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## To Attract More Girls to STEM, Bring More Storytelling to Science

By Anna Kuchment | April 16, 2013 | 1 2

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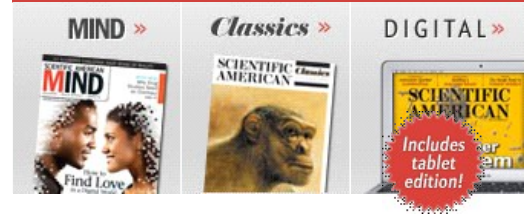
A student from High Technology High School in Lincroft, New Jersey CREDIT: Marissa Hazel

### Guest Post by Jonathan Olsen and Sarah Gross, teachers at High Technology High School in Lincroft, New Jersey

Women and girls are historically underrepresented in STEM (science, technology, engineering, and math) fields and much has been written lately about why girls in school seem disinterested in these areas. As STEM becomes more important in our increasingly interconnected global society, it becomes even more imperative that educators find ways to encourage girls to participate in these fields.

A few weeks ago, researchers at the Universities of Pittsburgh and Michigan released the results of a study that reflected many girls' antipathy toward all things STEM.

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The study, published in the journal *Psychological Science*, tracked about 1500 college-bound students over a decade and found that more women had the highest scores on both the math and the verbal portion of the SAT test than their male counterparts. These women were more likely to pursue non-STEM careers after graduation even though they excelled in those fields in school. As the principal researcher of the study, Ming-Te Wang, summarizes, "This highlights the need for educators and policy makers to shift the focus away from trying to strengthen girls' STEM-related abilities and instead tap the potential of these girls who are highly skilled in both the math and verbal domains to go into STEM fields." We couldn't agree more.

As educators in a STEM-focused high school, we come in contact with intellectually gifted female scientists every day—albeit young ones. We also know there aren't enough of them. As a school, we struggle to attract young women who want to attend an engineering-focused high school in the first place. In our time here, we've never had more girls than boys in any given class. Too often, our gender ratio is lopsided. We know that this is not a result of ability. As the Pittsburg-Michigan study showed, and what we experience every day in our classrooms, is that there is no shortage of girls who could successfully pursue anything they wanted. The girls in our school are brilliant and many do pursue careers in STEM-related fields. However, some choose not to, and other smart girls never even make it through our front door. Why not?

Perhaps girls with high verbal scores choose careers other than STEM because their passion hasn't been kindled in those classes. We know it is not the fault of their teachers but a problem of process. For many schools, arts and sciences are rarely ever integrated. Teachers are kept apart with little time to collaborate.

If integration does happen, it is usually the humanities teacher looking to include aspects of STEM in their courses. The recent adoption of the Common Core Standards by forty-five states calls for more integration between subjects. However, ask most humanities teachers and they will tell you that they are being told to integrate STEM content into their classes, removing literature for nonfiction, rather than being given the opportunity to collaborate with their STEM counterparts. Integration is wonderfully effective and certainly the future of education but it is a two-way street. We think schools should use reciprocal integration between the arts and sciences to capture the imagination of these top female students.

How many engineering teachers include a fiction book like Kurt Vonnegut's *Player Piano* in their syllabi? Do many math teachers analyze the intricacies of M. C. Escher's artwork with their students or read *Behind the Beautiful Forevers* by Katherine Boo? How many science teachers read aloud the poetic observations of Dr. David George Haskell? Do many biology teachers share the story of the HeLa cells? We think ideas like these should be a part of all STEM curricula. And experts agree. The [Next Generation Science Standards](#), released for public discussion last week, ask teachers to show students how insights from many disciplines fit together into a coherent picture of the world. And we believe that incorporating more storytelling into science can help do this.

Research has shown that storytelling [activates the brain beyond mere word recognition](#). In 2006, researchers in Spain discovered that stories stimulate the brain and even change how we act in life. Last year, a team of researchers from Emory University reported in *Brain & Language* that similes and metaphors can activate sensory portions of the brain, and the Laboratory of Language Dynamics in France discovered that action words can stimulate the motor cortex. So if, as the recent study in *Psychological Science* shows, female students with high ability in both math and verbal areas tend to steer away from STEM careers, maybe it's time to bring more of those verbal skills into the STEM classes for the benefit of these students.



