Swimming in New Vocabulary

Exploring interesting animals leads to gains in vocabulary—with an assist from technology for assessment.

By Kerri Donohue and Gayle Buck
Structured scaffolding has been shown to help young children develop a richer, sophisticated vocabulary (Guo et al. 2016). In order for students to evaluate and understand scientific processes, a knowledge base, including scientific concepts and facts, needs to be part of the learning experience. This is important in developing an enhanced understanding of the natural world, now considered an essential knowledge base (NRC 2007). Possessing the appropriate vocabulary will not only aid students in conceptual understanding but also in the ability to construct scientific explanations based on reasoning and evidence.

This process may begin prior to children being able to read, as with appropriate support, even very young children can engage in speaking about science using appropriate vocabulary (Parsons and Bryant 2016; Wright and Gottwalds 2017). Since not all scientific vocabulary words may be gained using a constructivist methodology, instruction should consist of a variety of ways in which children consider the word and understand it in a greater context than through a simple definition in order to promote conceptual understanding (Nagy and Scott 2000).

Through an informal program in our school of education, grade K–1 students learn a variety of new science vocabulary words relating to animal characteristics. The students are introduced to a new group of animals and their characteristics through storytelling, games, discussion, and crafts (see Table 1, p. 34). The new vocabulary words are then reinforced through a matching game, followed by assessment on an iPad. Through this series of activities, young students have shown that they have the ability to learn advanced scientific words and associate them with the correct animals and habitats. While the activities are focused on marine science, they can easily be modified to teach about any animals or plants from a variety of ecosystems. The iPad app, Nearpod, that was used for vocabulary assessment may be used across subjects and is quite helpful in informing the remainder of the lessons as well as being a worthwhile use of technology and important form of practice for improvement of computer science skills for the students.

**Introductory Activities**

Through three 90-minute lessons, students learn about marine mammals, fish, and arthropods, along with the associated characteristics necessary for survival and overall ability to thrive in their respective habitats. Each class begins with a storybook and a slideshow of pictures of that day’s animal group where the characteristics of the animal are mentioned. The books have either the characteristics explicitly mentioned or pictures of the animals possessing those characteristics that are then pointed out to the students during story time. For all three groups of animals, the same routine, as explained for mammals below, is followed. While going through fish and arthropods, the similarities and differences between the three groups, physical traits and how they relate to the animal’s survival, are introduced. Vocabulary words relating to these characteristics that may be new, or are not commonly used in everyday language, are emphasized. Overall, the vocabulary words address the general characteristics such as: fin types (pectoral, dorsal, caudal), endoskeleton, exoskeleton, bony skeleton, and cartilaginous skeleton.

**Mammal Lesson**

A picture book focusing specifically on marine mammals is read to the class with the scope of the lesson then narrowed to a few mammals that are typically known to this age group. The students are shown pictures of dolphins, humpback whales, otters, seals, sea lions, and walruses. For each picture, the students are asked the same set of questions (Figure 1) to generate discussion. While students are sharing answers and discussing these mammals and their habitats, a vocabulary list of general mammal characteristics is developed and displayed. For example, students are asked “How do walruses stay warm?” upon which the students often yell out “Blubber!” Blubber is then listed on the board as a characteristic. The next animal, the otter, is discussed with the same guiding questions, and many different responses are provided. Since otters do not have blubber, students learn they have the most hair per square inch of any mammal, and blubber/hair is listed in the mammalian category. We have found that it is helpful to first speak about how much hair humans have, on average, and then compare that to how much an otter has rather than just give the students a fact. Comparing traits that animals have with ones humans possess aids in understanding. The list of characteristics typically includes hair, breathing at the surface, blubber, and bony skeleton. Besides general mammalian traits, the specific characteristics that representative mammals possess, such as teeth type and fins, are listed.
In order to learn the vocabulary associated with fins, students perform the “fin dance” immediately after going over the names for the following fins: pectoral, dorsal, and caudal. Each type of fin is shouted out, and the students have to move their arms to approximately where the fin would be. When “pectoral” is shouted out, the students raise their arms out to the sides. For “dorsal,” the students would raise their arms as straight back as possible and then lower them almost to their sides for “caudal.” It becomes a dance when it is done really fast and the order is switched up frequently. The fin dance may be done in each of the three lessons, which enables extra reinforcement of the associated words.

