OVERVIEW

Simulation

In Nature Rangers, a park ranger in the Great Smoky Mountains National Park (GSMNP) has found a mystery plant that is not native to GSMNP. Since the mystery plant has started growing in the lake, the park ranger urgently needs students to help determine three things: 1 - the type of plant it is; 2 - the impact it has on the ecosystem; and 3 - if this plant should be removed.

Students will be acting as biologists, botanists, foresters, or ecologists during the simulation. Students complete rotating research tools on plant structure (roots, stem, leaves, and flower), photosynthesis and what plants need to live, reproduction and the internal structure of flowers, and different methods of seed dispersal (wind, water, and animal). The seed dispersal tool will be done with their team. After completing the seed dispersal portion, students will receive a video from the park ranger telling them more about their role for the Adventure. Students will then make an observation about the mystery plant. Teams investigate the characteristics of the plant to determine if the plant is aquatic or terrestrial, how many petals the flower has, the height of the plant, and the temperature in which it grows. Each of these observations will be used to classify the plant.

Once all students have completed the four research tools, they will have all the information they need to classify the plant. Working in their groups, they will complete a dichotomous key using the observations made by each team. Students will classify the invasive plant species as a water hyacinth. Now that students have identified the invasive species of flower, students investigate the impact the water hyacinth could have on the Great Smoky Mountain ecosystem if it were to spread.

Students will continue working with their team to learn about the interconnectedness of ecosystems. Students will classify organisms into decomposers, producers, and consumers. Once these organisms have been classified, the students will look at the Great Smoky Mountain ecosystem. In the research tool, they will explore different parts of the ecosystem to see how an invasive species would affect the entire ecosystem. They will use this to select which parts of the ecosystem would be directly affected by the water hyacinth if it overtakes the lake.

Once the students classify the plant and analyze the impact it has on the ecosystem, the students discover that, while beautiful, the plant in question is indeed a non-native invasive species and should be removed at once. The park ranger immediately begins to plan for removal – only to realize the supplies are on the other side of the river and the bridge to get to them has been washed out from an overnight storm! Working with another park ranger nearby, the students come together as a whole group to determine the best way for the park ranger to cross the river and to discover the solution is found with a nearby foot bridge. Once

across, the park ranger tasks the students with breaking a code to get into the locked box of supplies. Each team figures out one number, which when put together, completes the code and opens the box. Thanks to the students' code breaking skills, the park ranger can open the box and eliminate the water hyacinth. The Great Smoky Mountains are saved!

Engineering Activity

Following the steps of the Engineering Design Cycle, students are tasked with designing a new bridge to replace the one that was destroyed by the storm during the simulation. Students should work in teams to first design their bridge on paper. These teams do not have to be the same teams as the simulation. Then, students should build and test their design using materials commonly found in classrooms, such as paper, pipe cleaners, plastic bags, rubber bands, etc. As an additional challenge, the bridge should be able to meet project design constrains. The suggested constraints for the bridge are the following: should not break, span across a gap of at least 12 inches (30.48cm), measure at least six inches high (15.25 cm) and three inches wide (7.62 cm), and be able to hold at least one pound (453.6 grams). The teacher may change the project design constraints in accordance with what works best for the classroom. If time allows, groups should present their design to the class to explain how it works and why certain elements were added.

This activity is introduced in the software. A tool will introduce the task and shows the steps in the Engineering Design Cycle. This can be displayed as a 1:1 or projected for the whole class. After going over the Design Cycle, students spend the rest of the time designing, building, and testing their prototypes. Teachers are welcome to add additional constraints for their students during the Engineering Activity.

This activity can be done in 30 minutes to one hour or extended to longer timeframes if desired. It can be completed individually or collectively (whole class, small groups, centers, or stations) and customized with any time and space criteria that meet the needs of the instructor.

Nonfiction Science Writing Activity

In the Nonfiction Science Writing Activity, students will be introduced to three types of nonfiction writing: a plant guide, a review, and social media posts. They will write about what they learned and their experience during the simulation using one of the three writing options. For example, students can create an entry for the water hyacinth or another plant in a plant guide, write a review about one of the park rangers, or post to a microblog site about their

favorite part of the park. Additionally, the teacher or students may create their own prompts.

Similar to the Engineering Activity, the Writing Activity is introduced in the software. There are digital graphic organizers in the software that the students can reference. If preferred, those graphic organizers may also be printed from the Teacher Resources page. Once the students have chosen their Writing Activity, they have the rest of the time to plan and write. The students will write their drafts on paper. Teachers are welcome to create additional criteria for the Writing Activity.

This activity can be done in 30 minutes to one hour, depending on schedules.