Trade books are a great way to introduce complex ideas to students. According to Barclay, Benelli, and Schoon (2012), children’s literature is a useful tool for helping students understand science concepts because it helps them see connections to their own lives. Writing is another useful tool because much of the same type of thinking occurs in both writing and inquiry-based science (Pearson, Moje, and Greenleaf 2010). Integrating inquiry-based activities with reading and writing helps to develop skills in literacy and science in authentic ways (Patrick, Mantzicopoulos, and Samarapungavan 2009; Gerde, Schachter, and Wasik 2013). Creating a unit that incorporates reading, writing, and inquiry promotes growth in all three areas.

Over the course of a few months, we developed and taught a mini unit about water that promotes being environmentally conscious using literature and nonfiction trade books as well as writing. In addition, there is a hands-on component in which students use the engineering design process to construct a device that helps with water pollution. The final product for the unit was an opinion writing piece. Students needed more practice in opinion writing, a fourth-grade standard. This fifth-grade disciplinary core idea was taught in fourth grade at the end of the year to support our writing standard and to expose students to the engineering design process. The objectives were: After a discussion about ocean pollution, students will create and test a device using the engineering design process that will either clean up our beach model or our ocean model, and in a five-paragraph opinion essay, students will explain their reasons for why they think it is important to take care of the ocean, earning at least 16 out of 20 points. In this article, we describe how we taught the mini unit and share improvements for future use.

**DAY 1: THE IMPORTANCE OF WATER**

We started our mini unit with a KWL chart asking students, “What do you know about water on our planet?” and “What do you want to know?” First, students participated in a “turn and talk” to help stimulate background knowledge. They were reminded to listen to what friends had to say so they could present original ideas as we filled out the chart together.

After filling out the first two sections of the KWL chart, we introduced and read the first trade book, *The Water Princess* (Verde 2016), which tells the story of how a child named Gie Gie and her family obtain water. Two pre-reading questions were asked (Questions and answers are shared online). Once students listened to the story, more questions were asked and things we noticed about the book were discussed. Some components included why the author/illustrator chose certain words or colors, as well as why pages were divided up in specific ways.
Next, there was a whole-group discussion about the differences in Gie Gie’s water use compared to our students’ water use. Students recognized that Gie Gie went through a lot to get water, whereas they had the luxury of turning on a faucet to get theirs. The consensus of the class was that this made them sad for Gie Gie. When called upon, one student shared, “I am grateful for only having to turn on a faucet” and his classmates agreed.

This discussion led to introducing the next trade book, *One Well* (Strauss 2007). Only portions of the book were shared and discussed: One Well; The Water in the Well; People at the Well; Access to the Well; and Pollution in the Well. This book, along with the others used in the unit, became part of the class library so students could explore other sections of the books later.

### INFORMATION ABOUT WATER POLLUTION

When the discussion of *One Well* concluded, students transitioned to a Nearpod presentation. This presentation used information, including photos, from the following four texts: *The New Ocean: The Fate of Life in a Changing Sea* (Barnard 2017); *National Geographic Kids: Water* (Stewart 2014); *What a Waste: Trash, Recycling, and Protecting our Planet* (French 2019); and *Not for Me, Please! I Choose to Act Green* (Godsey 2018). Our goals for the presentation were to explain the importance of water; how much usable water we have on the planet; and ways we use water (factories, dams, hygiene, watering lawns, food production, etc.); as well as various ways that water is being polluted. We also shared a map of the garbage patches in the ocean and in a separate presentation provided ideas for ways to decrease water pollution and conserve water. Some ideas included picking up trash, using less plastic, reducing water use at home, using collected rainwater to wash cars and water the lawn, and writing to politicians for policy changes. Although we did not need it this year, Nearpod slides can be translated into over 60 different languages using reading preferences options by individual students. We feel this will be helpful for English Language Learners in the future.

While students still had their computers out, they worked on a group Jamboard answering the question, “Why do you think it is important to take care of our ocean/water?” In hindsight, we realize we should have asked a different question. The rationale for the Jamboard was to provide a place for students to share information they learned so they would have it later to help stimulate their thinking for the culminating writing prompt, which was an opinion piece. Most of the students replied that it was important to take care of the ocean to keep sea life, and us, safe and alive. We should have asked students to post ways in which we use water and asked them to come up with a different idea than had already been posted. If we had done so, our writing assessment would have been better.

### DAY 2: STEM ACTIVITY

Prior to beginning the STEM activity, which was to build a device that could...
Teams test how their device performs.

be used to clean up the beach or ocean, we showed and explained the supplies available for building. The list of supplies was written on the board in case students could not see everything on the table as they thought about what they wanted to build (see Figure 1). The items were categorized as things to use for attaching or building, and items that float. Students were told that they were not limited to use them as categorized.

