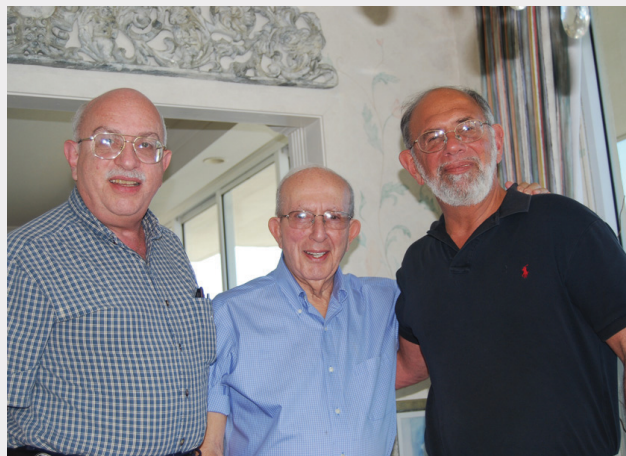


Serendipity in Science Education

Steve Weinberg



Left to right: Art Popper, sixth-grade teacher Tom Vinci, Steve Weinberg.

When my oldest friend, the soon-to-be-retired *Acoustics Today* (AT) editor, asked me to write an essay about serendipity for the magazine, I reminded him that I was not a scientist. He, in turn, told me that as a science educator, I had probably a few things to say about serendipity in my life as an educator and about science education in the United States. And, as usual, he's correct. Science education, if done well, does not shove factoid after factoid at students for regurgitation on exams, but rather science education stimulates a wonder for nature and a propensity for asking questions. But how do we get there?

I would also argue that we have failed miserably as scientists and as science educators. Why, for example, do a significant number of Americans have no faith in science? Just look at vaccine hesitancy, climate change deniers, and rejection of evolution in favor of creationism. Or take my favorite, that the moon landing was a hoax. If we as scientists and science educators did our jobs as they should be done, these all would be considered jokes for late night television. Not just science educators but practicing scientists should, and must, engage with students and the public. Science should not stop when the scholarly paper is published!

In thinking about writing an essay on serendipity in my career, I realized that I first needed to see how serendipity is defined. My old, now nearly extinct, print dictionary defines serendipity as “the unexpected occurrence of or faculty for finding valuable or agreeable things that are not sought.” My thesaurus listed “happy chance, accident, fluke, luck, good fortune, and coincidence” as some synonyms for serendipity. So, it occurred to me that we all have serendipity in our lives if we recognize it as such or not. Serendipity can be passive or active. Passive if we have no control; active if we're looking for something. If we are prepared for the serendipitous event, we have a eureka moment that I'll share below and that the other authors in this issue illustrate in their scholarly careers.

Serendipity can also be positive or negative. In fact, the inquiring mind is prepared for serendipity. Serendipity can occur in many forms. It may simply be an accident, a person being in the right place at the right (or wrong) time!

Think about when you met a friend or your spouse for the first time. What brought you to that location at that time? Was it something you did consciously or was it thrust on you? A significant serendipitous event in my life was that Art Popper and I were assigned to the same third-grade class at Public School 152 in the Inwood section of Manhattan (north of Washington Heights; at 200th street!). Little did he or I know that it would lead to a lifelong friendship and collaboration and that about 70 years later, he would ask me, a science educator, to contribute to a science magazine on acoustics.

Certainly, one of the most important cases of serendipity in both of our lives occurred in the same school. Public School 152 had six grades (no Kindergarten), and there were several sixth-grade classes. Serendipitously, Art and I were assigned to a class taught by Thomas A. Vinci. Years later, the formality gave way to a friendly “Tom” as you can see in the photo. Mr. Vinci was an amazing teacher, with a deep love of science, and science was the focus

of many lessons. In thinking back, it is clear that the enduring influence of Mr. Vinci's teaching is evident in his numerous former students who pursued careers in science, science education, or other science-related fields because of the way he made science an exciting adventure. But had Art and I not been assigned to Mr. Vinci's class, our lives (and those of many others in the class) would be very different today (and *AT* would have a different editor!).