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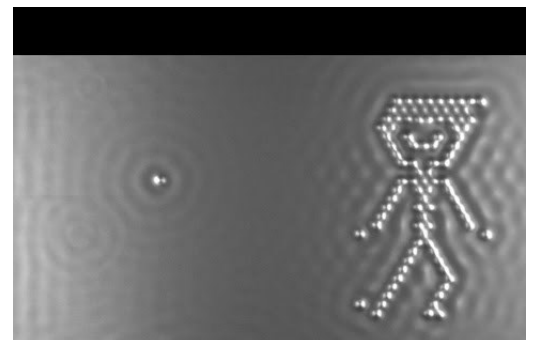
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The importance of storytelling in science has been growing over the last few years as scientists work to communicate with the general public and stimulate more critical thinking about important issues. Cornell University's Bruce Lewenstein, a professor of communication, leads an annual workshop to teach science storytelling to scientists. This year, the World Science Festival will include a special event called "Science & Story: The Art of Communicating Science Across All Media." Scientists recognize that science and storytelling are intertwined. Unfortunately, all too often students are introduced to science through uninspiring textbooks and fact-laden lectures by teachers who mean well but must stick to a curriculum dictated by standardized testing. In many of the schools from which we receive students, science has been relegated to a half-year curriculum or a few days per week. These teachers are faced with the challenge of squeezing the stories of science into textbook readings and workbook pages.

Think of a typical high school biology class. The advances in cellular biology over just the past five years could fill a book. Textbooks are outdated by the time they are printed. So instead of worrying about teaching students every fact about cell biology, why not embrace the stories of cellular biology and teach students to think like biologists? The Common Core Standards and the Next Generation Science Standards both ask teachers to help students dig deeper into fewer topics, but teach students to engage critically with science and technology. Biology teachers can do this by bringing reading and writing into their classroom. Rebecca Skloot's *The Immortal Life of Henrietta Lacks* tells the true story of a poor black farmer whose cells—taken without her consent in 1951—have become one of the most important tools in medicine. The cells helped in the development of the polio vaccine and are crucial to advances in cloning, gene mapping, in vitro fertilization, and much more. Reading the book can introduce students not just to cellular biology but also to issues like class, race, and bioethics. Instead of reading from a textbook they would be engaged and growing as global citizens who can think critically as they analyze the narrative of science rather than just the data.

History is full of examples of what we now call polymaths. We're familiar with Omar Khayyám, Leonardo da Vinci, and Benjamin Franklin. But what about Hypatia, Maria Gaetana Agnesi, or Hildegard of Bingen? The arts weren't subservient to the other STEM-related passions in any of these individuals. Instead, the arts and sciences were equally embraced with one fueling the other. If teachers taught STEM subjects through the lens of story we think many of those high-achieving girls with astronomical verbal scores might be more interested. It sure beats a pink microscope.

*Jonathan Olsen (@jonathanaolsen on Twitter) and Sarah Gross (@thereadingzone on Twitter) team-teach an integrated humanities, science, and technology program to ninth grade students at High Technology High School in Lincroft, New Jersey. High Technology is ranked the #1 STEM high school in the nation by U.S. News. Jonathan and Sarah are regular contributors to the New York Times Learning Network and their writing has appeared in Edutopia, ASCD, and The Washington Post's Answer Sheet. Sarah also helps teach a middle school science enrichment program through the STARS Challenge program at Monmouth University. Jonathan serves as his district's curriculum supervisor.*

More on the Next Generation Science Standards:

[States Say Evolution and Climate Change Should Be Taught in Schools](#)

[Will The New Science Standards Can Teach Young Earthers](#)

**About the Author:** Anna Kuchment edits the Advances news section for *Scientific American* and was previously a reporter, writer and editor with Newsweek magazine. Her first book, "The Forgotten Cure,"

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about bacteriophage viruses and their potential as weapons against antibiotic resistance, was just published by Copernicus Books/Springer. Follow on Twitter @akuchment.

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*The views expressed are those of the author and are not necessarily those of Scientific American.*

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### 1. antistokes

5:49 pm 04/16/2013

Also, the gal in the picture has her hair down in the lab. -1 for health and safety violation. -Dr. Stelling channeling her former life as a chemistry lab TA.