Next, students were given the option to design, build, and test a device that could clean up pollution on the beach (where much pollution comes from) or in the ocean (where there are large garbage patches). They were given a handout (see Supplemental Resources) in which they were to record their ideas for their device. They had to consider what they wanted their device to be able to do, how they wanted it to do that, and what they needed to build it. Then they needed to draw a sketch of the device. After 10 minutes of private thinking and planning time, students were given the option to work with a partner and combine their ideas. They were not told of this option ahead of time. All but two students chose to work with a partner. In one case, we suggested a pair work option ahead of time. All but two students did this. Students changed their partner students to facilitate discourse and collaboration based on students’ needs. After pairing up, students discussed their ideas, taking what they liked from each design. The next time we teach the mini unit, we will stop here to give students ample time to come up with a great design before constructing and testing the next day.

As students completed their designs, they went to the table a few at a time to gather supplies and then started to construct their devices. There were 6 (20×13×3 inches) aluminum pans in the room in which they could use for testing. Three had less than two inches of water and three a couple inches of sand. All had pollution (wadded up tissue paper, ribbon pieces, small pieces of a plastic straw, and small foam pieces) scattered on top. We had paper towels by the water pans to clean up drips. In addition, we modeled how to carefully test designs and limited the number to one team at a testing station. Safety goggles are advised for those testing in the sand. A water testing station was placed on a desk for students who could not physically get down on the floor.

After testing, students were directed to revisit their handout to record what worked and did not work with the device, as well as improvements that needed to be made, which included what items they needed to change the device and a picture of what it should look like now. Since they had only 60 minutes to work, students changed their devices, but some did not take the time to record what they did, nor did they have time to do another revision, which was also on the handout. We heard comments like, “Let’s try using duct tape instead [of Scotch tape], so it will stick better,” but we also heard, “If we had more time, we could take this section apart and make it out of sponges instead of wood.” Having students design one day and build and test the next should help with the latter.

Students disassembled their devices so the materials could be reused or recycled. The straw and foam pieces were plucked from the polluted waters to use again, but the wet paper was thrown away. The pans of water were set up near the back door of the classroom to make dumping them easier. We also sterilized the sand prior to use. The cost for supplies was less than $50, buying some new items and using others left over from other projects.

We initially chose our main assessment to be the writing piece at the culmination of the unit. In hindsight, we would like to have assessed the inquiry portion in addition to the language arts portion of the learning. We have created the rubric we will use when we teach this mini unit again (see Supplemental Resources).

**DAY 3: WRITING AN OPINION PIECE**

On the last day of the mini unit, students brainstormed ways to help the water pollution problem and their ideas were put on a poster to help with filling out the last section of their graphic organizer handout, which had three sections. At the top, students wrote their topic sentence and opinion. In the middle they provided three reasons for their opinion. Finally, at the bottom they shared one change they could make to help the pollution problem. We initially thought they could get their ideas for the middle section from the Jamboard they completed on the first day, however, as discussed earlier, we did not ask the best question for this task and did not monitor Jamboard closely enough (students were posting during the last
few minutes of class) to make sure there were a variety of ideas regarding reasons we should take care of the water. We wanted responses such as the following: we brush our teeth with it; it is used to grow our food and hydrate livestock; it is used to generate electricity; we bathe, cook, and do laundry with it; it is used in factories, etc. Instead, we got mostly that water helps us and animals to live.

We also created a poster that had an example of a topic sentence and introduction to help with the first section (see Figure 3). Students were told they could use this example or create their own. The graphic organizer reminded them to (and gave suggested starters to): introduce their topic by hooking the reader and stating their opinion (I feel…; I believe…; In my opinion…); provide three reasons (First of all…; Another reason is…; Lastly…); and for the conclusion, restate the opinion with feeling (In conclusion…; Now you can see…). A rubric was created to help guide students as they worked and they used it to self-score at the culmination of writing (see Supplemental Resources). In reflecting on the rubric, we wish we would have made the opinion portion of the writing worth more points because currently more points were delineated to neatness, grammar, and paragraph structure. Day three culminated with revisiting the KWL chart to fill out the “What we learned” portion.

In conclusion, the mini unit was a success. Students understood the importance of water in our world, including the dire pollution problem, and effectively designed and tested a device to help with pollution. They were able to write an opinion piece about the reasons water is important and what they could personally do to help with the problem. We feel reading and discussing the trade books and writing an opinion piece, along with the inquiry activity, helped to deepen students’ knowledge and understanding in all three areas.

REFERENCES

RESOURCES

SUPPLEMENTAL RESOURCES
Download the book questions and rubrics at https://bit.ly/3Ho5NYK.

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