Chapter 1

Mathematics for everyone

The report card on our instructional effectiveness in math education is well-publicized, but here is a brief refresher from the National Assessment of Education, who tested 250,000 students between the ages of 14 and 17.

They found that most students can perform simple arithmetic and remember everyday facts about science. However, most cannot understand high school textbooks or newspaper editorials. Most cannot handle problems involving percentages, geometry, or basic algebra. You may respond with, "The test probably asked those trick math questions that even I would have trouble with." Well, how tricky is this:

What is 10 percent of 20?

a. It is less than 20.

b. It is more than 20.

c. It is equal to 20.

d. I don't know.

Half of our 17 year olds could not answer that question correctly.

Simple arithmetic along with enough reading skill to enjoy the sports and entertainment page of the newspaper may be all that is necessary to function with success in most jobs. If so, we have accomplished our mission. Remember there are some 40,000 different kinds of jobs in the USA.

But also keep in mind that our mission is to prepare people to be "good" citizens in our democracy. That means they can read well enough to understand national, state, and local issues. That means that they take their responsibility to vote seriously. Less than 40 percent of the electorate actually vote in spite of millions we spend on civics courses. I am always amazed that most high school graduates will not read another book for the rest of their lives. Something is not adding up.

Who in the USA is winning all those Nobel and Pulitzer prizes?

The evidence suggests that in science and math, about ten percent of the student population in the United States is competitive with anyone else in the world. Does this mean that ten percent account for the "good life" we enjoy with technology, science, literature, business, and research? If that's the case, then what kind of paradise might we have if somehow we could stretch that ten percent into 20 or 30 percent?

The hidden talent in our students

One of the great unsolved problems in education is to identify and encourage hidden talent. The all "A" student may not be the inventors and breakthrough scientists. In fact, biographies of the famous suggest that they were not necessarily star students in school.

I don't believe it! Give me some examples of hidden talent

Sir Isaac Newton, the most famous scientist and mathematician that England ever produced was at the bottom of his class in elementary school. So was Albert Einstein. So was Thomas Edison and so was Woodrow Wilson, the only US president to earn a doctorate. My hypothesis is that all these hidden talents had one thing in common: They all were at the high end of the scale for curiosity. In fact, Dr. Einstein once commented that, "I have no particular talent except that I am extremely inquisitive." When his father asked the school master what occupation he might suggest for his son, Albert, the response was, "It does not matter. He will fail at anything he does."

Thomas Edison changed forever every person's life throughout the world with his invention (I would prefer to call it a discovery), of the electric light. He had only one day of school because the teacher complained that he was "addled," asking one question after another that she could not answer

such as, "Why is the sky blue?" His mother immediately withdrew him and began home schooling. He was so curious, he once sat on eggs to discover how they hatched. As a child, someone gave him a chemistry book. He performed every experiment in the book in an attempt to prove the author wrong.

President Woodrow Wilson did not learn to read until he was ten years old. He went on to get a doctorate and become President of Princeton University and then President of the United States.

Wilbur and Orville Wright, who owned a small bicycle shop in Ohio, managed to do the impossible: Build a bicycle that flies. They were so curious about how wind travels across wings, they built their own miniature wind tunnel to experiment with different wing designs. They concluded that the wind tunnel calculations they found in books were incorrect. What gave them the courage to question information in print by educated "experts"?

Stephen Spielberg, the academy award-winning film director, was a student about ten years ahead of my son at Saratoga High School in Saratoga, California. For a class project, my son interviewed every instructor who had Spielberg as a student. And every instructor said, "My roll book shows he was in my class, but I have no memory of him." It was as if he did not exist. He was quiet and no one paid attention because he was not a star student; he was not an athlete and he was not a "troublemaker."

The key issue: Skills that every student, white collar or blue collar, absolutely needs for future success in work and play

I wrestled with this critical issue in my book, ***The Super School of the 21st Century***. I concluded that the answer is in brain lateralization research initiated by Nobel Laureate, Roger Sperry at the California Institute of Technology. His experimental work in the 1960s with how a cat's brain works to solve problems inspired 4,000 follow-up studies of the brain worldwide. In the past 60 years we have discovered more about each hemisphere of the brain than we knew in the prior 6,000 years.

The implications are staggering for education at all levels in all subjects.

