More Than Meets the Eye; Accessibility of Scientific Information Through Art

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More Than Meets the Eye
Accessibility of Scientific Information Through Art

An Honors Senior Capstone Project
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As a child, I loved exploring the natural world. My wildlife-biologist mother and compost-manager father quizzed me on tree and bird names when we would hike. They would point out weather patterns and tell me why the temperature would drop right after a big rainstorm. They would show me different evergreen needles and ask me which tree they belonged to.

I loved and hated these lessons - my first education in science. I would resent how they complicated the simple beauty around me. However, I also loved uncovering the secrets. The black capped chickadees singing their name outside my living-room window had a new, more familiar identity, suddenly. I realized the power of names, of knowing what something is: familiarity. Once I knew the names of the douglas fir and cedar trees on my neighborhood street, I started noticing their identifying features. I could tell them apart.

This search for kinship by naming organisms around me was what started my journey into learning. Back then, science and art were one in the same. Making leaf prints by placing a piece of paper over a leaf and scribbling with crayon to get a perfect copy was as important as knowing that that tree was native to Oregon. Poems written about the sun shining through the shelter of differently-shaped leaves above me was science as much as it was literature. I learned to love the two together, not knowing that someday I would be told that they were separate sections of knowledge.

Since those early days of learning about the natural world through art and expression, I have almost completed my Bachelors Degree in Environmental Science. I have become well acquainted with frantic note-taking. With trying to put complicated three-dimensional biological processes into two-dimensional words. I am familiar with peer-reviewed journal articles and the complicated process of tracking down resources to put together different ideas into a scientific theory. Through this process, I have re-discovered the connection between art and science. I have found art to be a vital tool in both learning and sharing scientific information.

The accessibility of science has stood out as lacking in my educational journey. Trying to find articles that I can access without having to pay or use my student account is difficult. The dense writing in journal articles is spotted with citations that break up the flow and make it hard for the average person to understand. There are complicated graphs that even some of my professors need to consult others in the
field to understand. If I weren't paying to go to college, I would not be able to access 1/10th of the information I am learning. If I didn't have the financial and physical ability to take college courses, it is likely that I would not know how to search out in-depth information on the natural world.

I want to work towards fixing this. Information on the natural world is something more people would search out if it were more accessible. Sources that are made easier to understand and consume can reach a wider audience. This is where art can help. Artistic depictions of science can reach an audience that would normally not see the information. It can introduce people to learning about the natural world without the financial or temporal barrier of having to take classes.

As I learned when I was younger, giving a name to something makes it a part of your reality. When I knew the name for douglas firs and could identify them, I cared more about them. Naming and understanding our natural world can help us to understand how and why it is being affected by the changing climate. Reaching a wider audience with artistically depicted science can help people be interested in how humans are affecting our world. The more people that can be drawn into a love and thirst for knowledge about our planet, the more they can start to care about protecting it. More knowledge can equal more understanding of the ways in which climate change is affecting our planet.

Visually depicted science also interacts with disability. Two years ago, I sustained whiplash from a concussion that has had long-lasting effects on my way of living, both in terms of my health and academics. Because of on-going nerve compression, I have headaches, brain fog, and - most importantly for my academics - vision issues. I have had to adjust to my new vision-ability, often having a hard time reading. My eyes now tend to blur out information when I skim articles and are unable to move and re-focus quickly. This means that with dense journal articles, I often miss important information or have to take a long time to understand the contents. I use text-to-speech programs to help me read, but the frequent citations in journal articles make them extremely hard to follow using these programs.

One of the greatest forms of adaptation I have found to help myself handle academics with my visual disability is art. Both in terms of mental health and in terms of learning, art has been extremely beneficial to me these past two years. For a long time, I could not read or write for longer than ten minutes without getting extremely tired and dizzy. This made taking notes in 50 minute long classes painful and difficult. Luckily, science can be described through drawings easily. From my childhood art/science lessons with my parents, I have practiced turning my mom’s descriptions of trees and their biological functions into drawings. So, in my biology classes, I started taking notes in the form of images and labels instead of written bullet-points. I used small amounts of writing with arrows connecting it to the drawing for
explanation. Not only did this help me with my reading disability, doing this also helped me see the concepts we were learning more fully. Instead of seeing bits and pieces we learned each day, I had images that formed a more whole idea.

This was what restarted my belief in the connection of art and science. Even simple diagrams or water-colors of plants can stick in your memory and benefit your learning of a subject. In a cognitive psychology experiment, the benefit of visually learning science was tested. Both a visual and verbal explanation was applied to two STEM fields: chemistry bonding and the mechanical system of a bicycle pump. The results showed that in both STEM fields, learning with the visual representation was more effective to participants with both high and low spatial ability (Bobek, E. & Tversky, B. 2016).

