Nurturing Local-to-Global Thinking

Third graders explore the world with technology and citizen science, plus an engaging reading and exercise component!

By Natalie Harr Ylizarde and Ebony Terrell Shockley

Citizen science projects harness the power of the internet and public participation to advance scientific endeavors. With new technology and help from volunteers, scientists are now able to collect vast amounts of data from near and far that are critical for understanding Earth’s complex systems. For example, scientists are currently conducting the first comprehensive count of the Weddell seal population along the vast and treacherous coastlines of Antarctica. By engaging the public in examining Antarctic satellite images, scientists can safely expand their knowledge about seals by investigating population trends and connecting them with existing knowledge about climate change (University of Minnesota 2017).

Citizen science provides an opportunity for students to capture data both locally and globally while supporting the real-time work of scientists seeking to understand natural events. In this article, we present a project-based approach that explores climate at home and abroad to help develop elementary students’ local-to-global perspectives. Third-grade students “virtually” travel to a faraway place, compare and contrast this place to their local environment, examine photographs taken by scientists there, and report what they see. By engaging with this authentic project, elementary learners contribute actual data to make a difference in current scientific endeavors.

For our global connection, we selected Antarctica for a variety of reasons. First, it is a faraway place that few people have ventured, its extreme environment (the coldest, windiest, driest place on Earth) makes for a robust comparison to our home in Maryland, it’s located in the opposite hemisphere, and the polar fauna (e.g., penguins, seals, whales) that live there capture students’ interest. Although any location with an active citizen science project would work, a focus on a polar region provides a unique opportunity for understanding events in nature on a global scale.
Starting Locally

At the beginning of the project, we provide opportunities for students to become more aware of their local climate and existing ecosystems, such as weather systems and patterns, nearby water sources, and local plants and animals. We have found that the yearlong project “Nature Detectives” (Harr and Lee 2010) lays a strong foundation for creating a local connection. A complete description of this project, including safety guidelines, can be found in Science and Children's November 2010 issue. Nature Detectives helps students become citizen scientists of their own school yard environment. In this project, our students use observation skills and simple tools to investigate a small natural area in their school yard periodically throughout the school year. Students made predictions, recorded data, drew conclusions, and shared their findings about how their study site, including its plants, animals, and environment, transformed with each new season. We typically start this project at the beginning of the school year and complete our data collection and analysis for late summer and fall in preparation for a global connection. This project culminates at the end of the school year with students creating a school yard field guide, a unique science journal that showcases their data and discoveries across the seasons.

Launching the Global Connection

Antarctica is one of the locations in the children’s book On the Same Day in March (Singer 2000). In early winter, we use this text to introduce students to concepts of places far and near and how the places are alike and different. The book includes examples of various ecosystems from around the world, offering an opportunity for students to explore similarities and differences of places on the globe. The book ends with Antarctica as an icy, faraway place, with penguins on a shore, “seeking mates, missing fish, as the six month sun begins to slice down the Antarctic ice” (paragraph 15). This is an ideal launching point to introduce a place that seems so apparently different from students’ local environment. As an after-reading strategy and a formative assessment, we use the following activity.

Pack a Suitcase

After reading On the Same Day in March, we ask students to demonstrate their understanding of the Antarctic climate by packing an imaginary suitcase for an Antarctic research expedition. For the remainder of the project, students consider themselves scientists preparing to embark on a research expedition to a U.S. Antarctic station. Students write and/or draw the items (Figure 1) they need in order to work in this remote and faraway place. Students typically know to pack heavy clothes, special polar gear (e.g., goggles, thick boots), and toiletries (e.g., toothbrush, shampoo, or soap). However, as we revisit this activity periodically, we guide students to add some new thought-provoking items. For instance, students are often surprised to find they need sunscreen and special eyewear for ultraviolet radiation protection. Since there are no places to shop in Antarctica, they learn that scientists must carefully pack the right quantities of items. Water bottles, skin moisturizers, lubricant eye drops, and lip balm are necessary items for hydration in the field. Before our departure, a checklist reveals the
need for plane tickets and a valid passport to reach our final waypoint: to either board an icebreaker ship in Chile or a cargo plane in New Zealand to reach one of the three U.S. research stations in Antarctica.

