

Dana Poster

The class I teach is solely focused on the Engineering and Technology Standards in the new Science, Technology, Engineering, Environmental Literacy, and Sustainability standards in PA. I facilitate engineering challenges for grades K-5. However, teaching K-2 is a new experience for me. Therefore, I have chosen a kindergarten challenge for the focus of my project.

This engineering design challenge is sourced from Engineering is Elementary. The unit is intended for kindergarten students. The phenomenon to anchor the challenge is a story about two children who go to a park and always watch a duck named Danny. One day they notice that there is trash in the pond where Danny lives and swims. The two main characters want to solve the problem to save Danny the duck. In the classroom, we acted out the story by using a large container of water as a pond model, putting trash in the pond, and having Danny the Duck in the pond. We also put fake fish and fake plants in the pond to make the connection of how the pollution will affect them as well. The goal is for students to create a trash collector. The trash collector needs to get the trash out of the pond; however, it needs to leave the water in the pond; they cannot use their hands, the scooper cannot leave any additional pollution in the pond, or harm the living things.

Engineering notebooks for the first unit would be overwhelming for the teacher and students as this is their first real experience with both the class, school, and the engineering process. Therefore, the engineering notebook will be very visual, including red, green, yellow lights to visually sort materials and shapes as we test them. This board will serve as an example for the future as I shift students to individual notebooks. Students will present their ideas orally as they learn to collaborate and work together as a team. I will take pictures and video along the way to document student's learning.

1. The big concepts covered by the engineering design challenge are:
 - One way human's impact the environment is by making trash
 - A trash collector is a technology humans can use to reduce their impact on the environment
 - Use the Engineering Design 4D Process
2. This unit focuses on the Technology and Engineering portion of PA's Science, Technology, Engineering, Environmental Literacy and Sustainability. The specific standards are listed below. The standards then link to the foundation boxes for clarifying statements and the TechnologyEngineering Practices.

[3.5.K-2.C Explain ways that technology helps with everyday tasks.](#)

[3.5.K-2.D Select ways to reduce, reuse, and recycle resources in daily life.](#)

[3.5.K-2.E Illustrate helpful and harmful effects of technology.](#)

[3.5.K-2.G Explain the tools and techniques that people use to help them do things.](#)

[3.5.K-2.H Explain the needs and wants of individuals and societies](#)

[3.5.K-2.I Compare simple technologies to evaluate their impacts](#)

[3.5.K-2.J Design new technologies that could improve their daily lives.](#)

[3.5.K-2.K Safely use tools to complete tasks.](#)

[3.5.K-2.M Demonstrate essential skills of the engineering design process](#)

[3.5.K-2.N Analyze how things work.](#)

[3.5.K-2.O Illustrate that there are different solutions to a design and that none are perfect](#)

[3.5.K-2.P Discuss that all designs have different characteristics that can be described](#)

[3.5.K-2.Q Apply skills necessary for making in design.](#)

[.5.K-2.R Draw connections between technology and human experience](#)

[3.5.K-2.S Apply design concepts, principles, and processes through play and exploration](#)

[3.5.K-2.T Demonstrate that designs have requirements](#)

[3.5.K-2.U Explain that design is a response to wants and needs](#)

[3.5.K-2.V Explain that materials are selected for use because they possess desirable properties and characteristics.](#)

[3.5.K-2.X Develop a plan in order to complete a task.](#)

[3.5.K-2.Z Illustrate how systems have parts or components that work together to accomplish a goal](#)

[3.5.K-2.AA Demonstrate that creating can be done by anyone](#)

[3.5.K-2.CC Discuss the roles of scientists, engineers, technologists, and others who work with technology.](#)

[3.5.K-2.DD Collaborate effectively as a member of a team.](#)

3. This would be the first engineering challenge to which students are exposed. Therefore, it is important to teach essential procedural knowledge within the challenge. The 4D engineering process is the overarching procedural knowledge. In addition, it is crucial to teach students the procedures used to test materials, record and analyze data. This procedural knowledge will have to be repeatedly taught and modeled consistently throughout. Students will also need to learn procedural knowledge relating to sharing supplies and how to communicate and work together.

The following declarative knowledge will be taught throughout the unit:

- Living things share the environment.
- Pollution has a negative impact on the environment and living things.
- Using technology can minimize our harmful effects on land, air, and water.

Two types of problem-solving needed are trial and error and creative problem-solving. Trial and error problem-solving will be used when students are developing shapes and testing materials to create their scooper. They will have to identify which types of materials work best for the given task by trying them out in water. Students will also need to be creative when forming shapes for their collector and then turning the materials they choose into the shapes needed to perform the task.

The following objectives will be met throughout the unit.

- Explain or demonstrate why removing trash from the environment is important.
- Generate ways to remove trash from the pond.
- Explore the available materials and generate ideas for how they might be used to solve the problem.
- Explain or demonstrate how changing the shape of a trash collector impacts how well it can pick up trash.
- Test materials to determine which will function well in the water.
- Plan a trash collector by applying their knowledge of materials and how to manipulate them.
- Evaluate their trash collector based on how well it works to pick up trash from water.
- Change their trash collector based on the results of their tests.
- Reflect on why removing trash from the environment is important.
- Reflect on ways to remove trash and apply that understanding to a similar problem.

4. Students will be participating in many hands-on exploratory activities.
 - To investigate different shapes, students will be shown different “scoop” technologies and discuss why they make good scoopers. Then students will use paper and tape to create a scooper. They will test their scooper with fake trash and identify why their scooper works or doesn’t work and how they could make changes.
 - In order to investigate different materials, students will test the materials out in pie pans of water. They will decide which materials might be best for their scooper and/or how to change some of the materials.
 - Students will then need to create a design showing the shape and materials to be used for their collector.
 - Then students will test and identify what works and what didn’t. Then students will have the opportunity to improve their collectors.

5. So far, the activities we have completed have worked very well. The timing of the activities has just taken longer than expected.