Books in educational psychology must be rewritten

The problem with prior research in educational psychology which is dedicated primarily to "learning," is that this well-intentioned work in thousands of studies was directed to an exploration of half the brain, usually the wrong half. Most of the work, perhaps as much as 95 percent, was information about the left brain only. The reason is that most of the research asked subjects to respond by *writing something* or *speaking something,* which plays exclusively to the left brain, the verbal hemisphere.

The left brain, the talking side of the brain, has a mission to keep us safe and sane by evaluating all incoming information. For example, listen to the comments of shoppers examining the label on a product and saying, "I never heard of this brand before." That's an automatic response of the left brain when it encounter's something unfamiliar. It is automatically skeptical.

"Is this product any good? I never heard of it!" That's why we all must endure hearing and seeing the same commercials over and over and over. The reason: Now when we walk into a store and look at a product, our left brain has been quieted with, "Oh, this is familiar. I've heard of it. It must be OK."

The left brain attempts to keeps us "in touch" with reality. It tries to keep us "out of harms way." It is the "consciousness" that we imagine is our entire self.

The most efficient way for the left brain to keep us safe and sane is by urging us to continue what is familiar. "Better to be safe than sorry!" "Look before you leap!" "Don't rock the boat!" "Stick with the tried and the true." "Don't climb out on a limb!" "Don't stick your neck out!"

The left brain does not care for school

The left is not an aficionado of school since school and instructors are the "agents of change"--and change could be

harmful. That's why if you ask a student a question, the automatic response often is, "I don't know." It is not that the student does not know, but this is the left brain protecting the person. Who knows how the instructor will use the response? It may be turned against you. It may be used to ridicule you—to get a laugh at your expense. Better to "play dumb." Tell the guy you don't know and he will go away. And you know what? That is exactly what we do. We move on to someone else. You will see the same protective strategy working if you ask a student to do something unfamiliar. The automatic response is most often, "I can't do it!"

The left brain resists change

Since the left hemisphere resists change, it is not surprising that "memorization" will require many, many exposures before there is storage of the information in memory. The left reasons as follows: "I do not believe, nor do I want this information, but you have repeated it so many times, I am exhausted. Okay, you win! I will store the information in memory, but only until after the test. Then I will erase it."

What about the right brain

The right brain is Sigmund Freud's "unconscious" or "subconscious." Freud's model of the brain is something of an illusion since the entire right side of the brain may be conscious all the time. But we are able to access only a tiny speck of information. I think the secret of solving all problems is discovering more efficient ways to access information from the right hemisphere of the brain. In my opinion, Freud was on the right track, with a rough approximation of how the brain works. His model of the brain has been fine-tuned with current brain lateralization research.

It is not necessary that we be aware of the billions of calculations by our brain at every moment involving chemistry, digestion, temperature and so forth. Why would we want to be burdened with all those data? We seem to be most comfortable when we do not have to "think about our bodies."

It is important to note that the right brain is non-verbal and non-evaluative. It is the mirror image of the left brain. The left thinks in words and symbols while the right thinks in pictures, stories and patterns. Exactly how the right brain processes and stores information is still a mystery. For some understanding of how it works, think about your last night dream. While you were asleep, the often bizarre events in the dream seem to be perfectly logical and believable. It was "real." The instant your eyes opened, the left brain flashed on, evaluated the dream and you said, "Whoa, what a strange dream! It does not make any sense," and rapidly the dream breaks up and dissolves from your memory.

Since the right brain is non-critical, it does not block the intake of information which is characteristic of the left brain. Hence, if we can figure out ways to by-pass the left and play to the right, we can often get "learning" in the first exposure. In my book, ***The Super School of the 21st Century***, I present examples of this for every subject including reading, mathematics, science, learning multiple languages, technology, sports and academic subjects such as history, social science, civics and law.

What else do we know for sure about the brain

We know: First, our brain has its own intelligence, quite independent of us. Second, our brain knows the answer a half second or more before we do. We are the last to know. Third, any direction or goal that we request will be followed literally by the right brain. It will work around the clock when we are awake or sleeping—and continue to work to develop answers unless we abort with, "I guess there is no answer. I give up." There is validity in the adage: "Be careful what you wish for; you may get your wish."

If we do not abort (and persistency is also characteristic of famous inventors, scientists and mathematicians), we will eventually hear the right brain whisper possible solutions which we often recognize with, "Wow! Do I have a good idea!" The right cannot talk but it can whisper and it can sing and it can draw and it can act. Pay attention to people's hands when they talk.

That is the right brain trying to communicate information to help us. It can't talk, but it can gesture.

