

WHY STEM?

Why have we started this science center? We have over 4 million people in our identified service area (1 million of whom are children) who do not have access to the type of facility we are building. We have women and girls who are not being exposed to these disciplines as potential participants. We have many students dropping out of schools because they see no future either in what they are learning or are not excited by what is presented to them. We have teachers who are restricted in what and how they can teach by government mandates. We have teachers that never learned the STEM disciplines when they were in school and so now must learn these subjects.

The questions below and the answers to them will perhaps give you an answer to the important question of why this center is so important. Americans have always been innovators and we don't like being behind.

WHY SCIENCE?

Just look around you. We have a space station circling the Earth with humans on board doing experiments. We have robotic spacecraft that have reached, and will soon pass beyond, the edge of our solar system. We are beginning to understand how the brain creates the mind that we use to identify ourselves and our surroundings. We are learning more each day about how we came to evolve into mammals that question our own existence. We have decoded our DNA and developed medicines for diseases that have plagued humanity for millennia. And we have only begun.

WHY TECHNOLOGY?

Do you have a TV in your house? How about a cell phone? Do you use a computer or a calculator? What about the Internet? If you think about everyday items around you, you will see how technology has progressed as we have learned about what does and doesn't work. The first processors in computers used something called tubes. When the transistor was invented the first microprocessors only had a few thousand transistors in them. They now have over a billion transistors on a piece of silicon the size of your thumbnail. You can now send a message to a friend halfway around the world in time measured in nanoseconds. Only 150 years ago it took days for a pony express rider to deliver a message only halfway across the country.

WHY ENGINEERING?

If you live in a house (or a mud hut or a teepee) that isn't falling down you can thank an engineer. If you ride a bicycle or roller-blade or skateboard, or drive a car, or take a train you can thank an engineer. If you play video games or board games or cards, you can thank an engineer. New drugs and genes are "engineered" to attack illnesses or improve health. We can now engineer a new bladder from an individual's stem cells, **print** that bladder with a 3D printer and transplant it into that individual without the problems associated with rejection of foreign tissue. Virtually everything that is not made by Nature, like rocks, dirt, mountains or clouds required an engineer to build it. Engineers use mathematics to determine the best way to build something, science to determine the best course to follow in building it and technology to choose the best materials with which to build it.

WHY MATHEMATICS?

Although math is listed last, the other three disciplines listed above would not be possible without mathematics. We all know about adding and subtracting, multiplying and dividing, but what about more advanced mathematics like Algebra, Geometry, Trigonometry, and Calculus? Why are these important in today's and tomorrow's world? There are many societies in the world today that get along quite well without the higher mathematical skills. For example, there is a tribe in Africa that only uses the numbers 1, 2, and 3. More than three is "many". It works for them but does it work in our society today? Will it work tomorrow? Of course not.

Let's start with **algebra**. We use algebra every day whether or not we are aware of it. If you want to find out how much interest you are making on a savings account or have ever signed a contract for a cell phone, how did you determine which one was the best for your situation? How do you determine which medical plan is best for your needs? In these and numerous other areas you are "solving for x". Whether or not you are aware of it, there is an unknown value that you are trying to find.

What about **geometry**? If you are building a house, or designing a road, or even playing a game, you are using geometry. It is the way we figure out the load on a beam or the angle we have to use to enter a parking space. We use it to find the shape and size of things.

Trigonometry? Why do we need that stuff? Well, if you fire a gun or use a bow and arrow, you had better know trigonometry because that is the mathematics that will tell you whether or not you will hit your target. If you fly a plane, you will need it to know where you are going, when you will get there and how you will land. Have you ever skateboarded? Well it is

trigonometry that lets you determine whether you will have a great day half-piping, or if you will break your back or spend time in a hospital. If you like looking at the stars you will use trigonometry to determine where to look to find the one in which you are interested, as it is the science of degrees.

Calculus. Calculus was invented by Sir Isaac Newton and a lesser known (to most) mathematician named Gottfried Leibniz. It is the branch of mathematics that deals with limits, functions, derivatives, integrals, and infinite series. Planetary motion, the form of a continuous curve, even determining how long it will take you to go a certain distance at a certain speed taking into account acceleration and stopping is a calculus function. If you have ever seen the cross section of a Nautilus shell, you would have to use calculus to determine the rate of growth of the creature that inhabited that shell.

Mathematics is the basis of our world today. If you plan to get a well-paying job you had better study math. Dr. Pamela Clute, who is Vice Provost for Educational and Community Engagement at the University of California at Riverside (and a great mathematician), provided some statistics that can help you decide whether or not you should study math. They are:

Only 8% of high school graduates who took Algebra I in high school went on to earn a bachelor's degree by age 30. That figure rises to 23% for those who studied Geometry and 40% for those who also took Algebra II. If you take even higher math courses the numbers change dramatically. For those who study Trigonometry the number is 62%, for Pre-calculus 74% and Calculus 80%!

Today 70% of all jobs require some college. Entrance into any two- or four-year college or career program **requires** Algebra. In fact, it has been documented that students who fail algebra are more likely not only to go to college, but are more likely to drop out of high school than those who passed it.

In California, 33% of Caucasian and 42% of Asian-American eighth-graders take Algebra I, the course that will determine their future in school and later in life. The really sad news is that only 19% of Latinos and African-Americans will pass or even take Algebra I and thus limit their options for a decent job later in life.

Remember we have formed this center in order to encourage not just students, but also all of those who attend to open their minds to the

possible. Our desired outcome is for each visitor to the Banning Science and Technology Center, Inc. to develop a desire to succeed in, and to reach a decent achievement level in, each of the four disciplines mentioned above regardless of race, color, gender, age, handicap, religion, sexual orientation, or national origin.

We want to go back to the future. Back to when engineers, scientists, mathematicians and technologists put us on the moon and made America the greatest nation on Earth with the highest standard of living and learning.