[Link to this](#)

### 2. Radioactive

2:50 pm 04/17/2013

Integration between subjects would be helpful for all students, not just girls with high scores. Helping students make connections between classes brings a more colorful light to the content, which will likely attract more students in general to STEM fields. Although integration would be great, with the current high stakes testing teachers are having a hard enough time covering the content demanded of them. Integration may exacerbate this problem by adding additional material, but it may also help by making the classes more engaging and increasing student motivation. I personally would like to see more integration, but I think it will be a long and difficult road before it is efficient and effective.

[Link to this](#)

### 3. philipdspace

7:15 pm 04/17/2013

So, what the article is really saying is we need STEAM not STEM.

We need science, technology, engineering, ARTS, and math.

(and for any doubters — go visit backstage at any major Broadway style theatre or movie set or TV set. They're leveraging tons of science, technology, engineering, and math in the service of the ARTS. They just do it so well, you don't notice it all.

[Link to this](#)

**4. jdavidsn1533**  
9:45 am 04/18/2013

In one of my Human Development science classes in college, I was assigned to read *The Immortal Life of Henrietta Lacks* and it was a much better alternative to the boring peer reviewed articles that we also were assigned to read. The combination of biology and a story of a family, made it easier to read and understand and was enjoyable to me. Also, during my freshman year of college, the huge science lecture classes I was enrolled in had more women than men, but as sophomore year came around, there were less women than men. After reading this article I have realized that this is a worldwide issue and not just a coincidence. The integration of storytelling and science would not be just beneficial to girls, I believe boys also would benefit from it because it overall makes things interesting.

[Link to this](#)

**5. sscoles**  
2:09 pm 04/18/2013

Leaving out stories/art from those like Kurt Vonnegut, MC Escher, Katherine Boo, David George Haskell, and HeLa cells seems also to be a problem of “leaving out modern thinkers and works.”

[Link to this](#)

**6. designr66**  
6:40 am 04/19/2013

STEAM has been gaining momentum for a few years now. There are several STEAM academies already in existence and at least 1-2 new ones per year. John Maeda, president of the Rhode Island School of Design (and former MIT Media lab head) is a big supporter.

The obvious answer to why STEAM is getting more popular is that quite simply, what are the practical applications of the STEM lessons if not to design a better world for everyone?

For some great STEAM links, please visit DESIGN-ED's website at <http://www.design-ed.org>

[Link to this](#)

**7. SamCaen**  
11:15 pm 04/22/2013

Integration has many important implications for not only female students who are underrepresented in the STEM field, but for all students across many disciplines. Literacy plays an extremely valuable role in all subjects, however, it is usually only English classes that develop and nurture literary skills. Unfortunately, proficiency in reading and writing in English class may not translate to scientific writing; literacy can be extremely domain-specific, and students who do not learn these skills are falling behind. This article certainly brings light to this issue: perhaps it is not the individual parts of a cell, or the different shapes of proteins, but the practical and ethical considerations biology has in everyday life that will engage students. Similarly, it no longer suffices to be able to recall countless specific scientific details. Students need to become readers and writers in all domains, because each

domain is extremely specific, and if a student wishes to pursue a career in a given field, it is essential that they have sufficient literacy skills in the area. And to get certain students to certain fields, we need to start making all classes, especially science and math, a more well-rounded experience.

[Link to this](#)

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**8. Wisarut**

8:09 pm 04/25/2013

In my opinion, storytelling seems to be a good idea to inspire the talented student to continue their study. Learning only STEM is pretty boring and if there are some incentives to attract their interest, perceive tangible benefits or understand real applications of science and technology, those students will be able to associate academic backgrounds and personal experiences from storytelling. For example, if we stay simply in the lab, do some biological experiments, analyze the data, we will not see what and how the outside world is moving forward. The accumulation of knowledge of science and technology is imperative, but tedious for a long life learning. As a result, teachers should introduce the essence of the experiment on why we need to do that and how the biological result can apply for humans and living things. They may see the documentary films or have a site visit in one course. I think for a long run this technique is going to benefit all of the talented students at large.

[Link to this](#)

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**9. erc65**

9:30 am 04/30/2013

As a few other commenters mentioned, it is important to note that integrating literature into STEM courses can be beneficial for all students, not just girls. Activating different areas of the brain that beyond just word recognition could change the way that all students engage in word learning. Additionally, incorporating literature can make science more engaging for students who are less interested in the subject. For instance, in a high school physics class I read the novel "Einstein's Dreams." It was a different way for to expose students to the theory of relativity and forced us to interact with the scientific concepts in a new way.

