# \* \* 1AC Inherency \* \*

### 1AC STEM – Inherency

#### STEM cuts coming now

Camera, Education reporter at U.S. News & World Report, May 25 2017

(Lauren, *U.S. News*, “STEM Funding Uncertain in Trump White House,” May 25, 2017, https://www.usnews.com/news/stem-solutions/articles/2017-05-25/funding-for-stem-programs-uncertain-in-trump-white-house, 27 June 2017, RV).

When it comes to boosting science, technology, engineering and math, the news from Washington isn't good. While the Trump administration has showed some signs of prioritizing [STEM](https://www.usnews.com/news/stem-solutions), federal programs that support STEM initiatives are on the chopping block under the president's recent budget proposal for fiscal year 2018.

That was the bottom line from panelists at the 2017 U.S. News STEM Solutions conference session titled "A Look at the Future of Federal STEM Policy." The annual forum is taking place in San Diego from May 24 to 26.

Among other things, the spending plan would eliminate entirely a $1.6 billion pool of money created under the new federal education law, the Every Student Succeeds Act, which state and local school districts can use for high-quality STEM courses, increased access to STEM for underserved populations, science fairs and specialty STEM schools, afterschool programs, among many other things.

The president's budget proposal would also ax federal spending on teacher preparation by $2.4 billion, money that school districts can use to recruit STEM educators and restructure pay scales for hard-to-fill jobs, which often include math and science teachers.

"That all sounds great, but unfortunately [those programs] might not happen with the budget," said Lindsey Gardner, director of external relations for the STEM Education Coalition. "We like to say flat funding is the new up with domestic spending. If you have flat funding then you're doing really well, but the president proposed large cuts this week."

# \* \* 1AC Plan & Solvency \* \*

### 1AC STEM – Plan

#### The United States federal government should substantially increase elementary and secondary education in science, education, engineering, and technology.

### 1AC STEM – Solvency

#### Federal commitment is crucial to STEM success

Holdren, Former White House science advisor, 2013

(John, National Science and Technology Council, “FEDERAL SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) EDUCATION 5-YEAR STRATEGIC PLAN,” May 2013, <https://www.whitehouse.gov/sites/whitehouse.gov/files/ostp/Federal_STEM_Strategic_Plan.pdf>, accessed 06/27/17, pg. 22-24, AS)

