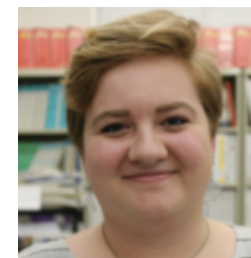




## UTeach Maker - Showcase Lesson Overview Hannah Spock (Spring 2017)



Lesson Title	Designing a Water Museum
UTeach Maker	Hannah Spock
Name of collaborator/s	Jessica Buxton (cooperating teacher), Alex Morrison (museum design strategy ideas)
Subject and grade level	10th Grade Chemistry
<b>Link to lesson plan and materials</b>	<a href="https://sites.google.com/view/livelongandmake/maker-ed/lessons">https://sites.google.com/view/livelongandmake/maker-ed/lessons</a>

### Lesson Description:

Students are presented with the following scenario:

"You are working as an independent museum professional and have been contracted by the Thinkery to design a series of exhibits about water and its properties. You must use your knowledge about water - its structure, its polarity, its properties - to design an *interactive* exhibit which is aimed to get middle school girls excited about water chemistry. This exhibit should require interaction from the visitors, and will be accompanied by a plaque which describes the property and its implications on the environment."

Students were given about an hour to study their assigned water property and then plan and design an interactive demonstration or model with a plaque that explains any observations in words. See the brief project rubric for a full description at [https://docs.google.com/document/d/1nBSqDmW2UmzQxeEpkzx92HZ\\_04d12LbcfpDGahTA5Bg/edit?usp=sharing](https://docs.google.com/document/d/1nBSqDmW2UmzQxeEpkzx92HZ_04d12LbcfpDGahTA5Bg/edit?usp=sharing).

The lesson went very quickly, but for how little time we had, the lesson went really well - students produced great projects and learned a lot about each others' properties, how the work, and their significance.

### Lesson Development:

I began planning independently to try to come up with a way for students to teach each other water properties. When I began to work on the rubric, I realized that the project could be framed as a museum exhibit and contacted Alex Morrison (who works to design exhibits for museums) for advice on how to set clear expectations on the meaning of an "interactive" museum exhibit. She helped steer me towards the EDGE design principles which were used to provide additional guidelines for creating a product. Then I worked with my mentor

teacher to develop the materials for the lesson, including the property information sheets and notes sheet. We also worked together to refine the timing and instructions using the powerpoint slides.

### **Lesson Implementation:**

This project was implemented with primarily 10th grade students in a Pre-AP Chemistry class at Crockett HS. All classes have students of a very wide range of ability levels, and each class has several ELLs and students with IEPs. The students are not used to particularly complex projects or high-level inquiry, and require a lot of scaffolding to ensure success on an open-ended assignment like this. I have used several "jigsaw" style activities, where each group is responsible for presenting information to the rest of the class, and these activities have had varied success, so I was a bit concerned that some of the properties might not be demonstrated well without well-planned support on my part. A significant percent of the students are often unengaged or uninterested in class, and struggle with managing their phone use, so it was quite exciting to see the entire class get engaged and motivated to work on their projects and delegate work efficiently in order to complete all the requirements quickly.

### **Connection to important concepts and skills within the discipline and/or across subject areas:**

Students were already familiar with the molecular structure of water after learning VSEPR theory. This project followed a lesson where students worked with magnetic water molecules to review the structure of water, and explore its polarity. They used observations to summarize water's interactions with other water molecules (cohesion) via hydrogen bonding, water's interactions with polar and ionic compounds (adhesion), and water's interactions with nonpolar compounds. Their knowledge of the molecular behavior of water was required for the project, as they had to use polarity to explain how hydrogen bonding was the cause of their given water property. Their knowledge of water properties from this unit will continue to be applied as they explore solutions, dilutions, rates of dissolution, and levels of saturation in the following unit.

### **Reflection:**

#### **What Went Well**

I was quite proud of the fact that students were modeling their tangible, usable exhibit demonstrations from real museum exhibits. I wanted the project to have an authentic anchoring experience, so students were tasked with the job of an independent museum designer and were commissioned to design museum exhibits for water properties. Groups used real, research-based industry design guidelines to support their designs, and were certainly challenged by the rigorous requirements of the final product.

I was particularly happy with the organization and accountability measures that went into this project, because it made 90 minutes feel like *almost* enough time! I was concerned that students would really struggle without adequate scaffolding, and so I provided a variety of supports which groups were free to use as they needed. Each group got an information sheet for their property, which had videos, text, and images to help them figure out what they might make, along with all the other handouts above. The trick was to try to make this information as concise as possible so it wasn't overwhelming!

Students were held accountable for their work with the group roles that they were assigned, as well as by the fact that their project was the only way that their classmates would learn the material that they chose to present. In addition, each student was able to give and receive feedback on their exhibits, as well as self-assess their work using the rubric.

To help groups finish on time, I broke up the build time into more manageable chunks, and each chunk had a checklist of items (on slides) to ensure that everyone was always working on something. Since this limited the potential for self-management, I made sure that students had lots of other creative and personal choices to make - what property they would work on, what their exhibit would be, what materials to use, how to make the plaque, and what instructions to include for their visitors.

### **Thoughts for the Next Iteration**

As per usual, the biggest opponent to this project was time. With only one class period to complete the project, there was no room left for revisions and iterations on the original museum exhibits. Ideally, students could have had at least one additional day, where they could document issues with the original version and make specific improvements to their demonstrations, models, and plaques. This would have made the project more iterative, as well as more inquiry-based, as the first round of making would more resemble a lab, where students were testing out their ideas to see if they behaved as they had predicted based on their information about the property. More time also would have meant that students could self-manage their time, a vital skill which was left out of this project.

Ideally this project could have been presented to an audience outside of the classroom. This is important for so many reasons - it adds a level of accountability to the project, it brings community members into the classroom, and allows students to take ownership of their project in a new and powerful way. In retrospect, I wish I had contacted a museum professional or two to come and provide feedback to the students. The museum exhibits also could have been used by younger students or family members, at more of an open-house style event.