Investigating Earth's Spheres

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Introduction

I have been teaching Earth Science for seven of my eight years as a teacher. My science background followed a Biology track and thus my Earth Science background is very minimal only being composed of one high school class and one college class. When you work in a small school district we all pick up the missing parts to make our school a great place to be. When I took over the Earth Science class there was not a curriculum in place and I was just handed a textbook and basically told, good luck. Following the order of textbook chapter I have found my way to the current progression of teaching my Earth Science classes.

Earth's Individual Spheres

Earth is comprised of four spheres: Lithosphere, Hydrosphere, Atmosphere and Biosphere, where each of these have so much teachable material that they can be taught as an individual specialized class. In high school Earth Science my goal is to teach the basics of all of the spheres to help students find their interest for their future lives. Even if my student's future is not in a science field I feel everyone should have this basic knowledge of Earth Science for life skills, current events, and political topics. These future basic science life skills can include gardening, travel, national parks formations, weather patterns, water issues, understanding earthquakes and other natural disasters, and voting on local fracking or wildlife re-introductions programs.

I feel it is important to teach each of Earth's sphere as individual science topics before linking Earth's sphere together as one unit. In order to understand the complexity of Earth's sphere working together, one should first learn how each of the sphere work individually. In my Earth Science class I start the year with teaching the lithosphere, followed by the hydrosphere,

then the atmosphere, and the biosphere is taught a little within each of the other spheres. Class is started with the lithosphere learning about “The Development of Earth” followed by the “Geologic Time Scale”, “Continental Drift”, and the “Rock Cycle”. Class then transitions to studying the hydrosphere with “Ocean Water” and “Ocean Environments”. Within each of these chapters the biosphere is discussed with what life on Earth is involved in each of the specific chapters. By teaching each sphere as an individual topic this has increased my own conceptual understanding about each of Earth’s spheres. Because I have this deep understanding, students are able to ask off lecture questions and we can have great in-depth discussions. We commonly discuss TicTok or Instagram videos and if the information presented is fact or fake. I feel these off lecture discussions are what make my classes’ fun, interesting, and where the students learn the most.

My Past Teaching of the Spheres

I personal have not specifically taught the interconnection of these spheres to my Earth Science students. In my past teachings I’ve talked about the concepts of Earth’s continents and the effects on ocean currents and weather patterns but I have never specifically stated how the lithosphere is connected to the hydrosphere and the atmosphere along with the connectiveness of the biosphere. I have always understood that Earth’s spheres do not exist in isolation but now I understand the importance of teaching this connection as it deepens the students understanding of how Earth systems work together to give us this amazing place to live. Using the Eyes on Earth approach provides a real world databases that are interesting and capture the student’s attention compared to my past teaching of using just textbook material. Another concept that I did not understand until recently is that if a student can explain something in their own words then, that is how you know the student really does understand the concept.

Student Struggles

In the past my students have struggled most with learning the atmosphere. I think with the other spheres there are conceptual ideas that the students can grasp and understand easier. In the lithosphere students can see actual continents and understand earthquakes and tectonic movements. We do a lab that uses the continental drift hypothesis evidence to create Pangea, then move the continents to their current day locations, and conclude by discussing continued movements to the potential future supercontinent Amasia. In the hydrosphere we study Disney's movie "Finding Nemo" and mapping the ocean currents that were used in the movie. The students really enjoy learning that a lot of Disney is based on real science as Marlin and Dory travel the real EAC (East Australian Current) with Crush and the other sea turtles. I do not find students struggling with the Biosphere as most students have traveled between Colorado and Mexico and they see the difference of creatures and plants in these different environments. Within these sphere lessons my classes have had a lot of hands on labs for the explanation of the concepts found in the spheres. These labs allow there to be no language barrier for the observations that happen. To continue to improve my teachings I need to ask more open ended questions that would allow the students to answer and explain what they are observing in their own words.

This brings us back to the Atmosphere, being the sphere that my students struggle with and also the sphere that I struggle with the most. I feel a lot of my student struggles stem from my struggles with this sphere and my lack of in-depth teaching knowledge. Thus I think the atmosphere will benefit the most with teaching the spheres interconnectivity to each of the other spheres.

As my students struggle with the atmosphere we can tie in material from the websites Survivor: Earth in 10 Lessons (*"Survivor: Earth" Lesson Plan Series | Precipitation Education*, 2024) and Connect the Spheres: Earth Systems Interactions (*Connect the Spheres: Earth Systems Interactions | Precipitation Education*, n.d.) where we can specifically look at water as it travels in each of the spheres. This would help students to visualize how one element can be present in all of the spheres and how that one element can manipulate and change the sphere as it interacts within that sphere and other spheres.

NASA Material

For students to be able to make a connection between the different spheres they will need real world data resources that show the big picture. The approach learned from this class: Eyes on Earth and pairing NASA resources are a great way to show this big picture of how the four sphere interact and are connected. Students can begin by using My NASA Data website (*Earth System Data Explorer*, n.d.) to pick and choose different sphere data and see historically what can change when spheres have different conditions throughout the year. These different conditions can then be compared between different years.

As a future final "Sphere" project, students can pick between a list of events for analysis of sphere interconnectedness from the website Teacher PSA Sphere Interactions (*PROBLEM SOLVING ACTIVITY: HOW DO EARTH'S SPHERES INTERACT?*, n.d.). Students will pick from an event and they will need to describe the main sphere being affected and then describe how the other spheres are affected from the initial event. Students will use these events to show other classmates that all of Earth's spheres are connected.

References

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