For each of the five priority STEM education investment areas, a set of strategic objectives has been identified as the focus for initial implementation of the Strategic Plan. These objectives have been developed with several considerations: they strive to be specific, so that progress and impact can be measured; they are meant to align with the strengths and assets of the designated lead agency and to allow for the significant role of collaborating agencies; and they represent areas where there is a clear responsibility for involvement of the Federal Government, with the realization that Federal investment will play only a part in achieving the intended impact. Implementation of the Strategic Plan will require commitment of the Administration, agency leadership, and legislative leaders in allocating the resources for the **collaboration**, **coordination**, and **evaluation** that will be necessary to realize these goals. Implementation also will require **oversight** and the development of more detailed **roadmaps** by lead and collaborating agencies over the coming months. CoSTEM will assist in this process. 5.1 Implementation of STEM Education Priority Investment Areas In order to make progress on the priority STEM education investment areas, lead and collaborating agencies will determine which features of current Federal investments could be adapted, modified, or leveraged in support of the coordinated activities of the lead agencies, and how. This collaborative process will ultimately determine how agencies can best create infrastructure in priority areas and how significant strengths and assets at collaborating agencies can be made available in conjunction with these efforts. This will require coordination of agency priorities and goals, statutory requirements, authorizing legislation, and available expertise and resources. Close collaboration among lead and collaborating agencies will be needed to maximize the opportunities to continue to meet any mission-specific needs. Preliminary implementation roadmaps are provided below for each of the five priority STEM education investment areas that, where appropriate, may help guide future budget planning and requests, mechanisms for investment, communication and outreach with stakeholder communities, and reassessment of evaluation plans and practices within each of the priority areas. The ability of agencies to implement the strategic objectives and to create common metrics will depend on agency capacity and will require financial commitments to ensure adequate capacity both at lead agencies, for design and oversight of programs, and at collaborating agencies, for asset identification and coordination functions. The implementation of the Strategic Plan will include a process for periodic examination of overall progress on all strategic objectives, with the expectation that some may be revised, and others will be added. Implementation Roadmap: Improve STEM Instruction IMPACT STATEMENT: Prepare 100,000 excellent new K-12 STEM teachers by 2020, and support the existing STEM teacher workforce. The education and development of teachers of STEM involves their pre-service preparation and also continuing professional development and learning opportunities over the course of their careers. The retention of teachers includes strategies that can involve school- and district-based resources and professional supports, meaningful community-based initiatives, and exciting opportunities to learn STEM and participate in authentic STEM research. Excellent STEM teachers know how to provide effective instruction and to inspire interest in these subjects so that their students understand STEM concepts and skills, and the Federal Government has a strategic role in providing learning and growth opportunities for the STEM teaching workforce. Background: Of all of the activities that occur within the formal and informal education systems, the interactions among teachers, learners, and the content is the primary determinant of student success in grades K-12. Research shows that top-performing teachers can make dramatic differences in student achievement and suggests that the impact of assigning students to top-performing teachers each year can significantly narrow achievement gaps.54, 55, 56, 57 Thus, the need to focus on improving STEM teaching is clear. The scale of K-12 STEM education is large. There are more than 3.6 million full-time teachers in the Nation’s elementary and secondary schools.58 Of these, about 500,000 teach at least one course in either mathematics or science at the middle- or high-school levels.59 Nationwide, there are about 2,800 universities and colleges that prepare teachers. These institutions are accredited by states or national organizations to certify teachers. Additionally, there are “alternative” programs to prepare teachers. According to the National Center for Alternative Certification, there are 136 state-defined alternate routes to teacher certification and about 600 alternate route programs that are implementing these options.60 Policies for teacher credentialing and continuing licensure are developed at the state level, as are standards for K-12 STEM curricula. The need for more STEM teachers is well documented,61 but the recruitment and retention of STEM teachers is challenging. States routinely list a lack of teachers in mathematics and the sciences as one of their most pressing labor shortages.62 The pre-service preparation of STEM teachers, activities that occur largely within individual institutions of higher education and are governed by state policies, does not compare favorably to the preparation of teachers in countries whose students show high levels of achievement in STEM.63 Additionally, there is continued debate on the specific STEM content that teachers need to be effective.64,65 The emerging field of discipline-based educational research (DBER) documents the difficulties of teaching undergraduate STEM courses for understanding and, along with PCAST’s Engage to Excel report, promotes widespread use of evidence-based instructional practices – including in undergraduate courses where future teachers are learning STEM content.66 And, as technologies that can support and improve classroom learning are readily available, teachers need to have opportunities to learn and use these exciting and powerful tools. Once teachers complete their initial preparation, local districts and schools plan and pay for the majority of their professional development activities, and much of this professional development is focused on general classroom and pedagogical issues rather than subject-specific topics. Federal investment in teacher professional development is, conservatively, only 9% of the total Federal STEM investment (Appendix A). The quality of this professional development ranges considerably, and research is limited about its impact on teachers’ effectiveness in enabling student learning. 67, 68, 69 In addition, CoSTEM agencies often offer a wide range of learning opportunities intended to inspire STEM teachers. In light of recent findings that access to learning opportunities and school supports are critical in keeping STEM teachers in classrooms,70 it is important that the professional development made available to teachers is connected to their day-to-day work, related to state standards (including the Common Core State Standards in Mathematics and the Next Generation Science Standards) and to the ongoing professional credentials that are required in states. Federal investments across lead and collaborating agencies alone cannot possibly reach all STEM teachers, or ensure that the offerings provided are compatible with the policies and practices of the states, districts, and schools where teachers are located. Thus, the focus for the Federal investments in teacher education, both pre-service and in-service, needs to be on building well-tested, replicable models that can be scaled or adapted across teacher education institutions, and at the level of states and districts for implementation, and providing infrastructure that can allow for scaling. These models can then be aligned with local policies and processes in ways that support teachers in their schools and classrooms. In addition, developing partnerships with local entities, local and regional science facilities that can support high quality STEM content, and the private sector will be especially critical. In his 2011 State of the Union address, President Obama called for a new effort to prepare 100,000 STEM teachers over the next decade with strong teaching skills and deep content knowledge. The President’s call built on key conclusions of the President’s Council of Advisors on Science and Technology (PCAST) - that teachers need to have enough content knowledge to link STEM to compelling real-world issues, model the process of scientific investigation, effectively address student misconceptions, and help their students learn to reason and solve problems like mathematicians, scientists and engineers.

# \* \* 1AC Science \* \*

### 1AC STEM – Science advantage

#### Trump education policy will promote scientific misinformation on issues like climate change – allows local repression of science education.

Gorman, Education World, Tweeted on November 29, 2016.

[Nicole, Education World contributor, <http://www.educationworld.com/a_news/how-will-donald-trump-impact-stem-education-667807267>, accessed 6-27-17, NW]

Fortunately, [The Scientific American](https://www.scientificamerican.com/article/how-president-elect-trump-views-science/" \t "_blank) asked Donald Trump’s campaign several questions about how he views science, and one of those questions touched specifically on science education in schools. [The question reads:](https://www.scientificamerican.com/article/how-president-elect-trump-views-science/" \t "_blank) American students have fallen in many international rankings of science and math performance, and the public in general is being faced with an expanding array of major policy challenges that are heavily influenced by complex science. How would your administration work to ensure all students including women and minorities are prepared to address 21st century challenges and, further, that the public has an adequate level of STEM literacy in an age dominated by complex science and technology? Trump’s campaign responded and gave all indication that Trump will not be following in Obama’s footsteps and implementing federal STEM initiatives. "Our top-down-one-size-fits-all approach to education is failing and is actually damaging educational outcomes for our children, “Trump’s campaign said. "If we are serious about changing the direction of our educational standing, we must change our educational models and allow the greatest possible number of options for educating our children. The management of our public education institutions should be done at the state and local level, not at the Department of Education.” While federal STEM initiatives seem unlikely, one thing Trump is very likely to do is affect how climate change science is taught in schools. Trump has made it clear that he falls in the camp of skeptics who believe more research needs to be done before climate change can viewed as fact. "There is still much that needs to be investigated in the field of 'climate change,'" Trump's campaign [said to the Scientific American](https://www.scientificamerican.com/article/how-president-elect-trump-views-science/" \t "_blank). This has angered many educators who cite 99 percent of the scientific community standing behind the fact that climate change is happening and who want to make sure they have the resources and support to teach their students the right thing. "It is more than possible that the sweeping Republican triumph at the national level may embolden local efforts to undermine the teaching of evolution and climate change. These are worrying signs for science education,” writes [National Center for Science Education (NCSE) Executive Director Ann Reid](https://ncse.com/blog/2016/11/what-election-means-ncse-0018403" \t "_blank).

