Start With a Story

FIVE SCHOOLS AND A ZOO USE THE ONE BOOK, ONE COMMUNITY MODEL TO BRIDGE STEM INTO STEAM.

By Patricia Brock, Sarah Dunifon, and Lisa Nagel

"Education that is organized in such a way that it cuts across subject-matter lines, bringing together various aspects of the curriculum into meaningful association, provides children with a better understanding of the subject. It views learning and teaching in a holistic way and reflects the real world, which is interactive" (Shoemaker 1989).

Stories are magic. A good story can put knowledge into context, engage students, and give them the desire to take charge of their own learning. The connections that literature and the arts can build across STEM subjects are an important consideration for teachers in lesson planning: Children learn best when subject matter is relevant, and literature brings meaning to science. Projects that fuse the arts with scientific inquiry are complementary and require students to engage in critical and creative thinking. Teaching topics such as animal habitats, characteristics, and suitable environments without connecting them to ideas that help students explain the world provides no reason for them to learn, care, or even remember the information.

This article outlines an integrated STEAM project based on *The One and Only Ivan* by Katherine Applegate (2012). Our students focused on real-world, authentic problems presented in this 2013 Newbery Award–winning novel. The book, which is appropriate for students ages 8–12, is based on the true story of Ivan, a silverback gorilla who was isolated in captivity for 27 years in a shopping mall arcade. It deals with difficult issues such as the humane treatment of animals and has a powerful message of friendship and hope. This project used a *One Book, One Community* format, a reading program that attempts to get everyone in a city or community to read and discuss the same book. The goals are to build a sense of community, promote literacy and can include activities like book discussion groups, author visits, lectures and watching the movie (if there is one). It has become so popular that school librarians now integrate it into curriculum. Five area elementary schools, in a collaboration with the Lincoln Park Zoo, communicated using Skype and a blog. Teachers shared lesson ideas between schools and students from all of the schools met with each other during field trips. All grades were included in this project. Students in grades 3–8 read the book, while the younger students explored age-appropriate, thematically related books (see Resources). This collaboration also allowed four of the schools to share resources with an underserved school: Teachers and parents at the other schools purchased books and paid for field trips for students from a low-income neighborhood. All five schools participated in the blog and read *The One and Only Ivan* according to a schedule devised by the school librarian who began the project. Teachers posted questions on the blog, and student responses were assessed on insight, understanding, and reflective thought. Students were also required to comment on at least two student posts and ask a new, related question.

Building Background

The focus of our project, using literature and the arts to engage students in integrated STEM learning, began with the book. The guiding questions for students were about gorillas and, through thematic extension in the novel, animal welfare:

- Do animals have rights?
- How should animals in the care of humans be treated?
- Can humans better understand themselves by learning about the needs of animals and animals' environments?

People eat meat, wear furs and leather, and go to a circus or the zoo for entertainment. For years, the impact of these actions on the animals was not considered. *The One and Only Ivan* is narrated by a gorilla who experiences loneliness and grief in the concrete box that is his home, creating in the reader an awareness that animals have rights.

After dividing the class into [pairs] we began with a webquest to research the book's author, the Newbery Award, western lowland gorillas, the Democratic Republic of Congo (the country where Ivan was born), and the real Ivan. Students recorded the information they found on each topic, and we assessed students as they used this information to:

- Form a word cloud of significant key terms and concepts using Tagul. Word clouds are used to analyze chunks of text. Tagul is a free word cloud generator that differs from applications like Wordle in that every word in the cloud is linked to a Google search.
- Upload images to produce a two-minute music video using Animoto, a cloud-based service free to educators that creates a video from photos, video clips, and music into video slideshows.

- Use PowerPoint to create a presentation that pulled everything together.