Applications of brain research to turn students around about math: What we can do to reduce student anxiety

Is student anxiety really that bad about anything mathematical? I walked into the first meeting of a statistics class one evening and casually turned to a woman in the front row and asked, "May I have your name?"

There was a long pause and finally she said, "It was right on the tip of my tongue." She was so traumatized by being in a math class, she could not recall her own name. I then said, "I would like to ask everyone a question that requires an honest answer. How many sitting in this classroom feel some anxiety about taking a course in mathematics?

Slowly, almost every hand of some thirty students in the room went up. I said, "Please keep your hand up and look around you. Notice that you are not alone. If you watch me carefully, you will see that every move is designed to lower your anxiety because you already know all the concepts in statistics. You will be excited to discover that statistics is simply arithmetic arranged in some novel patterns."

I then pause and take my time with the next thought: "I am going to say something that you have never heard a college professor say. I am going to guarantee that you will be successful in this class under two conditions." Another long pause to let them process this outlandish proposal. Their left brain is now talking to them, *"Um humm. Here it comes! Impossible conditions that no one can meet. Here it comes!"*

Condition Number 1

Slowly, I say: "I guarantee you will pass this course under two conditions. If you want, write it down and I will sign it. We will have a legal contract binding in 50 states.

I guarantee your success if you attend every class meeting on time. If you miss even one meeting for any reason, the con-

tract is void. it doesn't mean you won't succeed. It only means I'm not responsible."

Condition Number 2

Another long pause, then I say, " Condition Number Two. When you come to class, you are prepared to the best of your ability." Another long pause to let their brain process this. I can see the wheels going around and they are smiling. Their left brain is saying to them, "Okay, I can handle that. I think this is going to work for me."

Learn to "read their minds"

If an instructor has the skill to turn off the critical left brain and turn on the right, students will intake information in the very first exposure. To use a baseball metaphor, pitch the ball so your students can catch it, not throw it over their heads. For example, in my book, ***Brainswitching: Learning on the right side of the brain***, I shared this:

Since I know the left brain is suspicious of anything unfamiliar (which explains the fact that for all political offices from President of the United States to dog-catcher, incumbents are reelected 98 percent of the time), I am careful when introducing any new idea. For example, I introduced the Pearson Product Moment Correlation with this:

"First, I would like you to put down your pencils and pens and relax." I look around the room. Some have complied; others still clutch their pens like a baby who takes comfort holding a security blanket. "I am not going to begin until all the pens are down on the desk." With some reluctance, all pens are now on the desks."Please don't touch your pens. I don't want you to write down what I'm going to say next."

"Now," and I speak slowly with clear enunciation of each word, "Every-single-word-I-will-say-next-will-be-completely-incomprehensible-to-you." They laugh and glance at each other. "However," I continue, "before I am finished with the topic,

and it may take several meetings, every word will be crystal clear to you." They know that I have kept my word on every promise so far, so they have no reason to doubt me.

"Now please pick up your pens and write what I dictate." Still smiling and their posture relaxed, they cheerfully write as I say, "The Pearson Product Moment Correlation is the slope of the trend line—in parentheses, also called the regression line, the line of best fit and the line of the means—close the parentheses, of a bivariate distribution when the X and the Y variables have been converted into a new scale called z scores—use a lower case for the "z."

That setup sounds like a lot of work

Your left brain may be saying to you, "Wow! that sounds like a lot of work to setup something new. Is all that really necessary.? Why not just spit it out and move along?" Well, consider this: In one of my statistics classes, a woman come into the room late, and did not hear my setup speech. She came in as I was saying, "Now please pick up your pens and write what I dictate." About half way into the definition I was dictating, she threw her pen down and shrieked, "I don't understand a word you are saying!" Everyone turned to look at her. She was hysterical. I walked over to her and quietly whispered, "Please come with me" and we walked outside the classroom. When I explained the situation, she immediately calmed down and apologized for the outburst. Is it really necessary to take the time preparing students for something new? My answer is: Yes, it is.

Traditional math education

If you think about it, math education is organized like an insane asylum with activities to keep the inmates busy with "mindless" tasks such as drawing lines on paper along with circles and triangles. In school, we call it geometry. We ask the inmates to write letters and numbers on a piece of paper and then surprise them with a secret code for transforming the symbols into other letters and numbers. We can occupy them for hours

everyday. In the asylum, it is called "occupational therapy"; but in school, we call it algebra.

If anyone questions the value of these activities in the asylum, we can justify by saying, "It is good for them. It keeps their mind active. It keeps their brain flexible. They enjoy longer and happier lives."

