Investigating Earth's Spheres

Teaching the Earth Spheres Separately

More than likely in your personal science education, when you were going over the Earth Spheres, your teacher split them up into the following: Lithosphere, Hydrosphere, Biosphere, and Atmosphere. As a class, you learned about all the spheres as separate units and were tested over specific characteristics of each individual sphere. What I just described is what the science community now would refer to as the "traditional method" of teaching the spheres. Although, please note, that the "traditional method" of teaching the spheres is not seen as "bad". As, students gain much needed knowledge about each sphere individually. However, there lies the main issue, "individually". We do not live in a world that functions from multiple individual parts, but the method of teaching used implies this to our students.

For example, if a teacher approaches the spheres and decides to cover the hydrosphere and lithosphere as different units, this could affect students' understanding of how they truly interact with one another. With this "traditional method" students would learn all about the hydrosphere and lithosphere separately, however, they would miss how they interact in the real-world. Such as how water, through run-offs or groundwater, can create new physical features in the lithosphere. Then, how the lithosphere plays a role in naturally purifying the water created through the hydrosphere. Thus, the "traditional method" of teaching the spheres does a good job creating a backbone to work with, however for students to truly learn about the planet they live on they must learn how these spheres interact.

Eves on Earth Approach to Teaching the Spheres

During this course, a new approach to teaching Earth's sphere was introduced. This new teaching method closely a line with the Next Generation Science Standards (NGSS). According to the NGSS Standards (2020), "A high-quality science education means that students will develop an in-depth understanding of content and develop key skills—communication, collaboration, inquiry, problem solving, and flexibility—that will serve them throughout their educational and professional lives". Thus, this is what the Eyes on Earth course is striving to achieve pertaining to teaching the Earth's spheres. During the course, the focus was to design and implement engaging lessons for students to bridge connections from one sphere to another. Encouraging students to view the Earth's spheres as a web of interactions and cause/affect situations. Therefore, implementing something called Earth Systems Science, according to NASA (2009), Earth system science (ESS) is the study of cycles and interactions among the various components, or spheres, of Earth - lithosphere (land), atmosphere (air), hydrosphere (water), and biosphere (life) - and how an event in one sphere can impact the others.

For example, one of the NGSS high school standards are as follows: HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Using this approach from this course; I developed a lesson that allowed students to look at impactful human activities, researched the effect of the activities on two or more Earth spheres, developed a solution for said problem, and create a commercial that provided research and data on why we should make changes to our way of life. This allowed students to see the cause and effect of all actions made on Earth, thus broadening their understanding of how the spheres interact with one another.

Overall, this course took the good parts of the "traditional teaching" of Earth Spheres and extended it to be applied to real-world situations and applications. Again, the "traditional teaching" method does a wonderful job providing a backbone of knowledge of Earth's spheres; however, the Eyes on Earth approach takes that and creates a map of knowledge for students to see the connections all around our planet. As I was engaging through the course, I really enjoyed the introduction to so many resources to develop more data driven and engaging lesson. If I could suggest one thing, however, it would be that the course would provide a few exemplary examples of engaging 5E lessons. This would help participants see what aspects make a great data drive and engaging lesson.

Challenges for Students with Earth's Spheres

One main challenge for students when being taught using the Eyes on Earth approach, is the fact that most older students are used to learning about the spheres individually. Thus, when introduced to this new way of thinking about the world, some students are reluctant to process the world in that way. For example, when my students completed the lesson mentioned above, several students were frustrated that they had to describe how two or more spheres were affected and react. Although students were able to do this, it required more thinking than previous courses. Thus, to help to solve these reluctant attitudes toward problem solving and in-depth knowledge, students need to be exposed to that on a frequent basis. In my classroom, I strive to incorporate one or two problem-based or project-based lessons per month. This allows my students to develop more problem-solving skills and develop more in-depth knowledge of the content.

NASA Material to Teach the Spheres

During this course, several useful resources have been exposed that makes teaching the Earth Spheres more real-world focused and engaging for the students. NASA has multiple different websites that include real-life data, simulations, interactive activities, and articles that relate to several or all the Earth's spheres. The NASA data especially, is beneficial to developing lessons that show how the Earth's spheres relate in the real-world. Through data, students can see the cause/effect patterns that our planet has exhibited for long periods of time. For example, NASA's Global Climate Change (2020), provides updated data charts that allow students to visualize the increase of Carbon Dioxide since 2005. However, it doesn't stop there, this website also provides data over global temperatures, ice sheets, and sea level. Thus, demonstrating to students how increased Carbon Dioxide levels are affecting more than one of Earth's spheres.

As far as future resources I would like to use, NASA's Home and City (2020) interactive website, would be a great addition to my introduction unit to engineering. This website allows students to explore different materials that they use on a daily basis and how it was originally developed to benefit astronauts on space missions. This would be a great engaging factor that would allow students to see how engineering and problem-solving can be addressed in all areas of life. This website could also be used prior to having students develop solutions to problems that affect our Earth's sphere. Allowing them to see that engineered materials are all around us and that anyone can be an engineer and help provide solutions for our world. I look forward to continuing to explore the NASA resources in my spare time and through more Endeavor courses. I truly believe that this is the direction that education needs to go to develop individuals who can problem-solve the next generation of issues.

Bibliography

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