Exploring the Bay

Exploring the three types of water in the classroom was a worthwhile investigation. However, Ms. Hardman believes that extending learning into the students’ environment, beyond the walls of their classroom and even the science center, provides experiences that deepen students’ understanding. After a short bus ride to Mobile Bay, students changed into the extra pair of shoes they brought with them on the trip for wearing into the water. Follow your school guidelines for field trips. As they trekked a few yards to the shoreline, parents and preservice teacher volunteers readied the equipment. For this trip, Ms. Hardman



typically requires one chaperone for every five students to assist with equipment and student experiences.

Small fish nets were lined up on the beach for the students, two cast nets were placed to the side, and two parents put on waders and prepared to use a seine in deeper water. Ms. Hardman drew a line in the sand with her foot a few feet from the water and asked students to stand on the line. She stood in front of them shouting and pointing, after which students repeated and pointed in the same direction. NORTH! (North!) RIVERS! (Rivers!) SOUTH! (South!) GULF OF MEXICO! (Gulf of Mexico!) WEST! MOBILE! (West! Mobile!) FRESHWATER! (Freshwater!) SALT WATER (Salt water!) BRACKISH WATER! (Brackish water!) The second graders could not wait to begin exploring!

After orienting students to the area, each was given a small fish net to catch specimens on the shore. Students were allowed to walk in the water up to their ankles. Two other volunteers, one parent and one preservice teacher, called students two at a time and instructed them on how to use a cast net. Meanwhile, the two parents in waders began slowly seining the water.

The parents slowly seined the water, dragging the net between two nearby piers, a total of three times. As they approached the shore each time, students rushed to gather by the net to explore organisms that were captured from



Students examine specimens in the classroom.

deeper waters. While students caught wildlife with the various tools (e.g., cast net, fish nets, seine), volunteers worked alongside the second graders to identify species and unique characteristics of the organisms. Students, as they were encouraged to share their knowledge and prior experiences, identified animals they have seen in the past, “Look! A minnow!” Meanwhile, the adults encouraged the development of new science concepts by asking probing questions, “What do you think the minnow eats? What animals eat the minnows?” A variety of species were kept in a bucket for further exploration. After they all had experienced collecting and identifying organisms, students were given freedom to explore the area according to their curiosities and interests. Some students began digging in the sand, while others asked for another try at throwing the cast net.

Explain

After changing shoes and a quick bus ride back to the center, the dialogue continued in the classroom as the day’s experiences were elaborated upon and again connected to their daily lives. Many of the students were able to describe past experiences of when they caught fish in the bay, local creeks, and rivers. Students returned to the classroom tables and began a classroom discussion about the various specimens they observed at the bay. Projected on the monitor using a portable microscope, a small comb jellyfish (*Ctenophora*) slowly glided across the screen, allowing students



Students record their observations from the day.

to observe the magnified specimen. On a handout, students circled the organisms they observed at the bay while Ms. Hardman asked questions about their experiences.

The second graders provided detailed accounts of the organisms they observed. For example, a student noted that one shrimp he caught in the net was missing several legs. Other students remarked on the different birds they noticed on the shore and pier. Students referred back to their handout as they, with the help of Ms. Hardman, identified each species by name. Finally, students labeled and colored a map of Mobile Bay using geographic vocabulary as a way of reinforcing spatial awareness of the surrounding area. Following the investigations, the remaining marine specimens were released back into the bay in the same area from which they were collected.

Extend

The experience ended in a way similar to how it began—exploring specimens. This time, however, new vocabulary and assertions were made and students now knew the names of many of the organisms. They peered at the animals closely with magnifying glasses again, identifying body parts and unique characteristics. As a large group gathered around a fish tank, Ms. Hardman dropped one of the shrimp collected from the bay into the water. It gently sank to the bottom and began scurrying about until...CHOMP...a crab lurking by a rock snagged the shrimp and began snacking away. The young students were not fazed. One student exclaimed, “The food chain!” “Yep,” Ms. Hardman replied matter-of-factly, “The food chain in action.”

The learning does not end when students leave the center. Classroom teachers extend the experience by discussing the trip and sharing books such as *Jubilee!* (Tunks 2012), a story written specifically about the marine life and occurrences in the bay. Students shared what they learned by writing and illustrating reports about the field trip, which were then compiled in a class book and shared with other classes.

The second graders focused primarily on different types of water, local geography, and the characteristics of animals in the local habitat. Students visit the Pelican’s Nest at each grade level, focusing on different topics. The Down by the Bay trip, however, is repeated at a more sophisticated level in fifth grade. This experience includes six specimen collecting stations such as students using the seine net (as opposed to parents) to collect marine life for observation.

Evaluate

The second graders’ understanding throughout the investigation was evaluated in several ways, including class and small-group discussions at the center, scientific investigation and documentation, and small group/individual

questioning. As a summative assessment in the days following the field trip, students conducted and presented research on local marine specimens. They created detailed images to accompany the written reports, which included relevant and content-specific information.

Conclusion

Outdoor spaces are some of the most valuable resources available for elementary science classrooms. Situating students in authentic and many times familiar outside learning environments creates immediate relevance and meaning for science concepts that are otherwise abstract and lackluster. As students explored by the bay, they were able to connect prior experiences with newly learned science content. They were engaged and inquisitive as they held various organisms in their hands, observed them, and then released them back into the water. They were able to dig in the sand on the shore while looking at the Mobile downtown skyline in the distance across the bay. In the end, not only did students gain insight into how a variety of organisms exist in a habitat, they were also experts on the science of their backyard with new in-

formation they can share with their families and neighbors. They became field scientists...down by the bay. ■

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References

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Connecting to the Next Generation Science Standards (NGSS Lead States 2013):

2-LS4-1 Biological Evolution: Unity and Diversity

www.nextgenscience.org/dci-arrangement/2-ls4-biological-evolution-unity-and-diversity

The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.

Performance Expectation	Connections to Classroom Activity
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.	<i>Students:</i> <ul style="list-style-type: none"> investigate various animals in their local bay habitat.
Science and Engineering Practice	
Systems and System Models	<ul style="list-style-type: none"> observe, analyze, and draw conclusions about water salinity and various animals through investigations of the bay.
Disciplinary Core Idea	
LS4.D: Biodiversity and Humans <ul style="list-style-type: none"> There are many different kinds of living things in any area, and they exist in different places on land and in water. 	<ul style="list-style-type: none"> collect and observe organisms living in freshwater, salt water, and brackish bay water.
Crosscutting Concept	
Structure and Function	<ul style="list-style-type: none"> describe the way in which marine animals function in their habitats based on their structure.