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STEM: Defying a Simple Definition

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Jonathan Gerlach

On its surface, “STEM” is the acronym of science, technology, engineering, and mathematics. However, when you pull that first layer away, you reveal the most elaborate puzzle in the education world. Most educators know what STEM stands for, but how many really know what it means?

A common definition is
STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy. (Tsupros, 2009)

This definition raises many issues, though. My high school Advanced Placement composition teacher would be appalled by defining a term by using the same term in the definition! How do you define competing? Technology? Global enterprise? This definition is so vague that it leaves much up for interpretation.

When STEM was first introduced as “the next big thing,” the thoughts behind it basically centered around two issues. First, there was (and still is) a growing concern that the United States was not preparing a sufficient number of students, teachers, and practitioners in the STEM fields. Second, our industries need more workers in these fields due to an aging workforce and an increasingly innovative world market. STEM is constantly divided into these two categories: STEM education and STEM workforce, and rarely are the two discussed in conjunction.

As educators, we seem to consider STEM singularly from an educational perspective in which success in science and mathematics is increasingly important and technology and engineering are “integrated” when appropriate. When you start to divide STEM by subject (the silo approach), it gets even murkier. Can science and mathematics alone be STEM? Does using an electronic whiteboard during a lesson make it a STEM lesson? When my kindergarteners are playing with building blocks, is that a STEM center? If you ask 10 different science, mathematics, technology, and engineering teachers to define STEM, each will give you a very different and unique answer.

Inside education circles concerned with STEM, the silo approach creates a very incoherent conversation, yet one with growing urgency. A colleague of mine stated STEM was really trying to fill the jobs of the future. I would agree with that statement if it was made five years ago; today, though, I argue the future is already here, and we are unprepared. Educationally, we imagine STEM instruction as creating the next innovators, the superstars. We look for highly proficient students and try to increase their interest in these fields so that we develop the innovators of the future. Our goal is to get them through high school prepared for rigorous college coursework so they can become the leaders of tomorrow’s industry. Educationally we see STEM as a very specialized, high-tech field we are grooming our students to join. Industry, on the other hand, has a very unique view.

STEM from the workforce perspective is significantly different and more about grooming workers with 21st-century skills who are ready to jump right in. When teachers think about technology, we envision computers, touchscreens, and digital data-collection tools. This view differs from how technology was considered when STEM was first being discussed. Technology in industry is about thinking outside the box and using materials to solve problems. I was once told that scissors were a form of technology, and for industrial purposes, they really are. They were created to solve a problem: how to cut something more precisely. Problem-solving and developing quick and cost-effective solutions on the go are what industry is seeking in the next-generation workforce.

Biochemistry, engineering, computer programming, and emerging technologies are just a small sliver of what the STEM workforce needs. These positions require the most skills, and we need to continue developing students for these specialized fields, but we cannot forget the larger segment of industry that relies on STEM. Construction, transportation, and even the hospitality industry rely on a STEM-developed workforce. Whether it’s understanding how an engine works, or plotting trucking routes, the advanced level of technical knowledge and problem-solving capability needed for these positions have become obstacles that did not exist 10 years ago. This explains why industries view career and technical education as a key piece of STEM education. Students must be prepared for any path they choose in life, whether it is directly into a STEM career or studying a specialized STEM field in college.

I would amend Lander’s definition slightly: “Everybody who thinks they know what it means, knows what it means within their field, and everybody else is defining it to fit their own needs.” I think it is truly impossible to define STEM because it means so much for so many different groups of people. Whether it is researchers, science and mathematics teachers, the aerospace industry, or the construction industry, they all have one thing in common: It is about moving forward, solving problems, learning, and pushing innovation to the next level.

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