



Creating Integrated Science and Language Arts Centers: Considering Ocean Literacy and the 5E Instructional Model

ACTIVITIES AND
PROGRAM MODEL

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ABSTRACT

Unfortunately, most lower elementary grades teach little to no science content due to a primary focus on language arts and math instruction. Therefore, this article focuses on the importance of integrating science with language arts and shares steps on creating stations within an effective integrated science and language arts learning center. The example given was developed to aid in elementary students' understanding of aquatic animals, specifically using seashells to explore the world of mollusks. Stations within the center are described in detail and supporting documents from student outcomes are included. In addition, an explanation of where the center is used in the 5E Instructional Model learning sequence is discussed. This outline of a completed center provides classroom teachers or non-traditional educators insight into the cognitive process for making one and can be applied to any topic for integration of science and language arts.

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With approximately 70 percent of Earth's surface covered with water, the ocean regulates our climate and weather patterns, provides over 50 percent of our oxygen, contains food and medicine resources, plays an important role in transportation, is used for recreation, and impacts our economy (NOAA, 2021). Stressing its importance, the National Marine Educators Association (2019) states, "Understanding the ocean is essential to comprehending and protecting this planet on which we live." In order to promote ocean literacy, students need exposure to marine education; yet, researchers have noted marine education can be difficult to teach children due to their limited background knowledge (Lu & Liu, 2015). Consequently, researchers have found science content in elementary grades is taught much less frequently than reading or math (Griffith & Scharmann, 2008; Honey, 2011). As a result, integrating science with language arts instruction is becoming increasingly popular because it allows teachers to teach science while also teaching the language arts skills mandated by their curriculum (Bradbury, 2014). This article discusses why integration of science and language arts is needed, shares how to create an integrated elementary-level learning center, and makes the focus of the center an often underrepresented organism in the classroom, the mollusk. This topic then works to promote ocean literacy in young learners and introduces young students to the NMEA Key Principle #5: "The ocean supports a great diversity of life and ecosystems" (NMEA, 2021: 10).

WHY INTEGRATE SCIENCE AND LANGUAGE ARTS?

According to the National Science Teachers Association, inquiry science should be a part of the curriculum every day at every grade level in elementary school (NSTA, 2002). Gerde, Schachter, and Wasik (2013) explain that students use the scientific method for "observation, questioning, predicting, experimenting, summarizing, and sharing results," (p. 315) and these processes foster the development of and "encourage children's use of language, literacy, and mathematics skills in authentic ways" (p. 315). Therefore, teachers should integrate science topics and inquiry activities with reading and writing because this approach "establishes a cohesive context in which children can develop skills and knowledge important for both literacy and science" (Patrick, Mantzicopoulos, & Samarapungavan, 2009: 38).

With increased pressure on teachers to focus on reading and math instruction, there is little time left for science (Kingsbury, 2007; Milner et al., 2012), including environmental education. Fortunately, incorporating interdisciplinary lessons not only helps students better understand concepts, but for classroom teachers it is an efficient and effective way to meet curricular requirements for language arts and science simultaneously (Gerde, Schachter, and Wasik, 2013; Patrick, Mantzicopoulos, & Samarapungavan, 2009). One integration method is the use of science centers. For this article, a science center refers to several science stations placed throughout the educational space. These stations require children to complete certain instructional tasks, and for this example, tasks relating to science and language arts skills.

Creating science centers, especially those integrating language arts, may seem like a daunting task because there are many questions to consider, such as: What topics are appropriate for centers? How many stations do I need? What skills should I address? What materials should be in each station? This article takes readers through the steps to follow when creating science centers. The first section explains how to create and implement centers and could be most useful for those who may have had little experience teaching science or using centers for science instruction. To assist in describing the steps, we explain the first science center we created about mollusks, sharing our thinking as we went through the process. In addition, for those more comfortable with science instruction, we share how centers can fit into the 5E Instructional Model, an instructional framework that includes five phases of learning: engagement, exploration, explanation, elaboration, and evaluation.