#### Scientific literacy is weakening broadly in America

Gauchat, Assistant Professor of Sociology, University of Wisconsin-Milwaukee, 2015

(Gordon, “The Political Context of Science in the United States: Public Acceptance of Evidence-Based Policy and Science Funding,” Social Forces Journal, Volume 94 Issue 2, <https://academic.oup.com/sf/article-lookup/doi/10.1093/sf/sov040>, December 2015, accessed on 6/30/17, ATH)

Initial research on perceptions of science emphasized uneven science literacy in the general public and used gaps in knowledge to explain unfavorable opinions (see Bauer, Allum, and Miller 2007; Gauchat 2011; Wynne 1995 for reviews). Here, science literacy refers to the cultural knowledge a person would need to “comprehend and follow arguments about science and technology policy matters in the media” (Miller 1998, 206). This line of research has shown that a substantial portion of the public does not know about basic scientific facts or the essential principles of experimental methods (Miller 2004; National Science Foundation 2014). Consistent with what researchers call the “deficit model,” numerous studies have also found an association between science literacy and greater public acceptance of science (Allum et al. 2008; Durant, Evans, and Thomas 1992; Gauchat 2011; Sturgis and Allum 2004). Although often unclear, the main explanation for this finding is that individuals tend to be ambivalent, or even hostile, toward entities they do not adequately comprehend (i.e., due to a “deficit” of knowledge).

#### Warming proves – ignorance is an attitudinal barrier to policy action

Egan, Wilf Family Department of Politics, New York University, and Mullin, Nicholas School of the Environment at Duke University, 2017.

(Patrick and Megan, “Climate Change: US Public Opinion,” Annual Review of Political Science, Volume 20, February 17, 2017, accessed on 7/1/17, ATH)

Acknowledged by scientists and public affairs experts to be among the most challenging and troubling policy problems of our times, climate change is an issue about which the US public claims to be broadly aware. But despite an overwhelming scientific consensus about climate change’s causes and consequences, Americans remain divided over whether the problem even exists—and more so over what should be done to fix it. The public’s level of concern about climate change has not risen meaningfully over the past two decades, and addressing the problem with government action ranks among one of the lowest priorities for Americans. Here we review the relatively scant literature in political science on Americans’ attitudes about climate change, supplementing it with findings from psychology, sociology, communication studies, and other disciplines. We also provide an overview of opinion data on the multiple dimensions of belief, concern, and policy support in order to assess the evolution of the public’s response to this issue during a period of rapidly expanding scientific knowledge. Our review focuses on opinion, not behavior, and therefore does not address research on political participation related to climate change or personal actions aimed at reducing climate impact. Both the literature and the data support the disheartening conclusion that US public opinion— and the deadlocked American political structure more generally—is as deeply polarized on climate change as it is on other issues. The abstract, scientific nature of the issue amplifies the effect of elite driven polarization on mass attitudes. But unlike many other issues, polarization has not yielded much of a constituency for action on climate change. Even liberals and Democrats who accept climate change science and express concern about global warming’s effects rank the problem well below many other national priorities. This combination of polarization and low salience creates little incentive for national policy makers to advance major legislation to tackle the problem comprehensively. However, opportunities do exist for attitudes to motivate policy makers to take less substantial but still consequential actions as Americans begin to link climate change to extreme weather events and as states and localities respond to demands from their constituencies for better protection from climate change-related harm.

#### Federal STEM investment produces a stable research environment that’s key to scientific momentum – prerequisite to solving climate change and disease

Urry, American astrophysicist, who was from 2015–2016 the President of the American Astronomical Society, formerly on the Hubble space telescope faculty and was chair of the Department of Physics at Yale University 2007 ‘17

(Claudia, *CNN*, “Trump's proposed STEM budget cuts a grave mistake,” 7 June 2017, http://www.cnn.com/2017/06/07/opinions/trump-budget-cuts-for-science-urry/index.html, 1 July 2017, RV).

Ponder this every time you fire up your computer hard drive, or when a loved one receives life-saving cancer treatment -- both rely on Townes' lasers. In fact, today lasers are an essential part of modern telecommunications, guidance systems, computers, medical treatments (including surgery), civil construction, astronomy, weaponry, harnessing nuclear fusion for energy, and much, much more.

Estimates of the economic impact of lasers today run to trillions of dollars worldwide.

The message here? Revolutionary scientific discoveries can seem obscure and even unimportant when they are first made -- but can have enormous impact decades downstream, reaching into every part of our lives and rendering unimaginable a time when they were not there.

