



But if we don't make her do maths...

Submitted by David Deutsch on 21 June, 2005 - 11:58

Posted on the TCS List on Tue, 25 Jan 2000 19:15:39 +0000

by **David Deutsch** (<http://www.qubit.org/people/david/>)



A reader asked:

After visiting the "Puzzling Parenting" stuff, I went to the TCS site and read Sarah's wonderful article about math(s). It got me wondering. I am imagining a kid, no – a family of three kids. The kids are, um, 10, 12 & 15. The parents have resisted the urge to push academics on them. They have not done any academic math(s). They play video games, chat on the internet, build lego stuff, build tree-houses, etc. Would somebody write for me a description of life from here on? Tell me a story, that includes the 15 year old becoming a scientist. I am just having trouble picturing them starting math so late... Would somebody help me with this idea?

And later:

The concern is genuine. Without knowledge, how do we come to be who it is we are "meant" to be? And is there not a point, developmentally, where it can be "too late"?

NO. I am sure it can't be "too late."

What I really want is a way to picture life from here for, say, the oldest one (15, was it?). Does she begin with fractions and decimals

Maybe. Probably not.

and work her way up to algebra, then calculus?

Calculus is almost certain to follow, rather than precede, algebra, yes.

Does she start at the local community college

Quite possibly.

in remedial classes?

No, in normal classes.

What does such a life LOOK like?

Well OK, if you really insist on knowing, I'll tell you. I know all the details except her name, so let's call her Anna.

Sometime this year, Anna's previous interest in Lego, treehouse- building, the internet and computer games will all come together and draw her attention to a major TV documentary about how stunts are arranged in movies. She will start building such stunts in the garden, each more ingenious than the last, using all sorts of props and filming them on a video camera. One day, a physics teacher will walk past and see her doing this. Calling to her to give her advice about how to balance a particular arrangement of planks, he will inadvertently cause her to fall fifteen feet onto the grass, fortunately causing only a broken toe.

Anna will have to wait three hours for treatment in the emergency room, which could have been excruciating (because the slightly addled person waiting on her left suffering from chronic whiteboard-marker poisoning will be a mathematics teacher eager to plug the gaps in her home education), but in the event, it will pass quickly because she will get into conversation with the fascinating person waiting on her right, a huge lady called Agnes. Turns out Agnes' ex-husband used to do stunts in Hollywood and she used to help him before she found out about some of the other stunts he pulled—but that's another story. Anyway, now she owns three successful cafes in town and has just bought two more and wants to go up-market. She's been talking to an advertising agency about making a series of ads for the local TV. She hasn't liked any of their ideas so far, but soon finds that Anna is bubbling with great ideas for how to advertise high-class restaurants using movie-like stunts. Agnes will be surprised and delighted to hear that Anna actually has videos of several stunts she has arranged single-handed (with a little help from her little brothers) and will tell her her to drop by at her office next day.

Next day Anna will hobble along to Agnes' office above one of her restaurants, currently being re-fitted with the new up-market decor. Agnes will love the videos, and will commission Anna to design five stunts for the new series of ads, and execute them for the TV people. Anna will earn three thousand dollars for this, but think no more about it until six months later when the advertising agency will offer her a similar job, albeit for only \$500. She will accept, because even though it's a lot of work and the materials alone will cost almost that much, she will enjoy it enormously. The following week, someone will let the agency down and they will phone around in desperation for anyone they know who can do a firework display. Anna will never have done such a thing, and technically it's illegal, but she will agree to step in to help them out. Not only will the display be a great success, but Anna will meet and fall instantly in love with ... the computerised timing device that the agency gave her to time the fireworks. She will ask if she can borrow it, and for the next year it will spend far more time in her garage than at the agency, for she will think of more and more ways to use it to do wonderful stunts, and also special effects. She will also start editing her movies on the agency's professional computerised editing system.