If you think this sounds like a bizarre analogy to math education, you are underestimating the powerful force of your student's left brain that is evaluating every detail of anything you say or do. You can try to short-circuit the resistance of the student's left brain by telling them, "Hey, this activity will sharpen your thinking, your creativity, your problem solving skills no matter what occupation you select in life—and If you go to college, you will absolutely need these skills." That may work for the moment, but as you get into the activity, the student's left brain is continually talking in their ear to sabotage you like this: "Wait a minute! What is this all about? Nothing makes sense. Do I really believe this is going to be of value when I get a job? No, I don't think so.

The problem is: Your students are right

Let's take a look at algebra. Try this simple experiment: Go to the mall, stop ten adults at random and ask this question, "Can you think of a time when you used algebra to solve a problem at work?" I believe you will discover that it is the rare person in that mall who answers in the affirmative. If someone says, "Yes," follow up with, "Please tell me about it."

The evidence to support algebra for every boy and girl

It does not exist. Instead, the evidence shows that there is no transfer from algebra to other cognitive skills such as thinking, creativity or problem solving. If you are a "good" student who enjoys working with puzzles, algebra makes that student proficient with algebra. Period. It is like the assumption a hundred years ago that Latin must be mandatory for every boy and

girl to enhance their thinking, creativity and problem solving. There is no evidence that this is so, and Latin disappeared as a "requirement" for graduation. Incidentally, there is also no transfer-of-learning to other cognitive skills for geometry, trigonometry, or calculus.

Well then, what do you recommend?

Parents and the school board will go crazy if we eliminate geometry, algebra, trig and calculus from the curriculum. Is that your recommendation? No. No. No. If possible, we want more math literacy for boys and girls. I have several recommendations for a dramatic improvement in the goal of math literacy.

Declassify from mandatory to elective

First, declassify the math courses from "mandatory for every boy and girl" to "here are some interesting electives." Well, if we do that," you may say, "nobody will take math courses. They will need those skills for science in college." Let's examine that assumption.

First, kids who go to college are apt to find themselves in remedial mathematics anyway. For example, at Seattle Community College, 78 percent of entering students test into remedial math, with 50 percent testing at or below ninth grade (See footnote 1). We spend more money on remedial math than all other forms of math education put together.[1]

Second, most students may not intake math concepts until they have a need for them. For instance, my son graduated from San Jose State and went into the Seattle Police Academy where candidates must learn a huge chunk of law to deal with citizens on the street. Candidates recognize that there is a need-to-know and therefore intake the information rapidly, often in one or two exposures.

In science courses, when the need appears, that is the ideal moment to insert a math concept. At that moment, the student has a huge "picture-size window" open on the right brain for first trial learning.

A personal example of a need-to-know

I wanted to learn how to program a computer. Sounds simple. Just enroll in a computer programming course at the local community college. I did that. I sat in the front row and focused on every word from the instructor, but the entire effort was futile. I explained my disappointment to a colleague who commented, "You can't learn to program a computer unless you have something you want to program." Wow! That was it! That was the Epiphany. I created my need-to-know with the idea of writing an inexpensive software program for my statistics students. I wanted them to insert raw data and generate any relevant data analysis. With that goal, my right brain opened and what I needed to know became apparent after working with "how-to-write software" books. Computer programming finally made sense.

How to create a need-to-know in middle and high school students

We need a "hook." The hook is what I call in my Super School book, the *Romance of Mathematics*. "Whoa," your left brain may be saying, "That sounds like an oxymoron. There is no romance in mathematics. It is work. Period. You put your nose to the grindstone and work and sweat until a light goes on. As a famous mathematician once said about calculus, 'Just continue and eventually it will make sense to you. You will understand.'"

The Romance of Mathematics

My model here comes from art and music. We have been wildly successful with pre-art and pre-music offerings called Art Appreciation and Music Appreciation. It is time for a pre-math offering called Math Appreciation. This is the hook for kids and even adults who imagine that math is boring and incomprehensible to them, and will always be.

Content of Math Appreciation

Stories of famous scientists and mathematicians, that's the content. First, in preparation, I would search Nova, Discovery and the History Channel for every program about famous people who worked with mathematics.* In the footnote below, you will find a few of the people who I recognize for their unique contribution to mathematics. There are many, many more, each with a fascinating behind-the-scenes story such as the young mathematician who was so wrapped up in his work, he did not know how to butter his own bread.