**Dimensions of Place**

The more our students learn about a faraway place, the more opportunity we have to delve into the details of our local environment and how it differs from the global environment. An understanding and observation of similarities and differences supports pattern recognition (see NSTA Connection). According to Gruenwald (2003), one can learn deeply about a place by exploring its five dimensions: the perceptual, sociological, ideological, political, and ecological. These dimensions serve as a teaching tool to help students understand places beyond their mere geographical location. While packing for our research expedition, we use dimensions of place such as plants and wildlife, physical features, and kinds of human impact, as a framework to connect and extend student knowledge of our local and global environments. For the next activity, we collect a tub of relevant children’s books (see Resources) with multiple copies for students to research this information as a class. Working in small groups, students select a piece of paper out of a jar that contains a specific research assignment. Each research assignment contains a fact about the local environment that serves as a scaffold for locating similar information about Antarctica. To differentiate for this activity, students may write and/or draw their responses (Figure 2). After completion, students turn in their research assignment to be added to our class digital document. The students or the teacher can manage this ongoing document using a shared folder or drive. Over the course of two weeks, students work at their own pace until the jar is empty and our document is filled with rich information about our local and global places. Each group discusses where they found their information, whether the data was hard to locate, and interesting facts they learned during their search. Using the resources provided or teacher-suggested books, we have found this activity to be highly motivating for students, with multiple opportunities to collaborate, observe patterns in their findings, and learn deeply.

**Going Global: “Read and Walk” to Your Place**

With their suitcases packed, we adapted the Read and Walk to Antarctica project to get students “virtually” on their way to their faraway scientific location. We start this project shortly before the winter holiday break so students can continue working on it during their vacation and upon returning to school. The main tenets of this project challenge students to read books and participate in physical activity that equates to the mileage of a faraway location. In a note sent home to families, we ask students to dedicate time to “reading” and “moving” (see NSTA Connection). Students turn in paper

---

**FIGURE 2.**

Sample research assignment.

<table>
<thead>
<tr>
<th>Topic: Physical Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida’s landscape has plains, wetlands, lakes, rivers, and beaches.</td>
</tr>
<tr>
<td>Book Title(s)</td>
</tr>
<tr>
<td><strong>Antarctica: A True Book</strong></td>
</tr>
</tbody>
</table>

Directions: Read the fact about Florida. Conduct research to write and/or draw the same information about Antarctica. Include the name of the book(s) and page number(s) that you used to find this information.

A wall display of footprints helped students keep track of their progress to each waypoint.
footprints that track the books they read and their movement as mileage to our next waypoint. The specific mileage for each footprint will depend on the exact mileage to the location, the amount of time dedicated to the project, and the size of the class. We kept track of our progress till the end of January using a wall display of footprints in our classroom and by creating waypoint bracelets for students. The following locations are waypoints we used to travel like Antarctic researchers:

- Miami, Florida
- Santiago, Chile
- Punta Arenas, Chile
- An icebreaker ship to Palmer Station, Antarctica.

As we virtually travel to each waypoint, students learn about each place by reading books, exploring Google Earth, and visiting approved websites. Previously, our students have been so motivated by this project that they have more than tripled their mileage goal! Although this project has a focus on Antarctica, there are many ways to conduct a similar project by simply choosing a meaningful destination with students and setting a mileage goal for the adventure.

**Citizen Science for a Global Connection**

After packing and “virtually” traveling to Antarctica, students should now have a solid knowledge base about their global place and are ready to participate in real-time scientific research there. With Antarctica’s extreme climate, some scientists must rely on technology to safely collect scientific data to understand the complexities of the Antarctic ecosystem. Using technology, now students can conduct research in Antarctica as part of a citizen science project.

Zooniverse (Figure 3) is a collection of web-based citizen science projects that use the efforts of volunteers to help researchers analyze data. Among the citizen science projects available here, Penguin Watch 2.0 invites the public to view photographs from remote regions of the Antarctic Peninsula where human presence might disturb wildlife or disrupt their behavior. Scientists hope to capture novel behaviors of the penguin populations that humans have not observed due to the remote location.