One day in the cutting room, she will meet a pro who is engaged in a science documentary. He will be a mathematics graduate—who has forgotten all the maths he ever knew and will now be spending all his time filming animals mating. So they won't talk about maths but she will show him how to hide some of the more repulsive aspects of his footage using a

difficult timed transition on the editing machine, and in return he will introduce her to his boss, whose next documentary will be about the NASA robots that will one day explore Mars. Anna will be hired as a technical assistant on that documentary, and will dazzle everyone with the exciting stunts she will think of to demonstrate how these robots will behave on Mars. The boss will offer her a permanent job on the team, but she will refuse, because while at NASA, she will also have helped one of the astronomers out with making a promotional movie designed to persuade the government to fund more infra-red satellites. The problem will have been how to display, in an eye-catching and persuasive way, the complex data that demonstrate why such satellites are better than ground-based telescopes. Anna will succeed at this so well that she will have persuaded herself too. She will spend the next two years working for one of NASA's subcontractors, first in the publicity department, then designing user-interfaces for satellite ground stations, and then even some aspects of the satellites themselves.

All this will involve a lot of interactions between herself and astrophysics graduate students, but slowly the attraction of satellites will wear off, and she will realise that her real love is *theoretical* astronomy. She'll read a book about calculus, do a six-month adult-education course in physics to fill in the gaps in what she's picked up, and then apply to take an undergraduate degree in astronomy, complete it a year ahead of time and then be accepted for a PhD in quasar structure. At that point she will officially become a SCIENTIST.

Meanwhile she will have had two children with the NASA astronomer (who will have left astronomy to become an internet millionaire and failed miserably, but will by that time be blissfully happy again as a home maker), and she will worry that the children won't achieve anything in life unless they have a good grounding in the basics, especially mathematics, but for some unaccountable reason the ungrateful little wretches will be digging their heels in and refusing to listen.

[to post comments](#)

Comments

Is this anedocte even real?

Submitted by a reader (not verified) on 17 September, 2005 - 13:31

Is this anedocte even real?

[to post comments](#)

I really needed to read something like this!

Submitted by Wolfgirl (not verified) on 5 November, 2005 - 01:25

Thank you so much for writing this article. I am a high school student who has always hated math, I have much more avidly pursued interests in art and creative writing. My parents(who are in no way whatsoever TCS parents) do not approve of these interests and have always pressured me to pursue math and science(just like my older sister) because they believe that a person cannot make it in life only with skills in writing, art, and foreign languages(I am in a Spanish class and independently study Japanese). It's very nice to see that there are other people out there who acknowledge the fact that there is a great variety of useful skills, not just what parents and teachers think we will "need", but which we forget shortly after graduating. It was very nice to finally read something on this subject. Keep up the great work! I look forward to more great articles!

[to post comments](#)

ridiculous

Submitted by a reader (not verified) on 24 December, 2005 - 06:27

As a physics graduate who did a thesis in the field of astrophysics I think I'm qualified to call this story ridiculous. (And that's not because the physics guy was responsible for the toe breaking.) If you want to do serious science, you've got to work hard and work young. Otherwise, someone else will get the funding -- particularly for theoretical (ie: government funded) topics like galactic dynamics. (Sorry, quasar structure isn't actually a field.)

The real problem with children and math isn't "educational coercion". It is that parents are afraid of confronting their own fears of math. They need to know the same thing that kids need to know: it is ok not to be right; it is ok to experiment; it is ok to be frustrated that there is 1 correct answer. It is not ok to imply to your children that math is scary, or hard, or not important because you have issues with it.

It is also not ok to let your children say "this is too hard" and have that be the end of it because you think it's "too hard".

Math is hard sometimes, but so is using language. Would it be ok if your child said "NO TALK" and refused to use sentences? Yet a claim of "long division is hard" garners far more sympathy. Why is that?

to post comments

some kids like math... and some don't, which is fine too

Submitted by a reader (not verified) on 9 August, 2006 - 00:25

I'd say the story is not impossible, but very unlikely. Most probably, these kids will not become scientists. Not because they haven't had math pushed on them, but because they haven't taken it up by themselves. I loved math and biology as a kid and read textbooks in my free time (sadly normal schooling made me dislike textbooks, so I don't do this very much any longer, despite planning on applying to grad school this year). Some "unschooled" kids will like various academic subjects, and may take up jobs related to these subjects. Some won't like traditional academics, which is just fine, because most jobs have very little to do with traditional academics anyway...

to post comments

This is just silly.