Hook the kids by playing a story from Nova or Discovery or the History Channel, then follow up with additional details including "teasers" about the mysteries of mathematics that are still being explored by thousands of math buffs around the world (For suggestions, see my book, ***The Weird and Wonderful World of Mathematical Mysteries*** by clicking on www.tpr-world.com).

I would include in Math Appreciation the story of Michael Faraday (1791—1867), a name that every high school student will recognize. He was the only person ever to refuse an invitation to be knighted by the Queen of England. Faraday was so poor and lacking in any education, he could not afford to buy books or attend public lectures by eminent scientists in the Royal Academy. He got a job as a book binder so that he could read chemistry books being prepared for press, and later got a menial job washing test tubes and cleaning the laboratory of the famous Sir Humphrey Davy, who invented the miner's safety lamp.

In his spare time, Faraday conducted simple experiments with electricity to discover that, contrary to the established be-

* Such as Archimedes, Aristotle, Isaac Barrows, Bishop Berkeley, James and John Bernoulli, George Boole, Georg Cantor, Agustin Cauchy, Copernicus, Richard Dedekind, Rene Decartes, Les Diophantus, Euclid, Leonhard Euler, Pierre Fermat, Galileo, Ernst Goldbeck, James Gregory, Carl Friedrich Gauss, J. Hadamard, Roland Hamilton, P. J Harding, David Hilbert, E. W. Hobson, Johann Keppler, J. L. Lagrange, G. W. Leibniz, James Clark Maxwell, Sir Isaac Newton, Blaise Pascal, Henri Poincare, S. D. Poisson, Pythagoras, Bertrand Russell, and A. N. Whitehead.

lief that all energy travels in straight lines, electricity moves in a circular path. His innovative work made possible electric generators. He was so dedicated, he married only if his bride agreed that he would continue to work in his laboratory rather than take a honeymoon.

James Clark Maxwell, a young Scottish mathematician, looked at the crude sketches of electricity drawn by Faraday and discovered three equations that perfectly fit the patterns. Believing that nature is attracted to symmetry, he was convinced that there must be a hidden fourth pattern to balance the picture, and he was thrilled when finally he found it. Although electricity, like gravity, is still a mystery, Maxwell's equations allow us to predict and control electricity to make it work for us.

Speaking of perfection, Albert Einstein as a child was given a copy of Euclid's Elements, the second bestselling book after the Bible. Young Albert was thrilled as he read page after page about the world of geometry. He had never encountered anything that fit together so perfectly. There was, in that book, an exquisite beauty he had never experienced before.

But, will kids respond to these stories?

Laura Nickel and Curt Noll were 15 year-old teenagers who happened to read a note on the school bulletin board offering a prize for finding the highest known prime number. The Guiness Book of Records credited Dr. Bryant Tuckerman of the IBM Thomas J. Watson Research Center in Yorktown, New York as the current holder of the highest prime that contains 6,002 digits. Primes are important because they are believed to be the DNA of mathematics. All other numbers are composed of primes such as the number 4, for example, can be decomposed as the multiple of the primes 2 times 2. The number 6 is a multiple of the primes 2 times 3, and 9 is a multiple of the primes 3 times 3.

The story of Laura Nickel and Curt Noll

What could be more intimidating than finding out that a Ph.D. mathematician in a prestigious research center in New York holds the world's record for discovering the largest prime number? Instead, the teenagers were so intrigued with the quest that they were determined to pursue this prize.

The youngsters learned the basics of computer programming on their small high school computers and then contacted mathematics professors at California State University in Hayward for cutting-edge research about prime numbers. The professors helped by providing generous access to the university's computers, but warned that their project was probably doomed to failure. The high school students vowed to prove them wrong. They were determined to continue their exploration no matter how many impressive people in authority warned that, "It can't be done...and it especially can't be done by a couple of high school amateurs."

After rewriting their computer program five times and conducting 44 tests that consumed almost 2,000 hours, Nickel and Noll discovered the number two to the 21,701st power minus one which was confirmed by theoretical mathematicians at the University of California's Berkeley campus. Dr. Tuckerman from the IBM Research Center telephoned his congratulations.

The lesson here is that when young people become "hooked" in the pursuit of an intellectual adventure, they will play with it for thousands of hours. And no field has more possibilities for finding the Lost Ark than mathematics.