We have found that Penguin 2.0 is an easy platform for children to use independently (or in pairs) as citizen scientists. When arriving at the site, students receive a simple 30-second tutorial. Using a color-coding scheme, students learn (1) how to count and mark penguins as adult, chick, or egg, (2) what to do if the images are blurry or the wildlife is difficult to determine, and (3) how to identify other wildlife. To begin, students must create an account with a username and password to access the project’s background information, maps, discussion board, and a blog that features penguin research. Before using this site, we recommend checking that photos are available for students to review and checking your school’s internet safety policy.

A second website is TomNod (Figure 4). Just like...
Zooniverse, it contains a variety of projects for student participation. After students create an account, here you can get involved in the Antarctic Weddell Seals count mentioned previously. Although this project has a similar objective to Penguin 2.0 with counting wildlife, this project hones your students’ observation skills by looking for seals using satellite imagery. The tutorial helps distinguish different landscape characteristics (i.e., sea ice, coastal glaciers, large ice cracks) along the Antarctic coastline. The keystrokes take a little bit of practice, so we recommend trying this project as a class first until students feel comfortable navigating the images. We give our students the option to choose which site to work with based on their comfort and interest level. Before using this site, we recommend checking that the campaign is currently active and reviewing your internet safety policy.

Conclusion

We have found that participation in these Antarctic citizen science projects provides a way for learners to engage in active data analysis. Students begin to see themselves as scientists that make a difference by contributing data to an international data bank. Students can begin to make global connections to their sense of place, such as knowledge of the northern and southern hemispheres (e.g., opposite seasons, variations in daylight, celestial night view). These connections made through citizen science can plant the seeds for local and global awareness on climate change, ecosystem dynamics, their patterns, and their interrelationships. We wrap up our project with a summative assessment about climate in various regions of the world (see NSTA Connection). The summative assessment requires learners to demonstrate their understanding of climate by writing, labeling, comparing, and contrasting their local climate to Antarctica’s climate. Teachers can use a combination of these as appropriate for their student population. There are many ways to integrate a global perspective using the scientific practices allotted through citizen science. Citizen science presents an opportunity for elementary students to capture data both locally and globally while supporting the real-time work of scientists seeking to understand complex phenomena. With advances in technology and willingness from the public, citizen science has brought together scientists, educators, students, and the public for scientific progress. It is these moments that inspire learners to become scientists.

Natalie Harr Ylizarde (ylizarde@umd.edu) is an early childhood educator and doctoral student who currently prepares preservice elementary educators at the University of Maryland in College Park, Maryland. Ebony Terrell Shockley (eterrell@umd.edu) is a former K–12 science educator and STEM mentor. She is an assistant clinical professor and director of Teacher and Leader Education for the Teaching and Learning, Policy and Leadership department at the University of Maryland.

Acknowledgment

This project was funded by grants from the National Science Foundation (NSF DUE 1239758; NSF PLR 1341385; NSF PLR 1341393). Any opinions, findings, and conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

Internet Resources

Antarctic Classroom videos
www.pbslearningmedia.org/resource/ipy09.sci.life.eco.seals/studying-antarctic-seals/#.Wc6yrxNSwWo
Polar Ice
https://polar-ice.org
Tomnod Weddell Seal Count
www.tomnod.com/campaign/campaign_2058/question/168267
Weddell Seal
http://weddellealscience.com/classroom.html
Zooniverse Penguin Watch
www.penguinwatch.org

References

Nurturing Local-to-Global Thinking

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

<table>
<thead>
<tr>
<th>Performance Expectation</th>
<th>Connections to Classroom Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-ESS2-2.Obtain and combine information to describe climates in different regions of the world.</td>
<td>• compare the climate of their local region to a new global environment.</td>
</tr>
</tbody>
</table>

Science and Engineering Practice

Obtaining, Evaluating, and Communicating Information

• collect data regarding local and global environments and communicate information through charts.

Disciplinary Core Idea

ESS2.D: Weather and Climate

• Climate describes a range of an area’s typical weather conditions and the extent to which those conditions vary over years.

• identify climate in both local and global (i.e., Antarctica) environments throughout the school year.

Crosscutting Concept

Patterns

• Patterns of change can be used to make predictions.

• recognize patterns of change while contrasting environment, and collecting and analyzing data as a citizen scientist.

Resources


NSTA Connection

Download letter to families and summative assessments at www.nsta.org/SC1804.