But they don't spring fully formed from the scientist's minds; they take time, sweat, passion, imagination -- and money.

Last month the Trump administration proposed devastating new cuts in funding for STEM research -- STEM stands for science, technology, engineering and mathematics. President Donald Trump's first full budget proposes to slash research dollars by nearly 17% for fiscal year 2018.

Hard hit would be programs at the National Science Foundation, Department of Energy, National Institutes of Health, Department of Defense, Environmental Protection Agency, National Oceanic and Atmospheric Administration and National Institute of Standards and Technology. In all, the cuts would strip $12.6 billion from researchers and research institutions.

Let's be clear: Scientists don't want or need handouts. Their students and research need support -- because America needs the results.

Townes' research on lasers was funded by the National Science Foundation and US Navy, not because of any immediate use for the technology but because of the importance of understanding the fundamental behavior of atoms and molecules.

Federal research funding is a long-term investment in our economic and national security. It pays for the equipment and grants that lead to big discoveries, such as the laser; it supports the training of graduate students and postdoctoral fellows, who are working in the research trenches to solve the challenges that lie ahead for humanity, from a changing climate to workforce productivity and threats to human health.

Many of the most important discoveries are not the result of directed research -- they come from scientists trying to understand how the world works. How does matter behave (atoms, molecules and more fundamental particles)? How do cells operate? Are asteroids a threat or a resource? What is the ultimate fate of the universe?

Since the 1970s, federal investment in research and development has been on a downward trend relative to the economic growth it has largely enabled. And over the past decade, budgets for STEM research and development have declined 10% in purchasing power.

But **scientific research requires continuity**. A perfect example of the long-term nature of STEM research is the theory of quantum mechanics, which describes the behavior of atoms and molecules. When it was being developed in the 1910s and '20s, this theory was pretty esoteric. But as Forbes magazine put it, "The entire computer industry is built on quantum mechanics."

Today, quantum mechanics powers most of the modern US economy and undergirds the future.

It's not rocket science: Politicians, economists and military leaders agree that investment in STEM is essential for the nation's economic prosperity and security. Top business leaders have joined universities and science groups to proclaim STEM investments a national imperative.

And Congress, with bipartisan support, recently increased research and development funding by 5% for this fiscal year, in the omnibus budget bill enacted last month.

So one might have been hopeful when just a few months ago, Trump celebrated the Hubble Space Telescope's exploration of the deep universe and looked forward to future discoveries from the James Webb Space Telescope, Hubble's successor.

I'm astrophysicist, and I was encouraged. His enthusiasm reminded me of how Hubble discoveries and other scientific research have inspired the next generation of scientists, whom I am helping to train.

But if the President truly wishes to see America "expand the frontiers of knowledge," his actions much match his words. We need to invest in science now -- not just at NASA but across all fields.

We need to support research across STEM disciplines and cast a wide net for discovery.

Today the United States benefits from federal investments in decades past. The negative effects of sharp disinvestment now might not be clear for decades, longer than the careers of most policymakers, industry leaders or researchers.

Yet our leadership and strong economy, our ability to save humanity from terrible crises depend on our choices today. Let's choose science.

#### Plan fights cuts – this is key to avoid R&D momentum loss.

U.S. DEPARTMENT OF COMMERCE, January 2012, “The Competitiveness and Innovative Capacity of the United States,” http://www.esa.doc.gov/sites/default/files/thecompetitivenessandinnovativecapacityoftheunitedstates.pdf

In the long run, scientific output will be, to a great extent, a function of the quantity and quality of individuals who are induced to choose science as a career. However, a quality scientific education takes a long time, so **rapid increases** in public funding in particular fields, **followed by sharp cutbacks**, can negatively affect the career prospects of young doctorates in the field and discourage younger students who might consider going on to the next level of training (see box 3.4). Stable funding would help ensure that the nation receives the full benefit of its long run investments in R&D.

#### Warming causes extinction – scientific consensus – outweighs all impacts.

Terry **Deibel,** Prof IR @ National War College, 2007. “Foreign Affairs Strategy: Logic for American Statecraft,” Conclusion: American Foreign Affairs Strategy Today