Submitted by Matt Hearn (not verified) (<http://www.matthearn.com/>) on 30 August, 2006 - 17:29

From what I can tell, the author of this article is indicating that we don't need to teach our children any valuable skills because they will all, by pure luck, run into people that will hire them to do that which interests them for large sums of money.

In the 28 odd (some more odd than others) years of my existence, no one has ever come up to me and offered to pay me for sitting around diddling with musical instruments and recording gear, or for playing video games, or napping, or drinking beer. On the other hand, a high school diploma and college degree, which I wouldn't have

gotten if my parents hadn't made me go to public school and paid for my college studies, have gotten me a nice job at a computer company that pays the bills and affords me a cushy lifestyle.

In my opinion, convincing impressionable parents that their children will turn out to be scientists and engineers, etc., without any actual scientific study, is nearly criminal.

[to post comments](#)

Insane academics

Submitted by Wolfgirl (not verified) on 9 September, 2006 - 23:32

Math is one of the stupidest things I've ever seen. Nobody on earth uses it other than math teachers. By the way, science shouldn't be enforced as much as it is either. Most science is either totally pointless or completely immoral anyway. Also, physical education (aka forced weight loss program) has got to go. Students would benefit so much more from art, drama, and music classes. Careers in these areas make huge money and don't go against anyone's morals, the way science does.

[to post comments](#)

RE: Wolfgirl

Submitted by IkaTarii (not verified) on 28 January, 2007 - 11:31

"Careers in these areas make huge money and don't go against anyone's morals, the way science does." First, the huge money thing. I'm working with a simple IT certification, full-time, and making nearly identical to a friend of mine that's 'acting' for a museum. The actual sum of his actual acting gigs, so far, has been something in the range of \$200 for well over 2 years of hard work, sweat, tears, and (fake) blood. I believe he quoted to me that the average actor makes \$17k a year. There is no money in art, unless you miraculously strike it rich with talent; as opposed to engineering, which has less of a range in pay, but has an average and minimum far above that of acting and musicianship.

Second, since when was art -not- about offending people? That's the core of the concept. Nobody that feels passionate about any art form goes into it intending to uphold the status quo. The greatest artists of nearly every era offend people's morals simply as a cause of their own passion and desire to create something that instills a sense of awe and wonder.

I think, personally, that the TCS answer to mathematics is to find a proper compromise. Figure out what your child's interest truly is and relate it back to the sub-set of math they're currently enrolled in. For example, an artist having difficulty with geometry could be shown its applications to perspective, a musician in algebra could sit and listen to a sound clip generated through a polynomial equation, and an actor in calculus could be shown the stunt possibilities opened up through a greater mathematical grasp of physics.

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Its not always about the numbers