An issue that is often linked to underrepresentation of females in these subject areas (and is not mentioned in this article) is the idea of stereotype threat. That is, girls underperform because they worry that they will underperform and confirm a society's negative expectations of them in STEM fields.

Incorporation of literature could help to alleviate stereotype threat for some females, helping them to gain confidence in areas that they feel society says they are inferior in. Reshaping how science is taught could help eliminate the gap that exists.

[Link to this](#)

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**10. kmsteves**

6:28 pm 04/30/2013

Stereotypes and expectations that women are better suited for the humanities while men are better suited for STEM related fields, has permeated throughout society from the dawn of the Education institution. Growing up, I was told I "did not have to like math...girls are more verbal anyway." Many of my girl friends shared this sentiment, as well. I allowed myself to develop a distain for the complexities of science and math and, even though I had a good grasp on the subjects, I

convinced myself that science and math subjects were not meant for me—a girl that enjoyed reading and writing for hours on end. It is no wonder that girls today have antipathy toward science and math.

The main issue that surfaces in this article is related to the intelligent women who are less inclined, for whatever reason, to begin or stay in a STEM program through college. I do agree that integrating humanity-related activities in the science classes would enhance students' opportunities to engage with science on a whole new level. If teachers were to collaborate and treat science and math as connected subject, perhaps girls would be more likely to use their passions for humanities to understand science or view themselves as proficient, or advances, in scientific subjects. Along with storytelling, I think teachers should integrate different forms of the same material. For example, allowing students to read a book (narrative) about a biologist or a controversy could be helpful. Additionally, teachers can use modern social media or Internet sources (i.e. blogging) in order to allow students an opportunity to engage with the material in a way that is most used by their generation. Most importantly, students need to be presented with MORE opportunities to 'play with' scientific material, grapple with complex ideas, and engage in conversation about STEM issues and concepts.

[Link to this](#)

**11. cdhread**  
11:59 pm 04/30/2013

This article hits pretty close to home, as I (a girl) was successful in the STEM subjects I participated in in high school, but never felt like I wanted to pursue them (something I sometimes regret!) Math was my best subject and science made sense, but it was far from engaging. My biology class was centered on textbook chapters and units, and most of the work involved memorizing terms and processes. I felt so distanced from the material and would cram before an exam – only to forget everything the next day. Meanwhile I feel like I have learned a great deal about the human body from the show 'House' and even from books I've read and experiences I've had myself. I never learned more about the human body than when I came home from a trip one summer with food poisoning. Even though these other experiences in which I have learned about elements of STEM have been interesting, engaging experiences for me, I have always been turned off by STEM in the classroom.

I think this idea of storytelling has great potential for a solution. It puts the hard facts into a 'big picture.' It also helps make it clear that STEM is not a static field. As the article discussed, textbooks are out of date almost instantly... but they are never presented that way. I think girls – and even boys – might be more engaged if they are able to criticize and question more than the current curriculum allows. Girls language ability might be linked to a desire to interact with a subject – almost as a conversation.

The idea of 'storytelling' can be implemented not only through books and activities that involve both science classes and

English or Social Studies classes, but in a variety of other ways as well. Students might be more engaged with case studies, which do still require and help develop content knowledge, but also allow for 'thinking like a scientist.' Another alternative is partnerships with local organizations and firms so that students can complete internships or do job shadowing. Hearing from someone in the field – listening to their 'story' and the story of their work – might have a better chance of engaging students.

[Link to this](#)

12. s.gebre05  
11:00 pm 05/6/2013

While I agree with the author's position in that the arts should be better incorporated into science in order to provide more accessibility and entice more passion for students, I think there are also historical and traditional components that are at hand. The accessibility and passion that is seemingly not readily available for women when considering careers in the STEM field can also be attributed to the fact that society has largely "told" women that they are needed in other places (ex. domestic work, teaching, etc.). When trying to understand the dynamics of women in STEM fields, the ideologies behind what types of occupations are more suited for women comes from years and years of role play. In addition, I think stereotype threat is an important factor that plays a part in determining what fields women go into. If there is a negative stereotype associated with women going to the STEM field, less women may feel obligated to go that route, even if they're good at it.

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