Serendipity is personal and occurs in several arenas: science, accidental, personal, positive and negative, and perhaps several more that you can think of. In his book, *Sociology of Science: Theoretical and Empirical Investigations*, Robert K. Merton (1973) discusses the concept of serendipity as an important factor in scientific discovery. According to Merton, "serendipity refers to the unexpected discovery of something valuable or significant while in pursuit of something else."

Serendipity can occur in many aspects of life, including scientific breakthroughs and creative thought to personal relationships and daily encounters. ChatGPT told me that "serendipity emphasizes the role of chance and open-mindedness in making unexpected and positive discoveries." It can bring a sense of joy and wonder to our lives.

This joy and wonder in my life arose from my complaining at a meeting to floating weightless a few months later. A tale of serendipity in the life of an educator. How did that happen? You'll have to read this short tale from a nonscientist to find out.

The arc of my career went from being a high-school biology teacher to science department chair, to ultimately becoming the science consultant for the Connecticut Department of Education and assisting the National Aeronautics and Space Administration (NASA) in developing educational programs for the International Space Station. Along the way, I had some interesting, some would say, serendipitous, experiences.

I began my career as a biology and general science teacher in what by chance was a progressive school system in Connecticut. In the 1960s, the United States National Science Foundation funded several inquiry-oriented science programs. My first-year teaching, beginning in the fall of

1967, was also the first year my school system adopted the use of the Biological Sciences Curriculum Study (BSCS) biology program (see bscs.org/our-work/what-we-do). These programs emphasized inquiry-based learning that encouraged students to ask questions, investigate phenomena, and actively engage in scientific processes. Students were to learn through hands-on activities and exploration rather than passive reception of information. The program was training students to be prepared for serendipity.

Let me share what I think is an interesting example of serendipity that occurred when I was a school administrator. I was observing a fourth-grade teacher giving a great science lesson, asking questions, and challenging and pushing her students to explain some phenomena. (In my dotage, I forget what the lesson was about.) One young boy was really into the lesson, obviously very excited about the material. Toward the end of the lesson, the teacher handed out a worksheet for the students to summarize their thoughts. I noticed that the young man who had been excited just sat there staring at the sheet. I walked over to him, praised him for asking thoughtful questions, and asked him why he wasn't completing the worksheet. He said, "the page is blank." Clearly, it wasn't. On a whim, I took another piece of paper and wrote out the questions with a pencil. He immediately got to work. What was going on?

This was a young person who sometimes did great work; other times nothing. Many teachers (remember this is the early 1970s) used ditto sheets for students to use. The spirit duplicator, or ditto machine, copies by transferring ink from a master sheet to other sheets using alcohol-based fluid or spirit. Ditto sheets were almost always a particular shade of purple/blue. It turned out that the student was colorblind to this shade of blue. By switching to using a pencil or black ink, the student went from being a mediocre performer to being one of the top students in his class. My being in that class that day probably turned a student's life around. Serendipity! This very well may have been a known form of colorblindness. For one reason or another, we never pursued it. The internet obviously was not in our vocabulary.

As the science curriculum specialist for the Connecticut Department of Education, I had the opportunity to attend several national education conferences. At one

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conference, I attended a workshop run by NASA. To say that the workshop was “awful” would be kind. After the session, I was venting my feelings about a wasted 90 minutes to a colleague. Serendipitously, the Director of Education for NASA heard me complaining (and yes, I was embarrassed) and asked me to join him for a cup of coffee. To make a long story short, a few months later, he invited me to take a one-year leave of absence from the Department of Education and go to work for him at NASA headquarters in Washington, DC, to help create an educational program so that public school students could learn about the International Space Station (ISS).

While I was at NASA, he wanted me to be sure to fully understand as much as possible about NASA. Of course, NASA trains astronauts to work in a microgravity

environment using a modified Boeing 727 that flies a series of parabolas to create about 30-35 seconds of weightlessness on each parabola. To my delight, I was invited to go for a ride with a small group of astronauts. The moral of the story: complaining and serendipity may lead to weightlessness.

Reference

Merton, R. K. (1973). *The Sociology of Science: Theoretical and Empirical Investigations*. University of Chicago Press, Chicago, IL.

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