CREATING AN INTEGRATED CENTER CHOOSING THE STANDARDS AND SELECTING THE TOPIC

The first question to consider in creating a center should be which science standard to address. Science standards that focus on organized bodies of knowledge would be used since they require in-depth exploration of content. As such, multiple science and language arts skills can be taught as students learn the content. Once the standard is selected, the educator should

think about the learning targets for the center. Learning targets break down convoluted standards into teachable parts. We used a second-grade state standard for our science center. However, Next Generation Science Standards (NGSS) and Common Core State Standards (CCSS) that could be integrated for use with this center can be seen in Appendix A.

Standard: Obtain information from literature and other media to illustrate that there are many different kinds of living things and that they exist in different places on land and in water--e.g., woodland, tundra, desert, rainforest, ocean, river. ([Alabama State Department of Education, 2015: 21](#)).

Learning target: I can obtain information from literature and other media to illustrate the different kinds of living things that exist in water.

Our next consideration was which aquatic organism should be the focus of our center. Because they are readily available, we determined seashells could be used to teach students about water organisms, specifically mollusks. Being readily available is one of many rationales for why this might be selected. Other rationales could be that children need more exposure to seashells, or we could select our topic because of familiarity. When children have deeper background knowledge, there is a better foundation for students to build on for new knowledge. The key is to make purposeful decisions while planning the center.

TEXT SELECTION AND LITERACY STANDARDS

Because we want to integrate science with language arts, our next step was to find literature to support the standard. Since we decided to focus on mollusks and seashells, we selected the following children's non-fiction books: *Next Time You See a Seashell* by [Emily Morgan](#), *Take-Along Guide: Seashells, Crabs, and Sea Stars* by [Christiane Kump-Tibbits](#), and *Seashells by the Seashore* by [Marianne Berkes](#). With each title, we considered the purpose of the text, confirmed grade-level appropriateness, and checked for accuracy of information, as well as whether they would be appealing to students.

Next, in looking at the text selections, we considered the literacy standards that could be taught. We decided the following summary of standards could be used with our text set and most sets of books with a similar topic: identify the main idea of paragraphs; compare and contrast two texts on the same topic; write informative texts that introduce a topic, use facts to develop points, and have a concluding statement. These are skills in which repeated practice is typically beneficial for students. In addition, there were standards that were more specific to these texts that we could address. They included using words and phrases that supply rhythm and meaning in a text and finding key ideas and details from information presented through media (See Appendix B for corresponding worksheets and questions to support texts.).

BUILDING THE CENTER

The next step in creating a center is to consider the number of stations and their purpose. Each station should include an instructional focus, such as the use of reading strategies, writing, speaking, listening, viewing, visually representing, observing, measuring, classifying, etc. In the mollusks center, each station contained science content with two stations implementing hands-on skills, one station aimed at discussion of content, one with use of reading strategies, and one for writing. Learning targets for each individual station can be found in the Integrated Science and Language Arts Center Stations template (see Appendix A).

Here are the main foci for this center

Science Content: videos about mollusks and shells, book about shells in writing station

Skills: comparing and contrasting a bivalve and gastropod, shells sort, speaking and listening, viewing and visually representing

Reading: main idea of a passage; comparing information about a topic

Writing: rhyming stanza

These are described in more detail below.

In our example, stations one and two were skills-focused stations. Students compared and contrasted a bivalve and gastropod in station one using a Venn diagram and completed a shell sort in station two. Shells were pictured on the Venn diagram in the compare/contrast station. The terms “alike and different” were used because students are working without the direct guidance of the teacher and compare/contrast is a difficult concept to grasp in second grade. A student sample of the Venn diagram is shown in Photo 1. In the shell sort station, students sort shells according to similar characteristics such as by type, size, shape, color, texture, and patterns. See Photo 2 for a student sample. Educators could number the shells with a marker so students can record the selected characteristic or students could take a picture of their sort with an iPad to turn in for formative assessment purposes.

