STEM Learning Vs. Pseudo Science

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There is a continuous barrage of editorials, TV commentators, and published stories that denounce the current educational system as declining and inferior to other countries.

In general, the blame is directed at students, teachers, school administrators, and their curriculums. Everyone seems to be searching for the magic key that will unlock the performance of kids and knock down the barriers to a good education.

One of the most popular solutions to come along in recent years is STEM learning, which is supported by federal, state, and local governments as well as the manufacturing sector. These programs aim to make kids better at science, engineering, technology, and math. I am a supporter of the STEM learning initiative, and feel strongly that all citizens (not just students) need to have a better understanding of science. But I have a big question that relates to STEM learning: How can we ask kids to be more interested in science and math when their parents are enamored by pseudo science?

Wikipedia defines pseudo science as “a claim, belief, or practice which is presented as scientific, but which does not adhere to a valid scientific methodology, lacks supporting evidence or plausibility, cannot be reliably tested, or otherwise lacks scientific status. Pseudoscience is often characterized by the use of vague, exaggerated, or unprovable concepts. It is an over-reliance on confirmation rather than rigorous attempts at refutation.

Pseudo science ignores the scientific method. It makes conclusions and then looks for facts to support the conclusions. In pseudoscience there is no healthy skepticism about fantastic claims; in fact, there is an enthusiasm to accept untested personal testimony as a public truth (stories about UFOs, for example). It is more about what someone feels then facts. For example:

- A recent Time/Yankelvich poll found that 80 percent of Americans feel that the government is covering up information about extra terrestrials.
- 84 percent of scientists think that humans are warming the planet by burning fossil fuels versus 49 percent of the public.
- 93 percent of scientists support federal research on funding on stem cells versus 58 percent of the public.
- According to the National Science Foundation, only 15 percent of the public follows science news very closely.

The Scientific Method

Of all of the subjects that students can master in their STEM learning, I think understanding the scientific method of analysis is probably the most important lesson that can be learned. It is a way of looking at the world as it is, rather then how we would wish it to be. The scientific method is a disciplined way of digging out facts and using healthy skepticism in the analysis. In the scientific approach to analysis, people create a hypothesis, describe the facts that support the hypothesis, and then publish their findings as conclusions. Science has a built in system of checking for errors, by letting anyone on the planet try to find errors in the facts or conclusions. Your conclusions will not be accepted until a majority of the critics agree they are valid.

I think that the most critical factor in student learning are their parents. Parents are in the unenviable but responsible position of setting an example for their children and being involved in the learning process. Parent's involvement is crucial to developing the child's academic ability and confidence. Dr. Patricia Porter makes the case that parents are very influential in three ways:

1. Modeling – "Children love you and want to be like you. They watch what you do and try to do what you do. Modeling is the most important way you influence your child's behavior."
2. Mentoring – "Sharing your knowledge and experience with your children will help them develop skills."
3. Mediate – "You need to mediate between your child and the world around him. You can help your children understand science and the realities of the world by preparing yourself in the realities and basics of science."

How will students understand many of the advanced and complicated concepts in STEM learning if their parents cannot model, mentor, or mediate?

The Only Way STEM Will Succeed

Despite criticisms, science is really open to new ideas. There are really no questions that can't be asked, no sacred truths, and no subjects too sensitive to discuss or debate. But once you develop a hypothesis, you must prove it in the face of expert criticism.

People must also know that it is okay to question fantastic claims and ask for more evidence, just as it's okay to not accept a claim that doesn't make sense — that is how science works. You don't just prove something by one or two experiments. It requires ongoing testing by your peers until the concept is accepted by the majority of the scientific community.

The 21st century is gong to bring some fantastic breakthroughs in stem cell research, manual coding of DNA, fusion, quantum physics, artificial intelligence, computers, microelectronics, materials science, and more. Improving student's learning in science using STEM learning is a noble goal, but to depend on just the teachers and schools as some kind of magic bullet solution is a fool's errand.

Parents are going to have to learn more about science to play their role as mentors to their children. They need to set a better example; they need to be less gullible and better at critical thinking and need to learn to be more skeptical and to question fantastic claims. They need to understand that fantastic claims require fantastic evidence. Rather then accept a claim that appeals to them emotionally, people need to learn enough about science's empirical method of explaining problems based on experimentation, observation, and testing.

In our new century, with all of its problems and inevitable natural disasters, it will be very tempting for people to be attracted to superstition, cult theories, and pseudo science for answers. Unless we can make a lot more headway in discounting the importance of pseudo science, we will continue to move towards a society where irrationalism will prevail.

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