As a class, we then spend about 15 minutes discussing why these animals possess these characteristics and why there is such diversity among animals in the same or similar ecosystems. The main points of this discussion are continuously brought up throughout the lesson and activities, at the completion of each animal group, and then again at the end of the marine animal lessons. For mammals, students are asked to imagine where these animals live and why having a certain body shape works well for that environment. One student immediately stated that dolphins and sharks look alike because they both swim fast. Another student brought up how seals and sea lions move differently so we started to speak about how they come on land and why they might possess those differences. In addition, the teeth and jaws of each animal group are explored, with the students figuring out what each animal’s diet may consist of. Students are shown pictures of an animal with their teeth showing and asked “What kind of food do you need these teeth to bite into?” Most students knew that flatter teeth were for plants or crushing, while sharp teeth were

### TABLE 1.

Overview of vocabulary activities.

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| 1. Introduction (Identification) | • New vocabulary words were introduced through storybooks, dance, games, and class discussions with pictures.  
• Vocabulary words were continuously used throughout class activities by the teacher and students. |
| 2. Reinforcement (Application)  | • Student teams matched the vocabulary words with their corresponding pictures. Students were able to see and hear the new words while looking for the picture. |
| 3. Assessment (Revisiting)      | • Students used the iPad app Nearpod to answer questions to gauge knowledge of new vocabulary words. |
for meat or tearing. For example, when speaking about stingrays, students shouted they “Eat stuff on the bottom.” Students then started thinking about what lives on the bottom that stingrays like to eat. A few students yelled out clams or mussels, and we spoke further about looking at teeth and mouths for clues to tell us what an animal may eat. It is vital to not just learn the characteristics but also to learn what purpose those characteristics serve and how they aid the animal in survival.

After going over the diversity of marine mammals, vocabulary words, and taking part in games, students are tasked with building their own whale and otter craft to take home. The whale is a blue paper cup on which students draw eyes, use pipe cleaners to show how whales breathe through a blowhole, and attach the fins using standard glue. The otter is a brown paper lunch bag—students color in the fur and glue paper cutouts of correct food sources, like a sea urchin, on its stomach. Care is taken to emphasize the correct usage of vocabulary words as well as reinforcing newly learned animal characteristics throughout craft time. For example, when coloring the otter, students are asked, “Does your otter have blubber?” and the entire class often shouts out “No!” When gluing together their paper cup whale, students need to ask us for the correct fins to place on their whale and have the option of asking for help from fellow students at their tables. Students are also asked to tell us what kinds of food their otters and whales ate and how they know that. We found that many students were able to speak about their animals’ teeth and food sources.

If a student comes up with a creative way to remember a trait or a vocabulary word, it is shared with the class. For example, a student shared the following method to remember endo and exoskeletons: “Oh, so I know. When you step on us, it’s squish-crunch, but if you step on a horseshoe crab, its crunch-squish.” Once the students understand where mammalian and arthropod skeletons are located in relation to one’s own body, they are able to once again speak about the correct scientific terms for that location.

Reinforcement Activities

At the end of each corresponding lesson for the different animal groups, students play a matching game consisting of the new vocabulary words and their associated pictures, among other characteristics we studied. Students are divided into two teams, and one set of partners from each team goes at a time. All teams have the chance to have at least one turn. The students hear and see a word and are told to grab the correct picture from a pile spread out on the floor. Students’ team members are allowed to guide them if the pair is having trouble finding the correct match. At the completion of the matching game, everyone sits in a circle and all of the matches are reviewed in order to ensure that each student was able to see and hear the word associated with the correct picture. While we review the vocabulary words, we also review all that we learned about each animal. Due to one game that was played, students were able to recall that female otters sometimes wrap their babies in kelp while they go off to hunt. Making the connections between animal characteristics, both physical and social, and their habitats, all while using the correct scientific terminology, is an important part of the lesson.