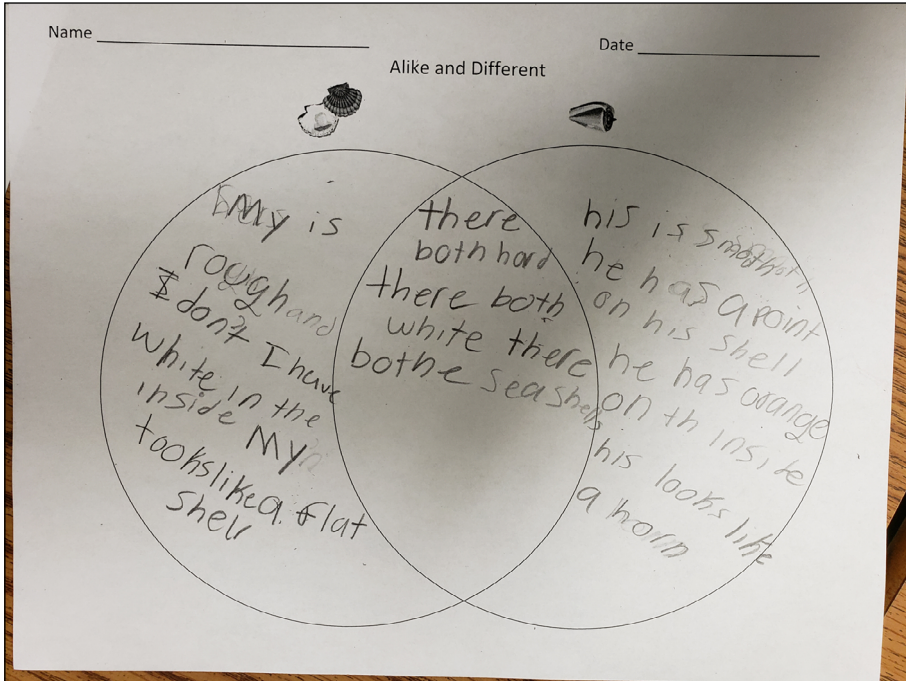


Photo 1 Student writing sample comparing and contrasting bivalves and univalves.

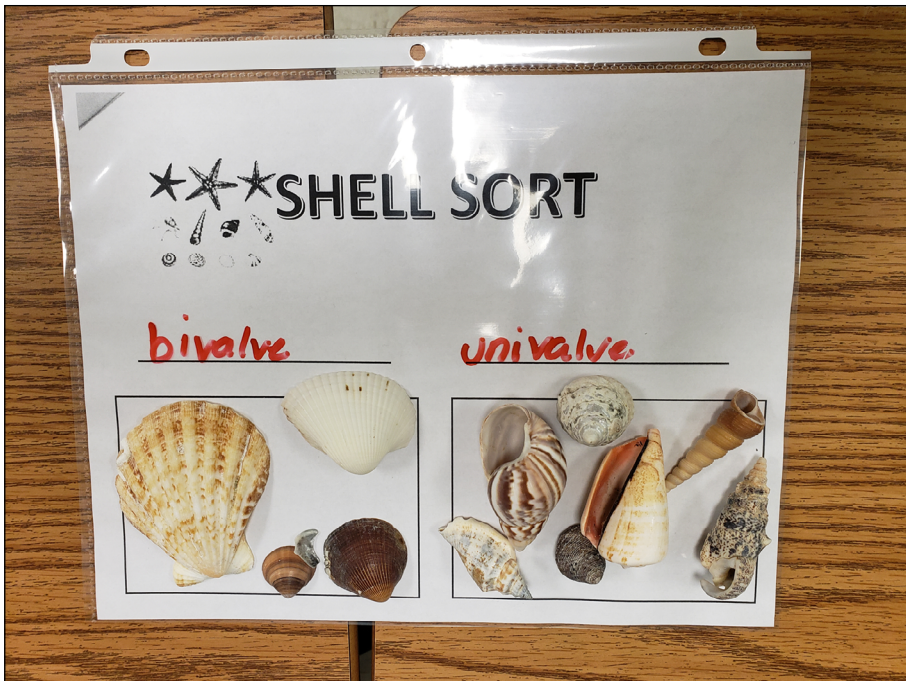


Photo 2 Student sample from shell sort activity with bivalves and univalves.

Station three's focus was on discussion of content. Here, students watched a five-minute video, "Mollusks for Kids," and discussed the animals described, recording conversations on an iPad. Then they watched and discussed two short videos, "Clam Opens Mouth" and "Sea Scallop." Consequently, students learned science content while practicing language arts skills: viewing, listening, and speaking. Links to these are cited in the Integrated Science and Language Arts Center Stations template in Appendix A. To differentiate instruction, advanced students could watch a five-minute video from the Smithsonian, "Mad about Seashells," and answer several questions that compare the video to what has been learned to date about seashells. Sample questions for this video are found in Appendix B.

