



Community Problem-Solving

Shared by: Kathryn Durkee (science), Don Barnes (Art) and Susan Wood (Language Arts)
Albemarle County Public Schools, Ablemarle, VA

Specialized tools/technology used:	Experience level required:
Online research, recycled materials, 3D printer, laser cutter, Arduino, solar panels & associated equipment	varies - feasible for all levels

Grade Level (of this example): 6, 7, 8

Time: 2-3 hours/week, 9 weeks = 18-27 hrs

Content Areas (of this example): Science, Art, ELA - see detailed Project Work Details below for standards used in the original project.

Project Summary

Student teams researched and selected a problem in their community, then designed and tested their solution. Teams participated in our Science Expo to share their projects, write-ups, and results during a poster session. Students researched groups they would like to invite such as the Department of Transportation, Department of Environmental Quality and Water Conservation Society. We also invited the local high school, all staff and admin, Instructional Coaches, School Board and local businesses that would benefit from hearing about their projects.



Ms. Durkee's Science
@TheScienceQuo

Authentic audience for the win!!
[#publiceducationfoundation](#)
[@ecyberchallenge](#)



Project Work Details

Time and experience

Students worked on projects approximately 2-3 hours per week for 9 weeks. Students' prior experience varied and organically determined the rigor of their selected project.

Engineering Design Process used by students

The project work was scaffolded and broken into steps:

1. Select a Topic
2. Identify a Problem and write a problem statement
3. Research the Problem using at least 10 properly cited sources
4. Brainstorm, analyze and identify the criteria and constraints for your design
5. Plan your rough designs, meet with group, select best components of all designs and combine into one plan
6. Build a prototype – first out of paper or cardboard, then final



7. Test the prototype
8. Construct a Conclusion
9. Identify the benefit to the community and describe next steps for further research/experimentation and how you have or how you could implement your solution in the future.
10. Students submit a write up with details on all steps of the project along with pictures of the process.

Team Organization

In the beginning, each member of the team worked on all of the sections together. As the teams advanced through the project, they began to delegate certain tasks to students based on their strengths and interests.

Project Examples

Team name: Filters for Friends

Our team is very concerned about the number of homeless people in the Charlottesville-Albemarle area and we are especially worried that they might not have readily available drinking water. We designed a portable water filter that can be used to easily filter out particles from river water. Once the particles are removed, the water can be sterilized with tablets and will be safe to drink. We are planning on distributing these to the homeless in our area so that they will always have water to drink even if they are unable to find another potable source.



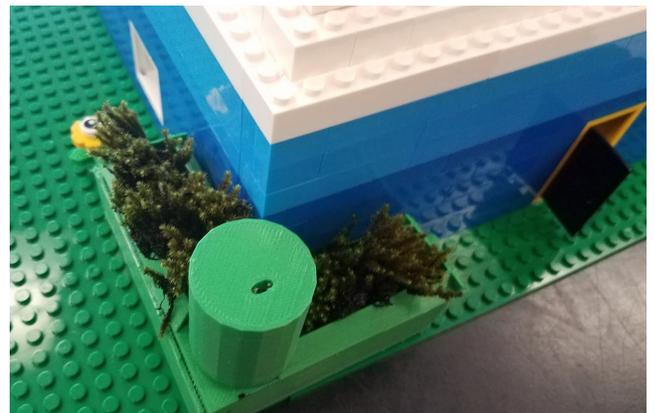
Team name: Water Squad

As an alert system, we coded a shower timer with a buzzer and LED light using Arduino to remind those who are showering to conserve water. We created this because teens our age take long showers and this wastes water. Our shower timer will be fun for people to use and will encourage users to take shorter showers and help conserve our limited resource.



Team name: Where is the water

In an effort to conserve our natural water resource, we designed a unique water barrel in hopes that more people will want to use it and collect rainwater. Our barrel is unique because it is shaped to fit flush around the corner of a house resulting in less space used by traditional rain barrels. In addition, our rain barrel has flower planters on the top which give homeowners the option to blend the barrel into their landscaping.



Team name: The Super Group

We created a storm drain filter that will remove oil from roadway runoff before it reaches the Rivanna River. Stormwater is not treated before it reaches our waterways. Filtering out and removing harmful oil from road runoff before it reaches our streams, will result in a positive effect on the ecosystems in the Charlottesville area. We recommend putting the filters in high traffic areas to manage the higher volumes of oil typically generated at those sites.