While the points that you all raise are valid (some are clearly more passionate about math than others) it is important for parents to realise - when a child is brought up within a certain religion, sent to a religiously affiliated school and takes part in various religiously affiliated community projects, there is a high likelihood that they will CHOOSE to continue observing that religion into adulthood (not a guarantee of course). Children that have sporting parents are often exposed to the sports themselves and often choose to pursue sporting interests. Children that have parents that are creative, "Bohemian", will often display these behaviours. The point I am making is that in order to get a child to like math, science, technology is to create an environment which allows the child to interact, explore and most importantly have a positive experience - in the end, they will make their own choices but a large percentage will be more open to these fields. I teach 3500 students a week and have taught over 15000 over the past 10 years. I can honestly say that making math fun is easy for me as there are so many wonderful ways to expose a young mind to this fascinating field - but its not always about the numbers - maths teaches you how to structure a solution, it teaches you to think outside of the box, it teaches you about life (some problems have no solutions, some have one and some have many) but by far the most interesting part of math is its application in real life - math and solving crimes, math and magic, brainteasers, math and space, math and business, math and genetics, HIV AIDS, sport, etc the list is infinite...I always teach my students that it is not about the numbers... it is about knowledge - the more you know, the more tools you have to play a meaningful role in society. To parents, please don't EVER say to your children that you were lousy at math (even if you did not do well at school), this allows them to justify their poor performance. Take them to the local science centres, encourage hobbies like Rocket launching, Lego building, mechano, playing chess, sci-fi books, watching lunar eclipses, going on full moon hikes, working out the cost of a full shopping trolley before checkout, play registration number games while driving, visit the aquariums, play card games, buy the activity books for the kids to work through on their own, etc Instill a love for knowledge and praise your child at all times - give them the self confidence to succeed. There will be times we do badly on a math test - this is not an indication of ability, it is merely a reflection of their performance for 1 test! Parents must not feel intimidated to help their children with math homework ("because it's not the same math we did in our day") as the math does make sense if you sit down and read it with an open mind - you would be able to relate the content to so many things that you do each day! Give yourself a little credit too! Above all, seek to gain as much knowledge as you can on every topic and this thirst for knowledge will propel your child to choose their own path but at least they will do it with enthusiasm and with a fair amount of exposure to math, science and technology in their youth, they will excel in their future fields. Please feel free to email me if you need any suggestions on how to get your child to fall in love with math again - there is no greater joy than helping someone back onto the path of adventure!

to post comments

I Enjoyed the Story

Submitted by *mammal_mama* on 25 March, 2007 - 02:23

I enjoyed the story. It could just as easily be true as not.

DD was responding to someone who wanted to hear predictions of the future for the oldest of these three children. I think it's really impossible to predict the future for ANYone --

College graduates don't necessarily end up working in their fields of study: there's no one thing that guarantees success and no one thing that guarantees failure (except that you're more likely to succeed when you love what you're doing, more likely to fail when you don't give a shit) --

So maybe DD was, at least partially, responding to the ridiculousness of the request to "picture life from here" for Anna, who has never been forced to study math.

Just because she was never forced to crack open a math-book, it's silly for anyone to think she's never been exposed to math.

I personally find it impossible to learn cooking or sewing or shopping or building or drawing -- or anything of interest to anyone -- without some interaction with math (even writers sometimes have to edit their work to fit into a certain word-count).

So children who love life (which is the normal state of children when free to do what they love) WILL be choosing to learn some math, however much and in whatever form they need, to do whatever they want to do.

Susan

[to post comments](#)

>>Tell me a story, that

Submitted by a reader (not verified) on 18 May, 2008 - 19:14

>>Tell me a story, that includes the 15 year old becoming a scientist. [...] >I'd say the story is not impossible, but very unlikely.

Surely the reason that the story is very unlikely is because presumably if the girl has no interest in maths or other science, she... probably **won't** become a scientist. Maybe she will become a musician, or a writer, or a something else. By the way, school makes maths seem much harder than it is - if you happen across a field you want to study very much that involves maths that you don't have, especially as an adolescent/adult rather than as a child, it really won't take long to learn the requisite maths. I can say this with confidence, having just learned the first year International Baccalaureate higher maths course myself in around a week and a half, having ignored my teachers who taught badly since September. It **really** won't take long to learn enough maths. And even fields midway between arts and sciences, like architecture, require no more than minimal maths.

Incidentally, my own main subjects were music (violin/composition) and drawing until perhaps two years ago, when I decided I liked maths, learned it better, and finally chose to aim towards becoming a Computer Scientist. Which would have made me... around 14. What, a years' difference? It's easy to become a scientist if you want to be one. If you don't, the last thing you want is a parent wishing you were one.