At station four, students located the main idea of a text using the Main Idea and Supporting Details worksheet with the book *Next Time You See a Seashell*. See Appendix B for the worksheet template and the teacher's key for the main idea from various parts of the text.

Finally, station five's focus was on writing. Prior to working in this station and during whole-group instruction, the teacher read *Seashells by the Seashore* and the class participated in a choral reading of the text. Afterwards, students were assigned a number to incorporate in their writing and when working in station five, were asked to use it to write a stanza similar to what is found in the book. These writings were then read to a partner.

We have included a blank copy of the Integrated Science and Language Arts Learning Centers Stations template (see Appendix C) created by the first author to assist in planning stations. It addresses questions such as: What are students learning from each station and how will success be evaluated? What misconceptions could occur and how might I keep from reinforcing them? What safety concerns might I consider? Finally, what materials do I need for the station?

EVALUATING THE CENTER

Once the ideas for the stations were complete, we reviewed them to make sure they had a good balance of content, science skills, reading, and writing. After the center has been implemented and students have had an opportunity to work through each station, it is important to evaluate the effectiveness. Be sure to reflect on each station and ask, "What did my students learn from completing this station? What can be done to improve the station? What was most/least engaging for the students? Were there misconceptions or safety concerns that I had not considered?"

TEACHING AND LEARNING WITH THE CENTER USING THE 5E INSTRUCTIONAL MODEL

This example of a science center about mollusks can stand alone instructionally or be used as a part of a larger teaching unit. Some science educators design instruction using the 5E Instructional Model, and this center can easily be incorporated into that framework. The 5E Instructional Model helps science teachers create student-centered, hands-on inquiry lessons. The five Es stand for Engage, Explore, Explain, Elaborate, and Evaluate. Within this model our center design addresses the "Elaborate" portion. See Figure 1 for a summary graphic on using this center with all portions of the 5E Instructional Model.

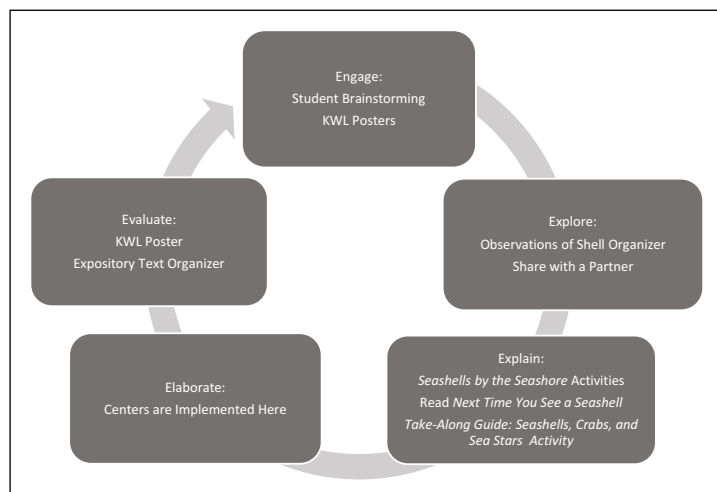


Figure 1 An Overview of Activities in the 5E Model Method.

In teaching about mollusks and shells using the 5E Instructional Model, the class would begin the “Engagement” component by brainstorming what they know and want to learn about seashells. See the document on the right in Photo 3. The teacher records students’ responses on a poster (see Photos 4 and 5). To “Explore,” half the class is given a bivalve and the other half a univalve and students make observations of their shell, recording their data (see Photo 6). They share their observations with a partner and should be matched so that one has a bivalve and the other a univalve (see Photo 7).