**Finally, there is one major existential threat to American security (as well as prosperity) of a nonviolent nature, which, though far in the future, demands urgent action. It is the threat of global warming to the stability of the climate upon which all earthly life depends. Scientists worldwide have been observing the gathering of this threat for three decades now, and what was once a mere possibility has passed through probability to near certainty. Indeed not one of more than 900 articles on climate change published in refereed scientific journals from 1993 to 2003 doubted that anthropogenic warming is occurring. “In legitimate scientific circles,” writes Elizabeth Kolbert, “it is virtually impossible to find evidence of disagreement over the fundamentals of global warming.” Evidence from a vast international scientific monitoring effort accumulates almost weekly,** as this sample of newspaper reports shows: an international panel predicts “brutal droughts, floods and violent storms across the planet over the next century”; climate change could “literally alter ocean currents, wipe away huge portions of Alpine Snowcaps and aid the spread of cholera and malaria”; “glaciers in the Antarctic and in Greenland are melting much faster than expected, and…worldwide, plants are blooming several days earlier than a decade ago”; “rising sea temperatures have been accompanied by a significant global increase in the most destructive hurricanes”; “NASA scientists have concluded from direct temperature measurements that 2005 was the hottest year on record, with 1998 a close second”; “Earth’s warming climate is estimated to contribute to more than 150,000 deaths and 5 million illnesses each year” as disease spreads; “widespread bleaching from Texas to Trinidad…killed broad swaths of corals” due to a 2-degree rise in sea temperatures. “The world is slowly disintegrating,” concluded Inuit hunter Noah Metuq, who lives 30 miles from the Arctic Circle. “They call it climate change…but we just call it breaking up.” From the founding of the first cities some 6,000 years ago until the beginning of the industrial revolution, carbon dioxide levels in the atmosphere remained relatively constant at about 280 parts per million (ppm). At present they are accelerating toward 400 ppm, and by 2050 they will reach 500 ppm, about double pre-industrial levels. Unfortunately, atmospheric CO2 lasts about a century, so there is no way immediately to reduce levels, only to slow their increase, we are thus in for significant global warming; the only debate is how much and how serous the effects will be. As the newspaper stories quoted above show, we are already experiencing the effects of 1-2 degree warming in more violent storms, spread of disease, mass die offs of plants and animals, species extinction, and threatened inundation of low-lying countries like the Pacific nation of Kiribati and the Netherlands at a warming of 5 degrees or less the Greenland and West Antarctic ice sheets could disintegrate, leading to a sea level of rise of 20 feet that would cover North Carolina’s outer banks, swamp the southern third of Florida, and inundate Manhattan up to the middle of Greenwich Village. Another catastrophic effect would be the collapse of the Atlantic thermohaline circulation that keeps the winter weather in Europe far warmer than its latitude would otherwise allow. Economist William Cline once estimated the damage to the United States alone from moderate levels of warming at 1-6 percent of GDP annually; severe warming could cost 13-26 percent of GDP. But the most frightening scenario is runaway greenhouse warming, based on positive feedback from the buildup of water vapor in the atmosphere that is both caused by and causes hotter surface temperatures. Past ice age transitions, associated with only 5-10 degree changes in average global temperatures, took place in just decades, even though no one was then pouring ever-increasing amounts of carbon into the atmosphere. **Faced with this specter, the best one can conclude is that “humankind’s continuing enhancement of the natural greenhouse effect is akin to playing Russian roulette with the earth’s climate and humanity’s life support system. At worst, says physics professor Marty Hoffert of New York University, “we’re just going to burn everything up; we’re going to heat the atmosphere to the temperature it was in the Cretaceous when there were crocodiles at the poles, and then everything will collapse.” During the Cold War, astronomer Carl Sagan popularized a theory of nuclear winter to describe how a thermonuclear war between the United States and the Soviet Union would not only destroy both countries but possibly end life on this planet. Global warming is the post-Cold War era’s equivalent of nuclear winter at least as serious and considerably better supported scientifically. Over the long run it puts dangers from terrorism and traditional military challenges to shame. It is a threat not only to the security and prosperity to the United States, but potentially to the continued existence of life on this planet.**

#### Disease causes extinction, too

Kerscher 14 – professor and management consultant (Karl-Heinz, “Space Education”, Wissenschaftliche Studie, 2014, 92 Seiten)

The death toll for a pandemic is equal to the virulence, the deadliness of the pathogen or pathogens, multiplied by the number of people eventually infected. It has been hypothesized that there is an upper limit to the virulence of naturally evolved pathogens. This is because a pathogen that quickly kills its hosts might not have enough time to spread to new ones, while one that kills its hosts more slowly or not at all will allow carriers more time to spread the infection, and thus likely out-compete a more lethal species or strain. This simple model predicts that if virulence and transmission are not linked in any way, pathogens will evolve towards low virulence and rapid transmission. However, this assumption is not always valid and in more complex models, where the level of virulence and the rate of transmission are related, high levels of virulence can evolve. The level of virulence that is possible is instead limited by the existence of complex populations of hosts, with different susceptibilities to infection, or by some hosts being geographically isolated. The size of the host population and competition between different strains of pathogens can also alter virulence. There are numerous historical examples of pandemics that have had a devastating effect on a large number of people, which makes the possibility of global pandemic a realistic threat to human civilization.

#### U.S. federal funding for STEM is modeled internationally.

National Science Foundation 16**,** independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense, January 19, 2016 (“U.S. science and technology leadership increasingly challenged by advances in Asia”, *National Science Foundation*, Accessed Online at: <https://www.nsf.gov/news/news_summ.jsp?cntn_id=137394> , Accessed on 06-27-2017)