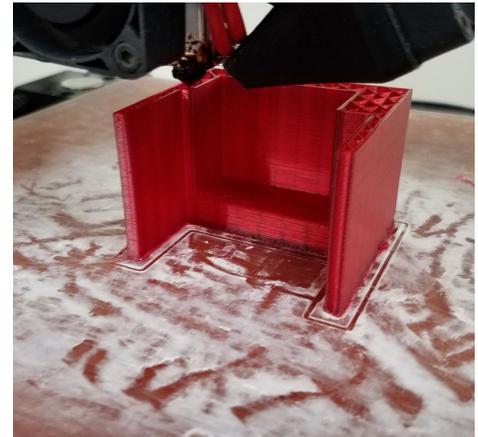


Team name: Weather Kids

We designed a mini retention pond that will be placed in the ground underneath rain gutter downspouts of houses. There are many new housing developments in the Charlottesville-Albemarle area which creates more impermeable surfaces and less areas for water to filter into the ground resulting in more runoff. The mini retention ponds reduce runoff and increase the amount of rainwater that percolates into the ground, replenishing local wells and aquifers and providing people with more usable fresh water.

Team name: Team Solar

We built a solar powered cell phone charging station for the playground at our school. This will benefit the people at Community Public Charter School and Murray High School by providing a place to charge their phones while they are at recess. It will also reduce the amount of electricity needed to charge the devices. Our design could also be used at other schools or on the mall in downtown Charlottesville.



Team name: Team Filter

We have made a filter for storm drains that will remove oil from the runoff. It is designed to let the water through but not the oil. Doing this in multiple storm drains will reduce the amount of oil reaching our watershed. We created our design so the filter can be changed periodically.



Content standards targeted in original project

Specific content varies depending on the project. Overall content includes but is not limited to:

Science Content	
Virginia Standards	Next Generation Science Standards
<p>The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"> a) models and simulations are constructed and used to illustrate and explain phenomena; b) sources of experimental error are identified; c) dependent variables, independent variables, and constants are identified; d) variables are controlled to test hypotheses, and trials are repeated; e) data are organized, interpreted, and used to make predictions; 	
<p>The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"> f) models and simulations are constructed and used to illustrate and explain phenomena; g) sources of experimental error are identified; h) dependent variables, independent variables, and constants are identified; i) variables are controlled to test hypotheses, and trials are repeated; j) data are organized, interpreted, and used to make predictions; 	



<p>The student will investigate and understand the relationships between ecosystem dynamics and human activity.</p>	
<p>The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include dependence on freshwater resources and the effects of human usage on water quality.</p>	

<p align="center">Language Arts Content</p>	
<p align="center">Virginia Standards</p>	<p align="center">Common Core ELA</p>
<p>The student will use a variety of graphic organizers, including sentence diagrams, to analyze and improve sentence formation and paragraph structure.</p> <ul style="list-style-type: none"> a) Use and punctuate correctly varied sentence structures to include conjunctions and transition words b) Choose the correct case and number for pronouns in prepositional phrases with compound objects c) Maintain consistent verb tense across paragraphs d) Use quotation marks with dialogue and direct quotations e) Use correct spelling for frequently used words. 	
<p>The student will apply knowledge of appropriate reference materials to produce a research product.</p> <ul style="list-style-type: none"> a) Collect and synthesize information from multiple sources including online, print and media. b) Evaluate the validity and authenticity of texts. 	



<ul style="list-style-type: none"> c) Use technology as a tool to research, organize, evaluate, and communicate information. d) Make sense of information gathered from diverse sources by identifying misconceptions, main and supporting ideas, conflicting information, point of view or bias. e) Cite primary and secondary sources using Modern Language Association (MLA) f) Publish findings and respond to feedback. g) Define the meaning and consequences of plagiarism and follow ethical and legal guidelines for gathering and using information. 	
<p>The student will write in a variety of forms, including narration, exposition, persuasion, and informational.</p> <ul style="list-style-type: none"> a) Identify intended audience. b) Use prewriting strategies to generate and organize ideas. c) Organize details to elaborate the central idea and provide unity. d) Select specific vocabulary and information for audience and purpose. e) Revise writing for clarity of content, word choice, sentence variety, and transitions among paragraphs. f) Use computer technology to plan, draft, revise, edit, and publish writing. 	

Art Content	
Virginia Standards	National Standards



<p>The student will plan for and reflect on the art-making process, using a sketchbook/journal.</p>	
<p>The student will refine media techniques to demonstrate craftsmanship.</p>	
<p>The student will use ideas, concepts, and prior knowledge to solve art-making problems and create works of art.</p>	