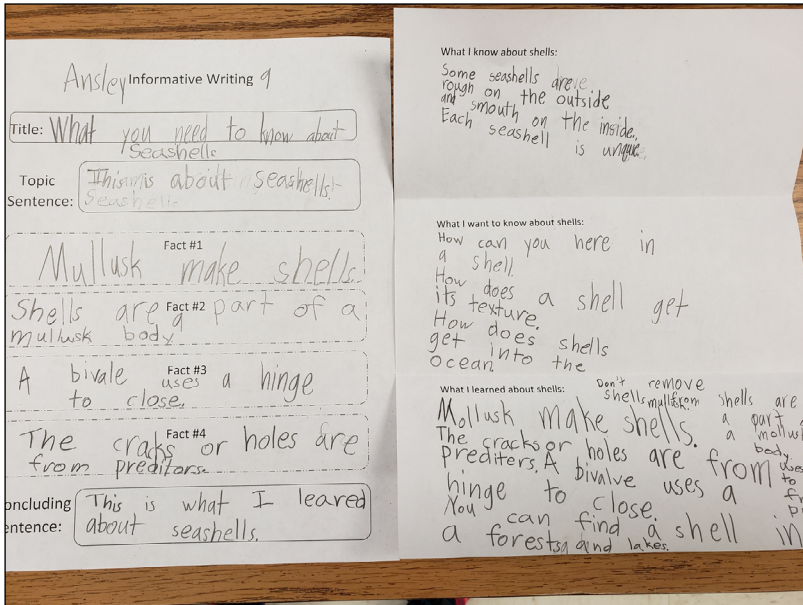


Photo 3 Student sample showing what they know and learned about shells.

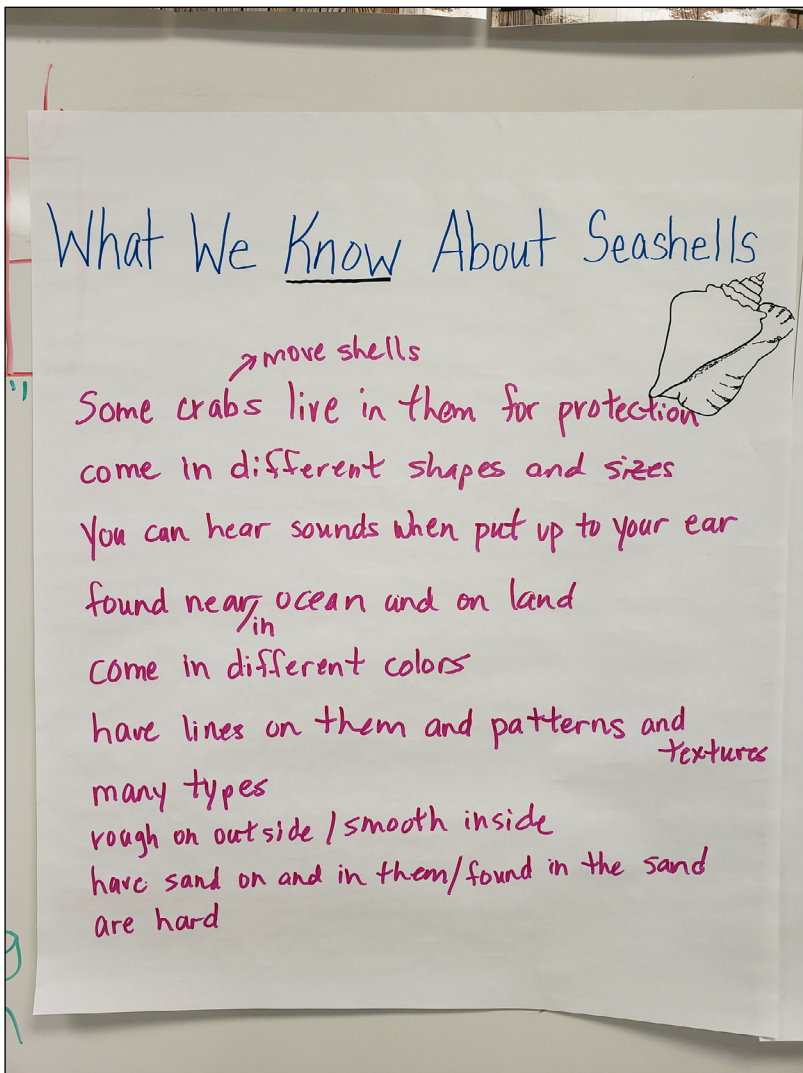


Photo 4 Class list of what they already know about seashells.