For the first time in history, kids can be players

An unsolved mystery is this: If primes are so basic to mathematics, then there must be—-there has to be—-some hidden pattern. The belief is that nature is organized with patterns to explain all phenomena. As Dr. Einstein once commented, "If the universe is the product of pure randomness, science would not be possible." Einstein, Newton, Descartes, Pythagoras and

others conducted a lifetime search for one unifying pattern that would explain all natural events. No one has yet discovered that secret pattern, but we continue to search.

More about the mystery of prime numbers[2]

A traditional definition of prime numbers is: "A number which can only be divided by itself and one." Examples: 1, 2, 3, 5, 7 are primes, but 4, 6, 8, and 9 are non-primes. *All non-primes are composed of prime numbers multiplied together.*

Prime numbers are the darkest mystery in all of mathematics. The reason: Primes are the DNA of arithmetic—at least, that is the prevailing belief among mathematicians, and yet no one has ever discovered the equation that will predict one prime after another. Since there is no equation to predict primes, the only alternative is trial-and-error by playing with numbers.

Mathematicians believe that something *that fundamental* to arithmetic *has* to have a pattern, but none has been discovered. There must be a hidden equation that will generate the prime numbers, the building blocks of arithmetic.

So, what's the mystery?

In biology a hidden pattern called a double helix was discovered for the DNA molecule --a stunning revelation that explains how heredity functions and won a Nobel Prize in 1962 for James Watson, Francis Crick, and Maurice Wilkins. James Watson was a postdoctoral student still in his 20s when he was awarded the Nobel Prize.

Unfortunately, there is no Nobel Prize waiting for someone who discovers the hidden pattern explaining how arithmetic works. Mathematics was, for reasons still unknown, excluded from Nobel Prizes by Alfred Nobel, the man who made a fortune with the discovery of dynamite in 1866. But, it is exciting to search for an answer anyway.

Here is what we now know: The even numbers starting with 4 and most of the odd numbers can be created by multiplying two or more prime numbers. The primes consists of a small set of odd numbers and the even number of 2.

The problem

For several thousand years we have been looking for a hidden pattern that will explain how the primes fit together to create the other numbers. The primes are the parents of the other numbers. But how do they procreate? Something as fundamental as the ability to create all other numbers has to have an underlying pattern, but as yet—no pattern has been discovered. It looks random, but this disturbs our mystical belief in science and mathematics. As I mentioned, Albert Einstein was so fond of saying, "If the universe (and everything in it) is a product of randomness, science would be impossible." There has to be cause-effect relationships. If not, we had best discontinue all scientific research; it is a waste of time and money.

Scientists and mathematicians go to work every day with confidence in the belief that there are thousands of hidden patterns waiting to be discovered—patterns that explain disease and all other natural events such as light, electricity, and gravity.

A novel idea

This is the first American generation in which children of all ages can be players involved in the fascinating search to solve mathematical mysteries because children have two powerful resources: home computers and time.

Mathematical mysteries are now reserved exclusively for graduate students. The assumption is that undergraduate students do not have the *mathematical maturity* to understand such mysteries. My recommendation: In Math Appreciation, if we can explain these mysteries so that a child can understand, we can turn young people on to the thrill of discovery.

Once kids enjoy the experience of Math Appreciation, why would they ever want to spend time playing video games?

Footnotes

[1] "Reform math at issue in Seattle Schools," Seattle Post Intelligencer, Tuesday, May 29, 2007. Written by Robert Femiano who teaches elementary school and was Washington State Presidential Math Teacher of the Year, and Danaher M. Dempsey Jr. who teaches high school math and is on the State Board of Education Math Advisory Panel.

[2] My explanation of prime numbers.

I personally believe that prime numbers are a myth. There is no such thing as prime numbers. Here is why:

The current belief is that all even numbers and most of the odd numbers are composed of prime numbers multiplied together.

For example:

4 = (2)(2) And 2 is a prime number. So far, so good.

6 = (2)(3) Both 2 and 3 are prime numbers. Bravo!

8 = (2)(2)(2)

All primes multiplied together. But wait, this is not three primes multiplied together because it is impossible to multiply three numbers together. It is also impossible to multiply four numbers together. It can't be done. Arithmetic can only be performed with a pair of numbers, not three or more numbers. So,

8 = (2)(2) = 4 and (4)(2) = 8.

Notice that 4 is not a prime number.

Another example:

12 = (2)(2) = 4 and (4)(3) = 12

Note: 2 and 3 are prime numbers, but 4 is not.

12 = (2)(3) = 6 and (6)(2) = 12

Note: 2 and 3 are prime numbers, but 6 is not.