**"Other countries see how U.S. investments in R&D and higher education have paid off for our country and are working intensively to build their own scientific capabilities. They understand that scientific discovery and human capital fuel knowledge- and technology-intensive industries and a nation's economic health,"** said Dan Arvizu, NSB chair. **Federal commitment wavering** At the same time that China and South Korea have continued to increase their R&D investments, the United States' longstanding commitment to federal government-funded R&D is wavering. In 2013, government funded R&D accounted for 27 percent of total U.S. R&D and was the largest supporter (47 percent) of all U.S. basic research. *Indicators* shows that Federal investment in both academic and business sector R&D has declined in recent years, reflecting the effects of the end of the investments of ARRA (American Recovery and Reinvestment Act), the advent of the Budget Control Act, and increased pressure on the discretionary portion of the federal budget. Since the Great Recession, substantial, real R&D growth annually -- ahead of the pace of U.S. GDP -- has not returned. Inflation-adjusted growth in total U.S. R&D averaged only 0.8 percent annually over the 2008-13 period, behind the 1.2 percent annual average for U.S. GDP. "Decreased federal investment is negatively impacting our nation's research universities," said Kelvin Droegemeier, NSB vice chair and vice president for research at the University of Oklahoma. "Our universities conduct 51 percent of the nation's basic research and train the next generation of STEM-capable workers. Federal support is essential to developing the new knowledge and human capital that allows the U.S. to innovate and be at the forefront of S&T." **Americans support science** Despite ongoing challenges with federal investment in R&D, Americans have generally favorable views toward science, believing that science creates more opportunity for the next generation, that its benefits outweigh its risks, and that the federal government should provide funds for scientific research. Additionally, despite declining public confidence in most U.S. institutions, Americans' confidence in the scientific community remains strong. However, Americans take a dim view of our nation's performance in K-12 science, technology, engineering, and mathematics (STEM) education; most believe other countries are doing a better job. About half of Americans worry that science is making life "change too fast," up from about one-third who expressed this concern a decade ago. Americans remain divided on global warming, an issue that science informs but which cultural and other factors also heavily influence. However, a majority of Americans say they would prefer a focus on alternative energy sources over fossil fuel development. Eight out of ten say they would like to see more emphasis on fuel efficiency standards for vehicles and renewable energy development**. "Our country's commitment to investing in R&D and in our higher education institutions has and continues to fuel our success," said NSB chair Arvizu. "Other countries are emulating our model.** **We can view these advancements as opportunities for our global society to tackle complex problems, such as energy demands, food and water security, and disease. At the same time, we need to remain steadfast in our nation's dedication to that which has served us so well: investing in people and their ideas."**

#### STEM increases civic scientific literacy and supports democratic participation in public policy – exporting science exports democracy.

Süerdem, Professor of Business at Istanbul Bilgi University, and Çağlıyor, Halic University, 2016

The low levels of scientific literacy among the general public in a society where technology penetrates all aspects of everyday life creates major citizenship problems. One of the main goals of education is increasing the civic scientific literacy of the citizens besides preparing students for science based vocations. Well educated human capital stock is important for informed decision making as well as the development of research and development activities. The quality of policy decisions is highly dependent on the level of interest, information and attitudes towards S&T. Making conscious decisions about S&T related developments is substantial for democratic participation of the public to policy making. Increasing complexity of science and technology related issues creates a gap between expert and citizen knowledge. Scientific literacy decreases this gap in terms of creating a knowledgeable approach to the controversies around scientific issues.

#### International democracy prevents war and underpins global cooperation and economic stability

Kroenig, Associate Professor in the Department of Government and the Edmund A. Walsh School of Foreign Service at Georgetown, 2015

(Matthew, “Why Democracies Dominate,” The National Interest, July/Aug 2015, Proquest, accessed on 7/1/17, ATH)