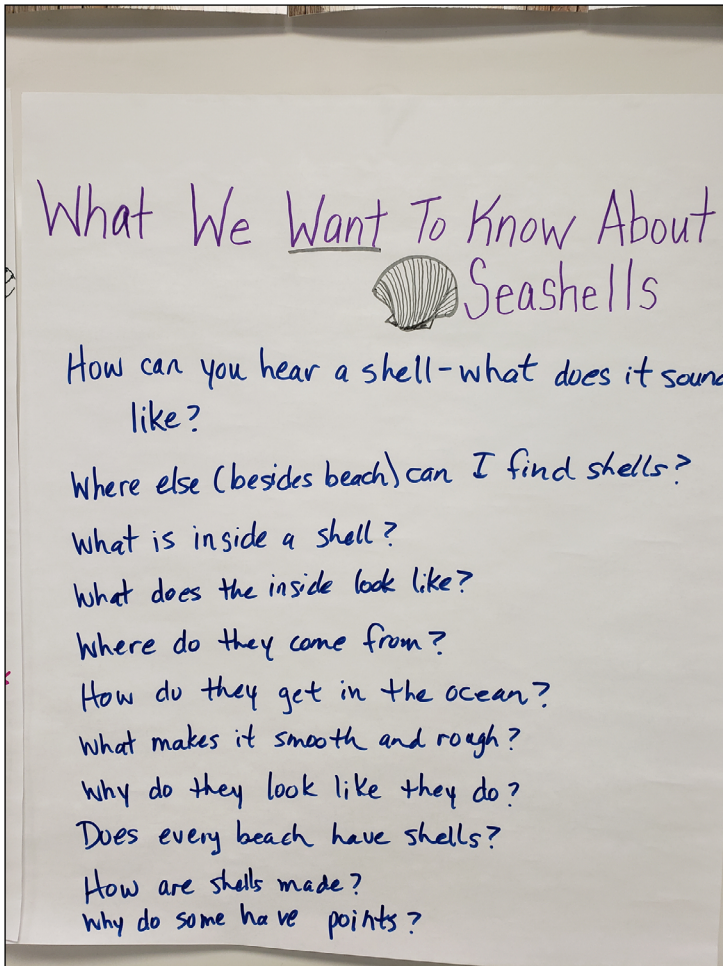


Photo 5 Class list of what students want to know about seashells.

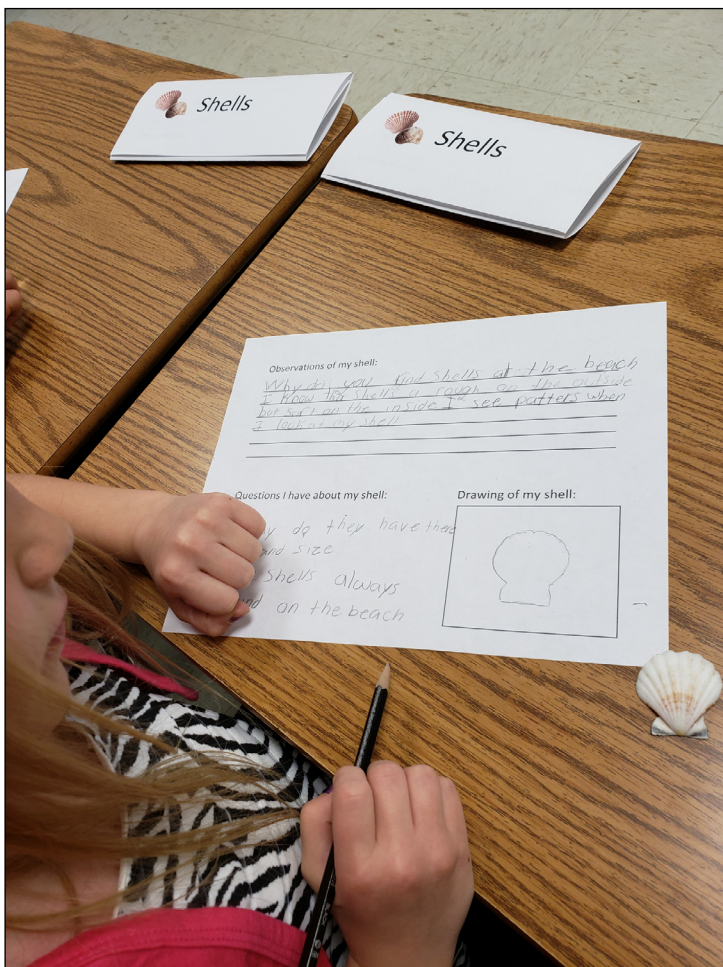


Photo 6 Student drawing and observations of a seashell.