[to post comments](#)

Mathematics

Submitted by kmmapete on 12 August, 2008 - 06:05

This person does realize that my 2 year old knows basic math right? I mean, he doesn't know what it's called, but he sees 2 candies sitting next to 3 candies and knows that the 3 candies is greater than the 2 candies. That's math. All the first few years do is teach you how to use the right words in relation to things you basically already know. DS knew what 3+3 was before he was asked, he could count up to 10. So if you put 3 and 3 side by side and

asked him how many there were, he could easily count them up to six. He knew that if he ate 2 now, he would have 4 later. We just had to teach him the words to go with it. OH, and he knows algebra, he just doesn't realize it. $6+y=8$. There are 6 plates on the table, he needs 8 plates, so what is y ???

Wow, he's smart. The fact is, regardless of what anyone thinks, a child would have to live in a rubber room to NOT learn math. Advanced algebra, geometry, calculus etc. would take some effort, but if the child wants to learn how to build a tree fort, teach him some algebra. He will need to learn what makes a right angle, measurements etc. If a child wants to make a catapult, he needs algebra. These are everyday ways in which we use math and don't even think about how much a child learns when doing it. Just don't dumb it down when you explain it...

We need the wall to be perpendicular to the floor, meaning, it needs to be at a right angle. What's a right angle, well.....etc etc etc. In stead of saying, we need the wall to be straight up and down.

to post comments

Mathematics from a Mathematics Undergraduate

Submitted by Harrison Gross (not verified) on 27 March, 2009 - 08:59

In regards to the above poster, you are absolutely correct - children do learn basic computation almost automatically.

What I have noticed while pursuing my higher education, is that most people fail to realize what the definition of mathematics is. In all honesty it has almost nothing to do with numbers, and everything to do with rational thought. I know this doesn't seem to pertain to the matter at hand, but it does. In this way that it connects with logic and thought patterns it also connects with computer science.

Any child of today in a "first world" country will know about the internet. It is then plausible that if you raise your children they may become interested in it. From there they may want to know how a computer works, and how the internet works. This will then let them delve into computer science, and knowing mathematics is a large portion of computer science. Linear algebra is a large portion of today's 3D video games due to polygonal models and texturing, calculus is a large part of physics, and there is a large demand for them. And the thing is, a lot of these mathematical concepts aren't hard to master, to be honest, the grade and high school systems here in Canada are far slower than that of some other countries. However, that is because they are trying to cater to everyone and force people to do math, which I disagree with.

It just seems like a waste of time the way they currently have it set up. By grade 9, students know how to graph stuff on a 2d plane, how to compute with long division and multiplication (tedious and useless), basic algebra, fractions (a necessary part of the system, it just seems to take people so long to understand them) as well as addition and subtraction, which shouldn't even have to be noted. There is also a tiny bit of patterning and probability. Still, the topics covered are so tiny in scope that they shouldn't take nine years to teach them, and the main reason why it takes so long is because students don't want to learn this crap.

Also, in math there isn't always one right answer. People forget this sometimes.

Take the set of numbers that follows:

1 4 9 16 25

Ask people what they notice about these numbers, and most people will tell you that they're 1 square through 5 squared.

However, being a different thinking child, the teacher asked me what was so special about this pattern. I then replied with "The differences between the numbers is increasing by 2: 3 5 7 9". She then said no, you're wrong, when clearly I was right. It has aggravated me to this day, and I intend to not let that happen to my children if I ever have any, nor that of my siblings, who if they let me I will attempt to teach their children mathematics, if they want to learn it. My neice has been sort of receptive so far, and it gives me hope for her future.

to post comments

I agree with the post titled

Submitted by Mike Mitchell (not verified) on 8 April, 2009 - 22:50

I agree with the post titled "Ridiculous". Parents should not be inflicting their own insecurities on their child. Math is a great balance of memorization, logic, and problem-solving skills...all of which people use in life. Do not give the excuse of "I can't" to yourself nor your child. If one "cannot do" something, it is because they have not understood it yet...this doesn't not mean it's impossible.

Mike Mitchell

to post comments

If we don't teach her maths...