Modern scholarship is also supportive of the idea that democracies are bound to lead. Economists Daron Acemoglu, Simon Johnson and James A. Robinson have shown that states with inclusive economic institutions, those that provide "security of property rights and relatively equal access to economic resources to a broad cross-section of society," grow at more rapid rates than their exclusive competitors. They argue that states that exclude large segments of their population from growth-enhancing activity will do worse than those that do not. Moreover, a state's choice of economic institutions is, in turn, heavily shaped by its political institutions. Countries with inclusive political institutions (i.e., democracies) are more likely to produce good economic institutions because those in power come from a broader cross section of society and, therefore, have incentives to protect the economic interests of society at large. In addition, constraints on executive power allow rulers to credibly commit to protecting individual property rights, which encourages citizens to engage in long-term planning, investment and economic activity. Not only do democracies grow at faster rates, but they are also better able to borrow when times get tough. Kenneth Schultz and Barry Weingast have shown that democracies are more likely to become financial powerhouses because they are more trustworthy. Whereas autocrats can arbitrarily default on their nation's debt, for example, democratic executives are constrained by domestic legislatures, courts and economic interests with access to the political system. This makes it easier for them to attract capital and to float large loans at lower rates of interest. The democratic advantage extends beyond the economic sphere, however, into political-military matters. Political scientists think that democratic leaders are reluctant to shirk their alliance commitments because they fear the reputational costs at home and abroad. For this reason, democracies form larger, more durable and more reliable alliances. NATO is only the most prominent recent example. In addition, the well-known democratic-peace theory holds that democracies are less likely to fight wars (at least against other democracies). More importantly, they have a better chance of winning the wars they fight. Indeed, since 1815, democracies have won a whopping 77 percent of their conflicts, compared to only 45 percent for autocracies. Political scientists such as Dan Reiter and Allan Stam postulate that democracies are more effective in warfare because their leaders benefit from the free flow of information and, with an eye to the ballot box, they are less likely to get caught up in disputes they might lose. Others extol the virtues of democracies' superior soldiers, civilian-controlled militaries and stronger alliances. Of course, as in any academic field, the findings reviewed above are subject to debate. Nevertheless, where there is smoke there is fire, and there is more than enough reason to believe that there is something different about democracies. Moreover, the likely advantages held by democracies are far from trivial. Rather, they go to the heart of a state's ability to maintain and accrue power in an anarchic international system. In his classic book War and Change in World Politics, Robert Gilpin argues that "differential rates of economic growth" are the key determinant of power transitions among the great powers. Centrality to international capital markets is another important resource. The ability to borrow allows states to finance arms buildups and large wars in excess of normal revenue. In addition, easy access to credit allows states to engage in "tax smoothing," financing extraordinary expenditures through debt rather than through tax increases, which reduces economic and societal disruptions. The Dutch Republic provides an example of a country that was able to rise to geopolitical prominence in the seventeenth century in large part due to its ability to obtain cheap credit. Alliance politics are another central feature of international political competition. Strong alliances allow states to share defense burdens, securely engage in long-range strategic planning and deter international conflict. Shifting and unreliable alliances, on the one hand, or relative isolation, on the other, deprive states of these advantages and have been identified as a source of insecurity. Finally, and most obviously, states that win wars are better able to accumulate power than those that lose them. Nations victorious in war can reduce threats to their security and can gain political influence and access to resources that enable them to improve their international position. In contrast, losing a war disastrously may be the most direct way in which a state can squander its standing. In 1941, for example, Germany possessed 20 percent of world power (according to the Correlates of War Project's Composite Index of National Capabilities, a common measure used by political scientists, which aggregates information on economic, demographic and military resources), but by 1945, following its catastrophic defeat in World War II, Germany's share of global power plummeted to a mere 8 percent. Over the same time period, however, the leader of the victorious alliance in World War II, the United States, saw its share of global power increase by 14 percentage points. As Paul Kennedy writes, "The triumph of any one Great Power . . . or the collapse of another, has usually been the consequence of lengthy fighting by its armed forces." Taking these arguments a step further, it is not much of a leap to contend that states that excel in key economic and political-military dimensions should also do better in long-run geopolitical competitions. It seems intuitive that states that grow at rapid rates, enjoy easy credit, forge strong alliances, and avoid conflict while winning the wars they do fight will do better than states that do the opposite. In sum, democracies enjoy a built-in advantage in the struggle for global mastery.

#### K-12 STEM boosts science diplomacy

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How can we advance the STEM agenda to enhance the quality of life in the US and abroad? Is there a role for diplomacy in this process? STEM experts working in science diplomacy require competencies and skill sets which enable them to effectively inform government officials who are involved in policy development. The stereotype of a STEM scientist as an ivory tower academic, generating theories removed from practical application, is no longer relevant. Science has become exceedingly complex and multidisciplinary, and the scientific enterprise must address the need to collaborate, perhaps through team science efforts, to cure disease through translational or applied approaches (physicists have long recognized this need). Academic medical centers in the US are now promoting interdisciplinary collaborations to address various diseases to a much greater extent than they were in previous decades, with the aim of more quickly converting biological discoveries into marketable products. To internationally market these products, diplomats (e.g. health attachés) who can assist in negotiations involving intellectual-property rights or bilateral agreements and can strengthen collaborations and broker STEM deals between countries. This requires an attaché who can combine the challenges of STEM research with the challenges of science diplomacy. It is also recognized by academic institutions and the US government alike that the US has fallen behind in crucial areas related to STEM education. If our policymakers are addressing our technological challenges, it is paramount to include in any list of priorities the necessity for better training and exposure of American students to the STEM disciplines. (STEM education and training encompasses curricula and didactic teaching methods used from grades K-12 to graduate/professional schools as well as parent-teacher outreach).

#### Science diplomacy good – solves every impact

STATEMENT OF DR. NINA V. FEDOROFF, SCIENCE AND TECHNOLOGY ADVISOR TO THE SECRETARY OF STATE, U.S. DEPARTMENT OF STATE; ADMINISTRATOR OF USAID APRIL 2, 2008. HEARING BEFORE THE SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION COMMITTEE ON SCIENCE AND TECHNOLOGY HOUSE OF REPRESENTATIVES ONE HUNDRED TENTH CONGRESS SECOND SESSION https://www.gpo.gov/fdsys/pkg/CHRG-110hhrg41470/html/CHRG-110hhrg41470.htm