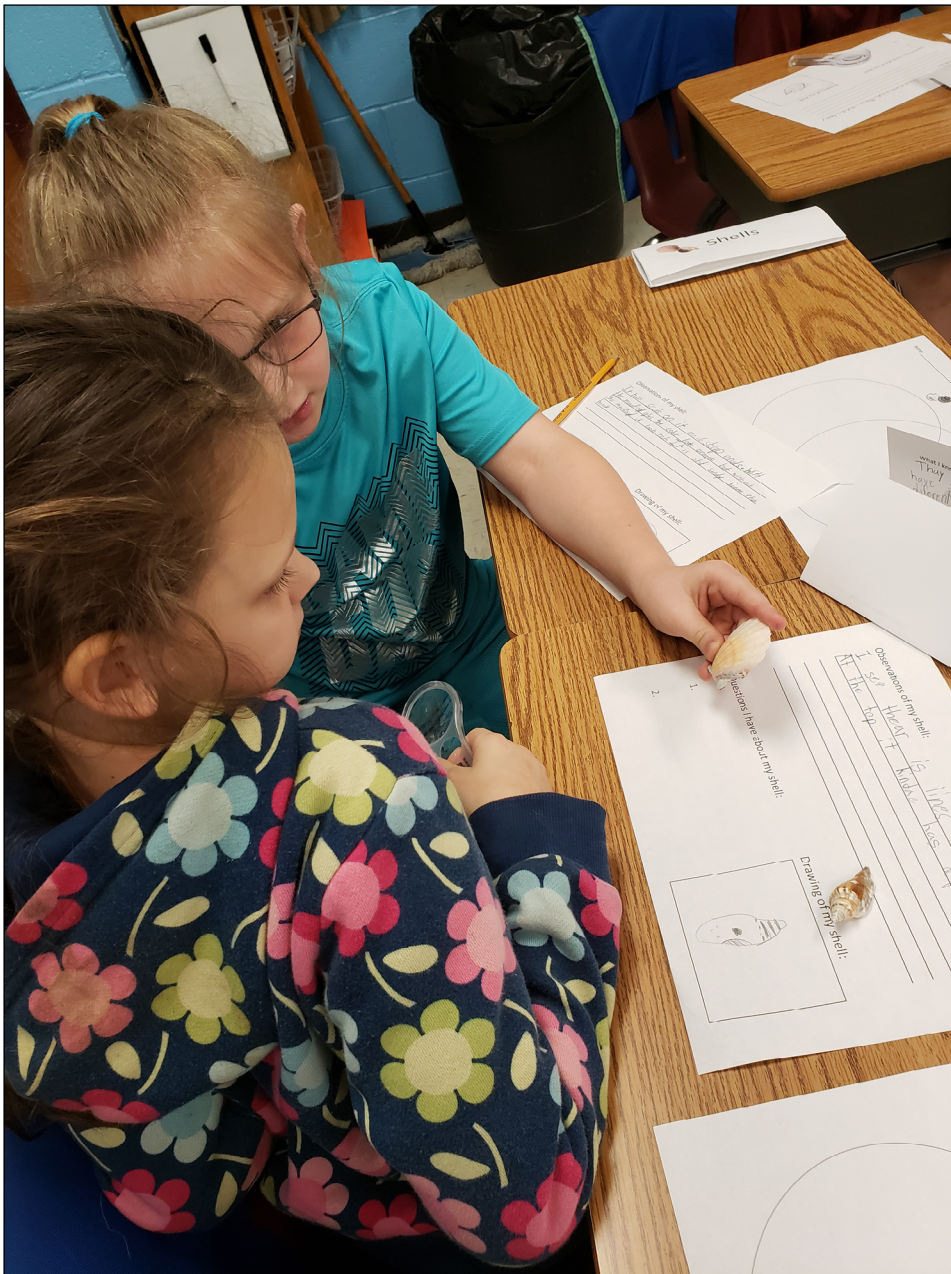


Photo 7 Students sharing their drawings and observations with a partner.