Zoo instructors with props and videos on western lowland gorillas visited the five schools. Students observed and conducted investigations with the educators to build an understanding of animal behavior and adaptation. Students were to observe and describe how living and nonliving things (other animals, plants, weather, and environment) affect the life of a particular animal. In *The One and Only Ivan*, a stray dog, two elephants, and a human girl all help Ivan toward a better future. Other objectives included observing and recording how animals of the same kind can differ in certain characteristics, how behaviors and body structures help animals survive, and how humans help animals adapt in the zoo. With money donated from parents at four of the schools, our classroom adopted a male gorilla named Amare from Lincoln Park Zoo. The zoo uses the money raised from the adoption to help Amare get the expert care he needs to flourish in his environment. Using the background-research information and lessons from the zoo instructors, students brainstormed and then designed a natural habitat for Amare. Some ideas were logs, a waterfall, termite mounds, trees, and vines for climbing.

Using a shoe box or small shipping box, students designed a diorama of a gorilla habitat or domain in a zoo (Figure 1). Using materials such as construction paper, leaves, grass, paint, clay, rocks, and glue, the diorama had to include an environment that supports the needs of Amare: plants, food, enrichment, and physical and social needs.

FIGURE 1.

A student-designed gorilla habitat.

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Combining Literature and Art

We emphasized independent reading and collaborative learning as students worked in Literature Circle groups. The groups used written notes and art to guide their reading and discussions. Each participant had a distinct role—Discussion Director (creates questions to increase comprehension), Literary Luminary (locates selections of text to share with the group), Vocabulary Enricher (clarifies word meanings and pronunciations), Story Summarizer (prepares a summary of the reading) and Artful Artist (student takes a photo or creates a drawing, cartoon, or flow chart based on a specific event or theme in the book). These assignments tap into students' personal responses to the novel and allow them to diagram a concept or idea. Mapping, charting, drawing, and other forms of graphic response serve the range of learning styles that exist in a classroom. Literary responses to written or spoken language come from the picture a student forms in his or her mind. Many times, a drawn or graphic response like a Venn diagram or a flow chart can capture those elements better than words. When the artwork was shared during group meetings, the artist remained quiet while the group interpreted the work. Then the artist explained the meaning of the image.

Third-Grade Spotlight: Combining Literature and STEM

From our research we knew that the real Ivan and his sister were shipped to the United States in a wooden crate. Based on this fact, we began a discussion on humane and inhumane ways that animals travel and what it would be like to travel from Africa in a wooden box. As the students reflected on this, comments naturally led to more sophisticated ways of thinking about the boredom and loneliness the two baby gorillas must have experienced. The Zoo instructors had pointed out that animals in a zoo do not have the same opportunities for physical and mental stimulation as wild animals. Zoo keepers, they stressed, work hard to provide the animals with enrichment using objects like puzzle feeders, which require manipulation to

dispense food. Simulating the active pursuit of food in the wild and making changes to the habitat improves animal welfare and reduces stress.

Classroom engineering and math projects included designing crates using craft sticks and glue that would hold a Beanie Baby (Figure 2) and creating a puzzle feeder using cardboard tubes, paper, scissors, string, glue, and M&M's. Both the crate and the puzzle feeder included specific directions that classmates could duplicate using measurements of length, width, and height and the dimensions of any openings. We assessed the crate based on the following criteria:

- Could the animal be released from the crate without destroying it (i.e., the crate had to have a lid that could be removed)?
- Was the crate structurally sound three days later?
- Did the crate hold the weight of the stuffed animal when lifted?

FIGURE 2.

A student-designed crate.

We assessed the puzzle feeder based on whether another group of students could exactly duplicate the project using only the directions with the measurements. For example, to create the puzzle feeder, one student cut a tube into 6.5 in. rings, placed each ring inside another to create a sphere, used glue in spots to hold it together, pushed string through an opening to hang it from a tree branch, and stuffed it with five M&M's.

One way Ivan the gorilla communicated was through finger paintings. We led a discussion on artists known for that style of art, especially Jackson Pollock. Students viewed photographs of Ivan's actual work and compared it to the style of abstract artists. On *JacksonPollock.org*, students created an abstract masterpiece online. A click of the mouse changed the paint colors, and the painting could be printed.