Submitted by Brett (not verified) (<http://www.tokcast.net>) on 5 December, 2010 - 13:12

I am not sure - but my understanding is that it gets harder and harder to teach and aging dog new tricks. The emerging sciences of the mind are teaching us much about the degree to which the plasticity of the brain makes learning certain things easier early on. Languages is perhaps among the most well known. Children are able to acquire multiple languages seemingly by osmosis while for most adults - as their years advance - the ease with which they can learn a new language diminishes year after year.

It would be interesting to know if there have been any studies conducted on the degree to which age affects the capacity to learn mathematics - or critical thinking - or dancing - or name your skill. If it was to turn out that there really do exist crucial developmental stages in the growing brain where, if they are not exposed to certain types of thinking - then the capacity to acquire these later on is severely reduced. Or perhaps all-but-impossible? I don't have this information - it's mere conjecture.

The neuroscientist Norman Doige in his best seller "The brain that changes itself" provides case studies and other evidence of the positive overall psychological and emotional effects of exercises that might be described as repetitive 'rote learning' where focussed concentration on literacy and numeracy exercises is able to treat learning "disorders". The following school uses such a neuroscience based approach to learning.

<http://www.arrowsmithschool.org/> (<http://www.arrowsmithschool.org/>)

It seems that the experience at this school and from the information in Dr. Doige's book - is that intervention does not take place early on then the likelihood of them ever being able to learn to read and write competently can be lost. Much the same applies for key numeracy skills.

Yes, it's coercive - but that's not my point. My point is - how as supporters of TCS do you deal with some of the neuroscience that seems to strongly suggest that the physiology of some children's brains is such that without targeted intervention with best-practise 'exercises' then in all likelihood the ultimate well being of the child will suffer. By the time a youngster comes around to the idea that undertaking these lengthy and sometimes repetitive (perhaps even boring) exercises is actually of essential importance to their cognitive health if they decide they want to do anything that requires them to engage with the written world or simply navigate the world confidently - by the time they realise this - the horse may have bolted and the receptiveness of the brain to 'learning' some important tasks is simply lost for all time.

The child now realises - too late - that s/he made the wrong decision but is angry because s/he felt she simply did not have the capacity to foresee that their brain would change in the way that it did. Infact they might even have been told that this was certain to happen but felt that reading/multiplication/operating a computer just would never be that important. They've now changed their mind. Who or what is to blame for this terrible outcome? The child was never coerced into doing what needed to be done at just the right stage of brain development in order that they would have the skills that would be essential to do what they'd finally decided years later to do.

This is an extreme example. But I think it goes to the heart of the forceful responses to David's original article from all those years ago. Exceptions like the girl who never studied any maths or science until they turned 25 exist, no doubt - but given what we are coming to understand about brain science - might it not be far more common for a group of 100 randomly selected children who choose to do anything but study maths and science - and instead decide that they want to be singers and play World of Warcraft and watch TV - despite the reasoned arguments about how plans are important and considerations of the future need to form a part of any big decision. Of our 100 random children who enter their 20s - by some remarkable coincidence they all decide to become theoretical physicists. They enter college. Sure - 2, 3 - I'll even give you 10 - thrive. They go on to get PhD's. But they are at one end of this spectrum. The remainder cannot overcome a biological truth: their brains - despite their burning passion to want to be physicists - simply cannot deal with number. Having not formed key structures - specifically the necessary neurocircuitry in their pre-frontal cortex prior to the age of 14 years or so which allows them to recognise patterns and perform mental calculations - they are effectively excluded from moving beyond basic high school maths without 10 times the work they would otherwise have had to do, had they willingly exposed themselves to the right type of thinking at the right time.

By accident of course, traditional education systems hit children with the right stuff at the right time. Sure there are a lot of misses - but just because of the volume of stuff thrown at often unwilling kids - it's enough to ensure that the vast majority of them leave with a broad enough skill set that enables them the best chance to really have options open to them. Options that - had they been given the chance to skip classes on language, literacy, mathematics, etc - would not have been available to them. Not without a much greater cost in terms of time, stress and emotional heartache at not realising (also a direct result of their undeveloped pre-frontal cortex which - when properly matured - actually gives them the capacity to plan ahead further than 5 minutes.).

