Phenomena in Our Science Classrooms

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I think, at a child’s birth, if a mother could ask a fairy godmother to endow it with the most useful gift, that gift would be curiosity. —Eleanor Roosevelt

Curiosity is one of my favorite words and a theme that guides my teaching at all times. I want my students to be curious. I want to reawaken the curiosity that school often drums out of them. As Edith Wharton said, “Beware of monotony; it’s the mother of all deadly sins.” How, as science teachers, do we ensure monotony is an unwelcome visitor to our classrooms? One answer is by having a phenomenon-driven science classroom.

The NGSS stresses phenomena and their role in our science teaching. Phenomena are those entities that are observable and can be phrased as guiding questions, such as:

- When did humans first determine we need water to survive?
- Why is there condensation on my glass during the summer?
- Do people really behave differently during a full moon?

Instead of beginning a unit of study with dry, dusty vocabulary, we must pique our students’ interests with a question. Vocabulary words make no connection if there are no guiding questions to provide context. Phenomena should be the foundation of our science teaching—a springboard for curiosity. A wonder-full question. A place for amazement.

“There are no foolish questions, and no man (sic) becomes a fool until he has stopped asking questions,” stated Charles Proteus Steinmetz, an electrical engineer responsible for the expansion of the electric power industry in the United States at the turn of the 20th century. By infusing phenomena into our science experiences, we can promote a scientifically-literate populace who are life-long learners, continuing to question the world around them. Being curious, posing questions, and being skeptical should not end at graduation, but continue on in our students’ lives.

Phenomena serve as anchors for our teaching. Think about the Engage portion of the 5E learning cycle. If you begin a unit about molecular motion with a lecture, the students soon drift away to videos on YouTube on their phones, taking Tik Tok videos of themselves, or, for the most part, being disengaged. By beginning our units or a lesson with an engaging phenomenon-based question, we enhance our chances of capturing our students’ attention; without their attention, no learning can begin.

If a phenomenon relates directly to our students’ lives, then all the better. In biology, why should students learn about mitosis if we merely begin with a definition of it, the phases, and the overall process? Sounds ho-hum, right? Teenagers are busy individuals. The teenage mind is sophisticated. Remember, they play complex video games that encourage problem solving, divergent thinking, and detailed storylines. If we only structure our classes in mundane ways, no wonder they are not engaged. Schooling should not be a linear process.

Education should not be merely about training the next generation of workers. When we pose questions like “You are fixing veggies to eat by chopping them. Oops. The knife slips and slices your index finger. Now, what? Obviously, you bandage yourself or get stitches. But what happens at the cellular level? How does healing occur?” Here
is your segue into mitosis, driven by student questions where they “uncover” the process of mitosis due to your arousing their curiosity.

When planning your phenomena-based questions, always consider the interests of your students gleaned from the beginning of the school year. Tie the phenomena to those interests so as to pull them into your unit or lesson. Keep current with their music, what they are watching on television, and with the influencers they are following. We need to shape our questions around their lives and interests. Make the questions culturally-relevant to them and to their social identities.

Have there been recent discoveries around the main idea you are wanting them to grasp? Is there a question that can address the discovery that could be embedded into the phenomenon? For instance, the question “Should chemical warfare be used and how does it work?” could be posed. This sort of question, albeit tragic, makes the world of chemistry relevant and stirs questions in our students’ minds. This question also makes school a more interdisciplinary place where social studies, biology, and chemistry come together as chemical warfare was used in both World Wars and in recently as in the 2017 Syrian civil war. The chemistry of how these classified chemicals work, such as mustard gas, make the teaching of chemistry even more engaging for us as teachers. We wonder what questions our students will pose, what their prior knowledge entails, and how they will “dig” for answers to their questions via research or other opportunities we provide for them.

Phenomena have a vital place in our science classrooms. They bring science to life in ways that heighten curiosity, encourage creative thought, and foster problem solving—all attributes that current employers are looking for in their employees. Ultimately, we want our students to thrive in our classrooms and using phenomena-based questions are a great place to start. In the words of journalist, Warren Berger, “Knowing the answers will help you in school. Knowing how to question will help your life.” Let’s shy away from an answer-based science class and move forward to a propulsive question-based one. Everyone benefits—our students, ourselves as professionals, and our society.