Assessment Activities

Toward the end of the lessons on marine animals and their characteristics, an iPad app, Nearpod, is used to gauge how well the students retained the new vocabulary and developed their conceptual understanding. Nearpod is an app that allows you to create questions you want to ask the students using several different formats. The basic version, which was used for this instruction, is free, but there are more advanced options available for a cost. For this project, fill-in-the-blank, drawing, polls, multiple choice, and collaboration questions were developed. For instance, students were given a vocabulary word and asked to circle the corresponding trait on a picture of an animal, such as circling the dorsal fin on a shark. The vocabulary words were spoken, written, and visually represented. Nearpod was also used to assess conceptual knowledge concerning animal habitats and food sources through matching habi-
tats to animals and answering polls regarding what type of adaptations are better served for eating food sources such as mollusks.

Typically, the students are able to work easily with the iPads and the Nearpod app with little explanation of how to respond to the questions. They easily figure out how to change the colors of their lines when answering a drawing question and how to submit their answers. Sometimes the collaborative questions, however, need further elaboration. We found that while some of the students understand how to share a picture with the class right away, others get frustrated and are unsure of how to proceed. A quick overview of how to answer all the question types before the students receive the iPads is recommended. Additionally, after approximately 15 minutes, students wanted to move on from using the iPads. This was rather obvious due to fidgeting and students putting their iPads down and beginning to play with other items at their tables. This time frame worked out well for our lessons. The final summary created by this program can then be used to reflect on the day’s lesson. Although our students had access to individual iPads, the ease in which students collaborated with one another signals that this would also work in pairs or groups of three. Classrooms without access to iPads would be able to use Nearpod in a computer lab as an assessment and do not need to have access throughout an entire class period. This form of assessment could also be done at the end of a group of lessons instead of during each one, with teachers using the matching game as an indicator of what needs to be reviewed before moving on. In addition, we have shared a vocabulary rubric online (see NSTA Connection).

With these activities, young students are able to handle a sophisticated science vocabulary. Most students are not daunted by the words but have fun learning how to pronounce them and then share them throughout the lessons: “That skeleton isn’t bony, it’s cartilage!” or “The dorsal fin is on the back silly, hello.” The experience of encountering vocabulary words multiple times and in a variety of contexts aids the overall effectiveness of vocabulary instruction (Graves 2016). With the use of scaffolding and structured explicit lessons in sophisticated science vocabulary, young students can build conceptual understanding of science and communication skills (Wright and Gotwals 2017). The purposeful addition of technology through the use of iPads also served to build their vocabulary, collaborative, and computer science skills.

Kerri Donohue (donohuke@indiana.edu) is a former informal educator at an aquarium and a PhD student of science education, and Gayle Buck is a professor of science education, both at Indiana University in Bloomington, Indiana.

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

**K-LS1-1 From Molecules to Organisms: Structures and Processes**


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.

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<th>Performance Expectation</th>
<th>Connections to Classroom Activity</th>
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| K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive. | Students:  
• investigate how different characteristics influence an animal’s survival in specific aquatic habitats, verbalize understanding, and collaboratively participate in a discussion with peers comparing animal characteristics. |

**Science and Engineering Practices**

| Analyzing and Interpreting Data |  
• use observations to describe characteristics, patterns, and/or relationships in the natural world.  
• use media to obtain evidence about the natural world and share findings with classmates. |
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<td>Obtaining, Evaluating, and Communicating Information</td>
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**Disciplinary Core Idea**

| L.S1.C: Organization for Matter and Energy Flow in Organisms |  
• investigate animal teeth and habitat to determine what they eat to survive. |
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• observe patterns in the natural world relating to aquatic habitats and animal characteristics in those habitats. |

**Resources**