Do neuroscientific facts - as they increasingly come to hand as this science matures - inform the direction of best-practise TCS theories?

Brett

to post comments

If we don't make her do math...

Submitted by liz reid (not verified) on 8 May, 2011 - 18:52

The "opportunities" to learn new tricks may diminish as you get older. There are plenty of classes for young people to learn things like math or maybe soccer basics. These opportunities will diminish as you age so even if your brain is still able to learn as well as a young brain your opportunities are less. This is just a social structure but it does make it easier to acquire these skills when you are young. You could argue that you are doing your children a dis-service if you don't expose them to these learning opportunities while they are easily accessible.

to post comments

ok, maybe, but

Submitted by Jody (not verified) on 19 April, 2012 - 13:39

I'm here because I'm reading a David Deutsch book right now on my iPad. I was surfing and ended up here. I am an opera singer and a poet. I have degrees in literature and voice. In all, I studied about 10 years to have the jobs that occupy my time today. I like my careers and they seem to like me too. BUT I was told as a nine year old in a US private (prep) school that I was bad at math. My parents were going through a life-altering event and as a result, the shock waves went right through me and onto my math homework page. Also, I just didn't like long division. I liked the act of it pretty well and I had mastered it perfectly, but then there was this ugly "remainder" at the end of it all. When I asked what it was and what that dot in there stood for, I was told not to worry about it, that it didn't really matter. The absurdity of such a thing astounded me. I hated math from then on. In a sort of "acte manqué" I shut down, and I listened less and less to my teacher, who now to me just sounded like some shaman following an obscure light in the distance like a zombie. From there, I was placed into remedial math and was told that English lit was my thing, math clearly wasn't. As a teen, I sang, rode horses, played tennis very well, wrote well-graded essays and poetry, and really, math didn't matter to me. I was in the stupid math class and the smart English lit class. And I was proud of that. Because I sang so well, I was allowed to skip math in college, and so I never went beyond algebra. I NEVER touched calculus. And now I'm older, have my own child and am faced with something horrible. I am interested in physics. I never took a physics class for the same reason that I never took a calculus class. I was "too good an artist." I am now reading everything I missed. I am delving into superstrings, M theory, the multiverse, supersymmetry and sparticles with a sincere and overwhelming desire to get to some sort of understanding, even if only a surface understanding of it all. I have no idea what I'm doing, but it's like some crazy quest. And I love it! I've had to back-track to Einstein and beyond to Newton. It is passionate. But then I see an equation. And I get ill inside. I am so very jealous of those who learned math as kids. I know now, I was capable. In fact, I may have been overqualified in a sense, in any case, let's say over-curious. I wanted to know what that decimal did, what the remainder actually was. I wanted an answer and I was not given it, and so I rejected the whole damned thing as absurd. Math as not rigorous enough for me!! I love the irony. I'm sure you could find a way to use this as an argument for your concepts. But we could also use them against. In any case, here at my age (mid-life - well, what we called mid-life in the 1950's) as an opera singer, published poet, I truly am happy to be learning the concepts of modern physics, and truly unhappy that I will never have the time nor the ability to catch up on all that math I missed. For, I could have understood this stuff perhaps a little better with that base. With that base, who knows? I might have even helped discover something fundamental had I not been placed in remedial math. In any case, I wanted to add my anecdote to the conversation for fun and in case David Deutsch frequents these comments or can have them passed onto him, say thank you for the Beginning of Infinity. I am thoroughly enjoying it. It is filled with humor, which makes it great fun, and it is pushing me to learn more, to define, to search, and even to look an equation or two in the eye! I am very grateful. It is teaching this old dog some new tricks, I suppose. If limited.

to post comments

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- [Why Stuff-Management Matters](#)