
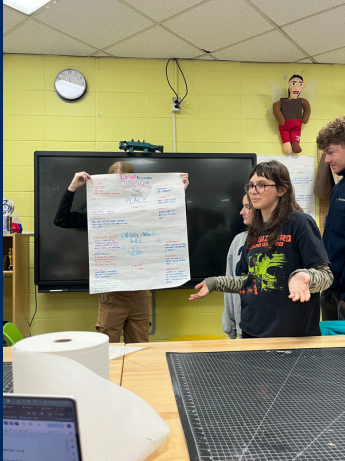

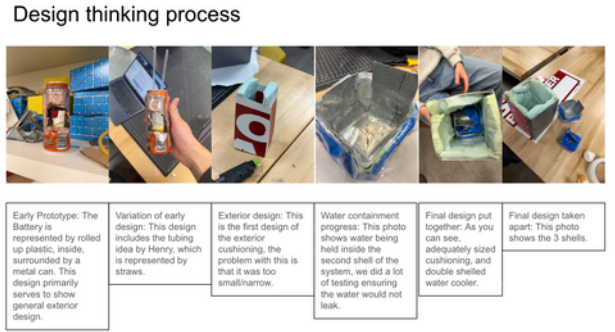


Xplorlabs Educator Fellowship - Learning Experience

As a class, we used Xplorlabs to research Thermal Runaway and the Extraction to E-waste journey. We frequently used the “jigsaw” method of learning to do short readings and presentations, guaranteeing that every student had their own important part to play in the larger scheme of learning. Students were highly engaged through the final “capstone” project, which involved prototyping a solution to a problem that we identified as a class, and conducting experiments to refine that prototype using real data. Students had a lot of agency throughout the project, and most felt a sense of pride and ownership that led to creative, original ideas and positive outcomes.

	Engage	Explore	Explore/Explain	Elaborate
Visual of Experiences				 <p>Design thinking process</p> <p>Early Prototype: The Battery is represented by rolled up plastic, inside, surrounded by a metal can. This design primarily serves to show general exterior design.</p> <p>Variation of early design: This design includes the sliding idea by Henry, which is represented by straws.</p> <p>Exterior design: This is the first design of the exterior cushioning, the problem with this is that it was too small/narrow.</p> <p>Water containment progress: This photo shows water being held inside the second shell of the system, we did a lot of testing ensuring the water would not leak.</p> <p>Final design put together: As you can see, adequately sized cushioning, and double shelled water cooler.</p> <p>Final design taken apart: This photo shows the 2 shells.</p>
NGSS				
Time	4 weeks	70 minutes or 2 class periods	2-3 weeks	10 minutes per group
Anticipated Outcomes	<p>Students research Thermal Runaway and Extraction to E-Waste using Xplorlabs materials. They learn:</p> <ul style="list-style-type: none"> • Products that they have which use a Li+ battery • Common dangers of Li+ batteries (fires in planes, e-bike explosions, e-waste, etc) • How safety scientists test batteries (drop test, crush test, blunted nail test) • Where the resources in Li+ batteries come from (rock lab) • The environmental problems with open pit mining (cookie mining lab) <p>Students also jigsaw readings on Li+ battery history and benefits.</p>	<p>After a month of researching and hands-on activities using Xplorlabs content, review Li+ batteries and their benefits/tradeoffs. Using what we've learned about resource extraction to e-waste and thermal runaway, identify the benefits about Li+ batteries that we want to leverage, as well as the problems that we want to solve.</p> <p>Students pitch two “big idea” solutions to a small group and provide feedback for each other. Then, they evaluate the ideas and refine them.</p> <p>Small groups pitch their favorite ideas to the whole class using a persuasive and informative poster.</p>	<p>Students prototype a solution to a problem that they identified and pitched. Students experiment with different materials and build battery enclosures optimized for strength or thermal efficiency, conducting experiments and using the data from those experiments to refine their prototypes.</p> <p>Students learn how to design experiments through design thinking battery enclosure lab.</p>	<p>Students present on their findings and prototypes. They include the problem and a problem statement that they worked on throughout their research, and how their object or system meets that specific need. Objects have digitally designed models and/or physical models based on research and testing.</p> <p>Students who designed systems reach out to school communities and work together to develop real plans for battery recycling.</p> <p>Class provides feedback and questions as part of engagement.</p>
Supporting Documents	<p>CNN plane fire article</p> <p>CNN article response questions</p> <p>Thermal Runaway Xplorlabs pathway</p> <p>Rock lab handout</p> <p>Extraction to E-waste Xplorlabs pathway</p> <p>Extraction to E-waste research doc</p>	<p>Creating a Pitch worksheet</p> <p>Evaluating Ideas slideshow/activity</p>	<p>Thermal runaway engineering design challenge</p>	<p>Project rubric example- structural integrity</p> <p>Project rubric example- environmental law</p>