In the “Explain” portion of the 5E Model, the educator reads *Seashells by the Seashore* to the class and they discuss each highlighted shell. On a second read, the class practices reading the lines together in a rhythmic manner. The teacher also reads *Next Time You See a Seashell*, stopping to discuss the information presented. Questions, the intention or purpose for each question, and student responses for this text are found in Appendix B. Next, having already learned some information from the books, groups of students are assigned a seashell from *Seashells by the Seashore*. Students work in groups to locate information from *Take-Along Guide: Seashells, Crabs, and Sea Stars* to compare what the two texts say about the shell and then share their findings. The “Elaborate” phase is where the center with five stations is implemented as described earlier.

In the “Evaluation” phase of the lesson, the class revisits their Know/Want-to-Know chart, adds what they Learned (see [Photo 8](#)), and from the synthesized information composes expository texts. See [Photo 3](#), which displays the graphic organizer used to help students organize their writing ideas along with the individual Know/Want-to-Know/Learned chart used during the “Engage” portion of instruction. Resource books and a list of helpful words should be available to assist with brainstorming and clarification of ideas (see [Photo 9](#)).

What We Learned About Seashells

Mollusks make shells

Find shells in many places like forests

Bivalves have hinges

Uses shell to hide from predators

Holes are from predators

Shells are a part of the animals body/outside

Shells are made of minerals of animal

Many things live in shells

Bivalve has 2 parts and univalve has one

Don't remove shell from snails or any mollusk

Photo 8 Class list of what they learned about seashells.

Helpful Words

bivalve

univalve - gastropods

hinge

mollusk

minerals

propel

retreats

evidence

predator

Photo 9 List of helpful words students can use when writing.

REFLECTIONS FROM IMPLEMENTATION

As an educator, the first author has the opportunity to collaborate with other educators who specialize in many content areas. Before implementation, the activities described above were presented at several conferences, where approximately fifty teachers provided input to improve the activities. Next, the center was used to teach second grade students at a rural Title I school in a land-locked state. Some students had been to the beach before and most had previously been exposed to sea shells. The lessons occurred at the end of the school year after state testing concluded and most other standards had already been addressed. Considerations for different learning needs were addressed through formation of groups and types of products submitted, such as writing, drawings, photos, and discussions with the teacher.

After implementing the 5E Model activities in a classroom, recommendations to improve the learning unit included using anchor charts for vocabulary so students could refer back to the words as needed. Likewise, the worksheets that helped students follow along with the activities and assisted them as they organized their thinking and the opportunities for students to use drawings and words to express their thinking were noted as high points of the unit. One educator appreciated the handouts and questions that accompanied the videos because she felt they would hold students accountable for their learning, providing specific content for them to focus on. In addition, they supported student knowledge needed for assessments. She also felt a sixth center could be added with multiple fiction and non-fiction children's books on the topic, so students could have one center to only read and enjoy books.

The classroom teacher who helped with implementation felt the students learned much from manipulating the shells and commented the "reading and writing component, rhyming words with choral reading, and science integrated into all the stations made this a strong learning experience for my students." She felt integrating science with language arts strengthened students' knowledge and skills in both areas, commenting that subjects are not isolated in the real world, so maybe they should not be presented that way in school. In addition, she said the students kept commenting about how "cool" the shells were as they worked.

CONCLUSION

The activities presented here could be implemented individually to incorporate short, stand-alone lessons that integrate science and language arts, or educators could use the activities as part of a center as explained at the beginning of the article or as part of the 5E Instructional Model as described at the end of the article. Whichever approach is taken, students are provided opportunities to learn more about science during a time in which accountability limits their exposure in the traditional classroom. Likewise, ocean literacy can easily be a focus for integrated centers as educators strive to incorporate reading and writing skills while placing a spotlight on marine education.

ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Appendices.** Appendix A to C. DOI: <https://doi.org/10.5334/cjme.67.s1>

COMPETING INTERESTS

The authors have no competing interests to declare.

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YOU TUBE VIDEOS

- Clam opens mouth.* <https://www.youtube.com/watch?v=XN0zK5WKL0I>
- Mollusks for kids.* <https://www.youtube.com/watch?v=RIygbucNX-0>
- Sea scallop.* <https://www.youtube.com/watch?v=Z4EFROfVyAA>

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