

This is a long-term STEM problem-based unit using HS Environmental Science students to teach the content they are discovering about ecosystems and human impact on the environment to a class of first graders. This unit was co-developed by Rebecca McLelland-Crawley, the K-12 Science Supervisor for the West Windsor-Plainsboro Regional School District, and Danielle Bugge, a science teacher at West Windsor-Plainsboro High School South. We also sought outside funding to add the element of “maker” education into this unit in order for the students to construct rovers and embed engineering in the environmental course.

Standards - Next Generation Science Standards and Common Core State Standards

NGSS HS LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

NGSS HS ETS1 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

CCSS.ELA-Literacy.W.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.

CCSS.ELA-Literacy.RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCSS.ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Lesson/Unit Objective

High School Environmental Science students will help first grade students investigate their ecosystem and develop rovers to explore their school yard and local habitats through in-person and virtual collaboration.

High School students will research, develop, and refine terrestrial and underwater rovers to explore their local ecosystem through less-invasive technology.

Students will analyze the impact of humans on ecosystems and habitats.

Students will communicate their research and engineering processes through a class website and on-going blog posts with video, writing, and screen casts.

Procedures

- Using school and BYO resources, students investigate their biome and local ecosystem.
- 1st grade and HS students create videos to introduce themselves to one another and point out favorite animals from deciduous forest. HS students send the link to their uploaded videos on YouTube for inclusion on the class website.
- Teachers can walk the younger students through the video introductions in class.
- HS students continue to research the ecosystem services of the local ecosystem and nearby pond and summarize their findings on their personal blogs.
- HS students investigate the use of littlebit kits to construct rovers as mentors to their 1st grade students and develop prototypes of terrestrial rovers. Students add Vodcasts and reflective blog posts about the process to site.
- HS students present their rovers to the 1st graders and work with them in their classrooms over multiple visits and virtually to develop rovers to explore their school yard environment, take digital photos, and build their website.
- HS students research and construct underwater rovers to explore the local pond and present their findings to the 1st graders and township stakeholders through their website.
- Students will continue throughout the year to add to the website on their findings - https://sites.google.com/a/ww-p.org/hss_envsci_1314

Extension activities: Have students present their work at a Board of Education meeting, present their website, and explain their experiences.

Assessment

District assessment rubrics for 21st Century Competencies are used to for teacher, peer, and self evaluation for collaboration and effective communicator.

District rubric for science investigations to evaluate student presentations of ecosystem findings with rovers.