This study validates what I experienced when I started taking notes in a visual format instead of just writing; I was able to understand concepts more holistically and retain them for longer. Teaching science using visual representations could therefore help many more students. In my senior project, I take advantage of this by teaching about native plants through visual representations. With my project, I want to make images that will both bring joy to people and spark their interest in the natural world. Teaching while entertaining. Accessible and fun.

I have created informative depictions of plants to share knowledge about them. I wanted to fight the accessibility issues I outlined in this statement by distributing cheaper scientific knowledge. My hope with these paintings is to help people know just a few more plants, starting their visual learning journey to become familiar with more organisms. My watercolors could be placed in a poster-form, on cards, or even on mugs and t-shirts for consumption and viewing.

My paintings are largely done in water-color on water-color paper. One is done in pen, and two are larger and done in acrylic paint. These paintings depict the water and nitrogen cycles. One of my favorite subjects in undergrad was Organic Chemistry because it was so visual. I loved the level of understanding I gained when drawing molecular bonding and reactions. These two paintings are my treat to put these molecules in art.

My inspirations for these paintings come from a variety of places. Some, like my two acrylic paintings, are because of my love of drawing molecules. My series of watercolors were inspired by a class I took with Professor Jennifer Hahn called Wild Foods. In this course, we had a sketch due weekly of a plant. The requirements for the sketch were wide-open, allowing students to be creative in how they wanted to depict their plant of the week. Having this freedom to focus on the details of the plant, made me more inclined to research it. I loved learning about a new plant’s habitat each week. And learning about new
plants weekly made me so much more aware of them in nature around me. I gained the ability to recognise and acknowledge so many more plants but simply being observant, drawing them, and learning their names.

I want to take the ideas I learned while doing this project and apply them to my future life. In terms of my own academics, I will certainly continue to conceptualize scientific concepts through art. I also want to help others learn this way. I will do this through sharing my own art through online selling platforms like Etsy. I will also do this in my work with children. By pursuing research in Oceanography I want to find ways to teach science. I want to combine my research with being an educator. Teaching young children has been a part of my life for years, and, with my passion for accessibility of information, I can open up learning visually to others.
For these watercolors I focused on their habitat and region. They were inspired by my interest in the native plants that I grew up around. Lupin is an example of art helping to remember plants. I had a picture book when I was a child where a woman scatters lupin flowers by the coast, and I have always remembered and been able to identify Lupin because of those pictures.
I focused on the history of these plants while painting them. Camas especially has a long, important history in the Willamette Valley, where I grew up. This is Camassia Quamash, the most common type of camas plant in the valley. It was very important to the Kalapuya people whose land spans the valley region. The camas bulbs were used in trade as well as an important food source. They were often cooked in earthen pits lined with douglas fir boughs. With low temperature and a long cooking time, the bulbs become a sweet food.
I focused on fun details for these two paintings. The California Poppy is actually done in pen instead of watercolor, and I researched medicinal uses for the plant. Dandelions are my favorite invasive weed in the pacific northwest because it is a good food source. They should only be collected when they are far away from a road and cars. The roots can be baked and made into tea. The leaves have more nutritional value than kale, and the bitter taste can be removed by blanching them. The name for dandelions in different
languages is often directly translated to “lion's tooth” because the leaves look like teeth and the flower looks like a lion's mane. The languages I have listed are Spanish, German, French, and Japanese.
The Water Cycle - acrylic painting on canvas
Water vapor plays a key role in Earth’s energy balance and is a dominant greenhouse gas. This makes the water cycle a vital part of study for climate change. The water cycle is largely temperature controlled, so as our climate warms, it will be affected. Due to the climate feedback system, wet areas on earth will become wetter and dry areas will become dryer (Zhang, W., et al. 2019). My goal with this painting is to get people thinking about where our water comes from and how this could be changing.
The Nitrogen Cycle - acrylic painting on canvas
Nitrogen is the most limiting nutrient in most soils, therefore it controls the growth rate of a lot of crops. The nitrogen cycle is hugely impacted by humans through the use of fertilizers in big agriculture. These fertilizers add large amounts of excess nitrogen to the soil. This increases emissions of nitrous oxide, which is a greenhouse gas and contributes to climate change (Fagodiya, R. K. et al. 2017). My goal with this painting is to get people thinking about how nitrogen affects the plants around them. I want the visual of the interchange between gaseous forms of nitrogen and the nitrogen in our soil to show people that what we put into the soil has an effect on our atmosphere.
References