Students then learned about abstract art and how it is filled with color, line, movement, and form and uses innovative textures and shapes. They also discussed the different forms of media that could be used, such as oil and acrylic paint. They learned how elements in the paintings grab attention and pull an emotional response from a viewer. Students were then instructed to think about and analyze different abstract paintings:

- Choose two words from the Tagul word cloud created in the previous lesson. Cut a sheet of white construction paper in half. Create two small abstract paintings using watercolor. Use color, line, movement, and form to elicit emotional response. For example: Use the word "Burma" (the name of Ivan's sister, who died). What emotion do you want your audience to feel?

Students then answered questions about each other's paintings, including:

√ What do the shapes represent?

√ How do the colors interact?

√ What could be the symbolic meaning of the piece?

Author Katherine Applegate also visited each school. To prepare for this event, a schoolwide masterpiece was created (Figure 3, p. 52). Using a large canvas and different colors (one for each class), students made their mark. They used a finger-painting technique to layer color. Teachers encouraged them to find white space on the canvas and consider the composition before painting. The finished art was then displayed during Katherine Applegate's visit and resided in the school library for the duration of the One Book project.

STEAM in the Field

At the Zoo

Field trips to the zoo and educator visits to the classrooms incorporated hands-on science and technology. Inquiry-based explorations of ape behavior in the animal's native habitat used data sheets and the Observe to Learn iPad application (see Internet Resources). This free app was developed for *ethology* (animal behavior) studies using methods that researchers use. There is a default *ethogram*

FIGURE 3.

The whole-school masterpiece.

(behavior checklist) or one where students can launch a study of their own design.

Led by the zoo educators, students observed animal behavior, compared behaviors between species or individuals within a group, and discussed topics such as space use, social groupings, and gorilla natural history and conservation. These topics connected to the key themes of *The One and Only Ivan*. Students then completed scientific illustrations of the exhibits, incorporating art into their science observations that doubled as a way to assess learning.

At the Theater

Because we viewed visual and performing arts as integral components to our project, we also involved our students in a theater production of *The One and Only Ivan* through the KidSeries Student Matinee Program at the Lifeline Theater in Chicago. Prior to the show, teachers received a study guide with activities that related the play to different subjects. For *The One and Only Ivan*, younger students were encouraged to create on paper ideal animal habitats for their favorite zoo animals. A simple math activity page included a maze. Following the matinee, the cast held an interactive storytelling session with games that explored the book behind the play.

On "Safari"

One kindergarten teacher paired up with the third grade and designed a playground safari. The teachers hid small stuffed animals for students to find and observe. Engineering tasks had students making binoculars and helmets from cardboard rolls and paper plates for Sun protection (Figure 4). Students recorded their findings, which also included observing native animals, looking under rocks for insects, and sketching an interesting weed. Math-related tasks included counting insects under rocks, comparing sizes and colors of plants, and sorting the stuffed animals by type. Science-related tasks involved environmental awareness and the diversity of life in ecosystems, with students exploring the playground to experience the kind of fieldwork that scientists do. Students were assessed by the data they recorded.

FIGURE 4.

A student on safari.

Conclusion

This collaborative project began with an enterprising school librarian who was looking to go beyond the scope of the One Book, One Community initiative of reading and discussion. She wanted a cross-curricular event that would involve all teachers of all subjects, and she wanted to bring a quality learning experience to an underserved school. By participating in STEAM lessons that were fun

and motivating, students were immersed in activities that allowed them to experience and then express the natural world around them over a period of four months. All five schools participated in the blog, read *Ivan*, Skyped with each other, and hosted an author visit. The STEAM lessons described in this article were the result of the partnership between the school that initiated the One Book, One Community event, the underserved school, and Lincoln Park Zoo. ■

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Internet Resources

Animoto
https://animoto.com

Jackson Pollock
www.jacksonpollock.org

Observe to Learn
www.lpzoo.org/education/initiatives/observe-learn

Tagul
https://tagul.com

Resources

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NSTA Connection

View a video created by students in the digital edition of *Science and Children*.