Ocean Literacy

Essential Principles and Fundamental Concepts

I teach in the Makerspace at my school, seeing grades 1-5. I also work with seventh graders. I support homeroom teachers during their PBL units, helping the students understand content, how to use that content knowledge to develop solutions, prototypes, or whatever else the teacher needs. Most of my students are Asian(⅔), the remainder are white and mixed, with just a few LatinX students, as well. We are located on the peninsula between the Pacific and the San Francisco Bay.

We try to weave in ocean literacy by studying Leatherback sea turtles throughout several grade levels, and we also partner with the Leatherback Trust, sending around 100 sixth graders to work with them every spring in Costa Rica. The sixth graders bring prototype ideas created and developed by second graders during their PBL. In Kindergarten we have what is called “Turtle Camp” where fourth graders teach them about Leatherbacks. The students have changed our area by getting enough signatures to get plastic straws banned, one of the plastics affecting the species.

I see teaching all seven of the principles and concepts since I work with most of the grade levels at our schools and I also teach science and social studies for some teachers or grades. With the knowledge gained through studying the brochure and its tenets, my students will be able to more effectively build deeper learning and understandings that will in turn, give them the ability to create better prototypes, products, or laws that could possibly change the course of this species’ decline. I would like for all grade levels to get a chance to work in and around the ocean and bay, to put their theories into testable scenarios that will build their schema for future learning and possibly lead to future jobs that work in protecting species from humans.

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Essential Principles and Fundamental Concepts

Principle 1: Earth has one big ocean with many features

I would use this principle in grades Kindergarten through second, for covering their science and social studies standards. I think we need to teach them more than just ocean and landmass names, earlier. The earlier we teach map skills and that the winds created by the rotation of Earth, as well as, the land masses create the weather we encounter or endure, at times. This is a great place to begin teaching about the water cycle, which will also teach them that some things occur in cyclic forms. This first principle also allows studies and comparisons of fresh and saltwater. What young kid doesn't like to play with water? Teaching students to identify differences, by testing and observing, allows them to make and develop theories based upon facts that are tangible and real to them. Introducing interactive science notebooks for data collection could also be introduced at this level to begin developing their organizational skills and to make connections within their learning.

For the older students, many science standards, from erosion/sedimentation, waves, to weather and habitats created by features under the waterline, could be covered more in depth to find underlying cause and effect relationships. I would modify or use the ACES lessons on Bathymetry to elementary levels when possible to teach them that there are landforms under the oceans, as well as, on the land.

Principle 2: The ocean and life in the ocean shape the features of Earth

I would use this principle in second and fourth grades, based on the standards covering erosion and deposition and how plate tectonics create landforms. The study of fossils and prehistoric life is always an interest with students. Again *cycles* could be covered while learning how rocks, minerals, and fossils form and create changes in land

formations over time, as well as, the water cycle and how it can change land and water features through the processes of weathering and deposition.

Principle 3: The ocean is a major influence on weather and climate

Weather is a big science standard for third grade, so I would really focus on this principle to aid in their understanding. This understanding how water temperatures, land masses, and winds create the weather and climate of any area, based on the water cycle, will also aid in their math understandings and practices from reading scales, graphs, or data tables while gaining new scientific knowledge during their research.

I can see it used in fifth grade, as well, during their “Earth’s Spheres” PBL. This principle will help them see the connections between Earth, its ocean, and the atmosphere we rely on. They will also study the carbon cycle and how it pertains to life on Earth and this new type of energy transfer, other than when the fourth graders study wave energy and the differences in potential and kinetic energies. The more often the students interact with cycles, the more they will be able to connect to new knowledge that may be cyclical, as well.

Principle 4: The ocean made Earth habitable

In the earlier grades this principle is key to understanding the things that make life possible. Most students will say we get our air from trees and other plants through photosynthesis. To me, this would be the perfect time to blow their minds with learning that most of our oxygen is produced in the ocean, this opens their minds to many new possibilities. Learning how life began as single-celled organisms, then evolving to humans and every creature in between is crucial to understanding how animals and

plants come from and rely on the same basic elements and practices:food/water and safety/shelter.

Principle 5: The ocean supports a great diversity of life and ecosystems

The ACES lessons on ecosystems and various animal studies are so well crafted for teaching research skills and working in teams. I would definitely use them for sixth grade when they study biodiversity. I would create a year-long unit taking the needed time to go through each of the lessons, ensuring their math and map reading skills are included and interwoven. I think the students would love the interactive Analysis Journals. Not only do these lessons teach research, but they also require the students to really think about the data they find to develop their own understandings that will help them come to the conclusions that will be based on theories they created. I also think this unit could spark interests in careers that study and protect the ocean or a particular organism, after the animal tracking and ecosystem studies. This could be a real possibility, being in the bay area/Silicon Valley. Our kids talk about sensors and robotics daily. Hopefully, new solutions will be developed in efforts to protect sea life and the viability of the ocean and wetlands... for our survival, since we are the ones constantly creating the problems that could be our own demise.

Principle 6: The ocean and humans are inextricably interconnected

In my opinion, principle 6 should be taught in every grade level. This is key to our survival. How ironic is it that we are destroying where life began...we are slowly edging to the possibility of wiping out our species. The *Expert Teams* lessons in ACES really show the learner how things we do, our unbridled practices, have an effect not only on

the shoreline, but in the deep oceans, and on all of the animals that depend on certain processes or specialized environments to survive. The amount of carbon in our atmosphere that is heating up our oceans is changing how the processes that have sustained life for millenia are behaving, and is having a negative effect on many organisms and ecosystems, so we must act fast! As we develop more of the world, we need to create less impact and develop strategies for maintaining, protecting, and living in a more eco-friendly to an eco-blended style of building, thus creating less stress on the amount of natural and available resources needed to be replenished. The amount of plastic in our food web is not only scary, it could be one of our biggest mistakes yet. My students, after a year-long unit or class theme, will push and fight for the needed changes in laws that will protect our marine world which will in turn save the entire world... they love a good debate and have done so on world stages in the past, so I imagine, as they gain more knowledge and passion, they will do so in the future. I am thankful for being so close to the ocean and having so many marine ecosystems for the students to study, lighting their fires for change and a better world. I could see them creating a club as a way to begin their eco-savior journeys, going to the bay or ocean on the weekends to build their ROV and exploration skills, which then leads to the last principle.

Principle 7: The ocean is largely unexplored

Before Covid-19, I had sixth graders building underwater ROVs for studying features and creatures around the bay. I also work with seventh graders three times a year on a 3 week Engineering and Design Project. In middle school, they are all cryptozoologists, based on creatures they read about or occur in their video games. The

deep oceans have such other-worldly looking animals, I could see them loving studying the deep. In the future, since most of the ocean has not been explored(or exploited), many new jobs could possibly be created. These new jobs will need students of ecological ethics to guide the practices used to create machinery that will allow our exploration of the most unexplored and largest part of Earth. The use of ROV building in teams to explore and develop various types of models required or needed for various locations or needs within that location will develop my students' 21st Century Skills and ensure that they are ready to go out and create a better world for all creatures, big and small.