Science by its nature facilitates diplomacy because it strengthens political relationships, embodies powerful ideals, and creates opportunities for all. The global scientific community embraces principles Americans cherish: transparency, meritocracy, accountability, the objective evaluation of evidence, and broad and frequently democratic participation. Science is inherently democratic, respecting evidence and truth above all. Science is also a common global language, able to bridge deep political and religious divides. Scientists share a common language. Scientific interactions serve to keep open lines of communication and cultural understanding. As scientists everywhere have a common evidentiary external reference system, members of ideologically divergent societies can use the common language of science to cooperatively address both domestic and the increasingly trans-national and global problems confronting humanity in the 21st century. There is a growing recognition that science and technology will increasingly drive the successful economies of the 21st century. Science and technology provide an immeasurable benefit to the U.S. by bringing scientists and students here, especially from developing countries, where they see democracy in action, make friends in the international scientific community, become familiar with American technology, and contribute to the U.S. and global economy. For example, in 2005, over 50 percent of physical science and engineering graduate students and postdoctoral researchers trained in the U.S. have been foreign nationals. Moreover, many foreign-born scientists who were educated and have worked in the U.S. eventually progress in their careers to hold influential positions in ministries and institutions both in this country and in their home countries. They also contribute to U.S. scientific and technologic development: According to the National Science Board's 2008 Science and Engineering Indicators, 47 percent of full-time doctoral science and engineering faculty in U.S. research institutions were foreign-born. Finally, some types of science--particularly those that address the grand challenges in science and technology--are inherently international in scope and collaborative by necessity. The ITER Project, an international fusion research and development collaboration, is a product of the thaw in superpower relations between Soviet President Mikhail Gorbachev and U.S. President Ronald Reagan. This reactor will harness the power of nuclear fusion as a possible new and viable energy source by bringing a star to Earth. ITER serves as a symbol of international scientific cooperation among key scientific leaders in the developed and developing world--Japan, Korea, China, E.U., India, Russia, and United States--representing 70 percent of the world's current population. The recent elimination of funding for FY08 U.S. contributions to the ITER project comes at an inopportune time as the Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project had entered into force only on October 2007. The elimination of the promised U.S. contribution drew our allies to question our commitment and credibility in international cooperative ventures. More problematically, it jeopardizes a platform for reaffirming U.S. relations with key states. It should be noted that even at the height of the cold war, the United States used science diplomacy as a means to maintain communications and avoid misunderstanding between the world's two **nuclear powers**--the Soviet Union and the United States. In a complex multi-polar world, relations are more challenging, the **threats** perhaps greater, and **the need for engagement more paramount**. Using Science Diplomacy to Achieve National Security Objectives The welfare and stability of countries and regions in many parts of the globe require a concerted effort by the developed world to address the causal factors that render countries fragile and cause states to fail. Countries that are unable to defend their people against starvation, or fail to provide economic opportunity, are susceptible to extremist ideologies, autocratic rule, and abuses of human rights. As well, the world faces common threats, among them **climate change**, **energy and water shortages**, public **health emergencies**, **environmental degradation**, **poverty**, **food insecurity**, and religious extremism. These threats can undermine the national security of the United States, both directly and indirectly. Many are blind to political boundaries, becoming regional or global threats. The United States has no monopoly on knowledge in a globalizing world and the scientific challenges facing humankind are enormous. Addressing these common challenges demands common solutions and necessitates **scientific cooperation**, common standards, and common goals. We must increasingly harness the power of American ingenuity in science and technology through strong partnerships with the science community in both academia and the private sector, in the U.S. and abroad among our allies, to advance U.S. interests in foreign policy. There are also important challenges to the ability of states to supply their populations with sufficient food. The still-growing human population, rising affluence in emerging economies, and other factors have combined to create unprecedented pressures on global prices of staples such as edible oils and grains. Encouraging and promoting the use of contemporary molecular techniques in crop improvement is an essential goal for U.S. science diplomacy. An essential part of the war on **terrorism** is a war of ideas. The creation of economic opportunity can do much more to combat the rise of fanaticism than can any weapon. The war of ideas is a war about rationalism as opposed to irrationalism. Science and technology put us firmly on the side of rationalism by providing ideas and opportunities that improve people's lives. We may use the recognition and the goodwill that science still generates for the United States to achieve our diplomatic and developmental goals. Additionally, the Department continues to use science as a means to reduce the proliferation of the weapons of mass destruction and prevent what has been dubbed `brain drain.' Through cooperative threat reduction activities, former weapons scientists redirect their skills to participate in peaceful, collaborative international research in a large variety of scientific fields. In addition, new global efforts focus on improving **biological, chemical, and nuclear security** by promoting and implementing best scientific practices as a means to enhance security, increase global partnerships, and create sustainability.

# \* \* 1AC Hegemony \* \*

### 1AC STEM – Hegemony advantage

#### Trump budget cuts kill science education and destroys competitiveness—federal investment crucial to innovation and productivity

Kennedy, former chief economist for the U.S. Department of Commerce and senior fellow at the Information Technology and Innovation Foundation, 2017

(Joe, ITIF, “First Look at Trump Budget Isn’t Pretty: It Cuts Critical Investment, Eliminates Vital Programs,” <https://itif.org/publications/2017/03/16/first-look-trump-budget-isnt-pretty-it-cuts-critical-investment-eliminates>, 03/16/2017, accessed 06/28/2017, AS)

The Trump administration today released [the first document](https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/2018_blueprint.pdf" \t "_blank) of its proposed budget for the 2017-18 fiscal year. The document only covers discretionary programs (those with funding that regularly runs out unless Congress votes to give them new money). Still to come are proposals for mandatory spending, which makes up roughly 70 percent of all spending, and proposals for all of the revenue sources. But the preliminary evidence suggests that the administration is taking its cues from a [deeply flawed framework](https://itif.org/publications/2017/02/27/bad-blueprint-why-trump-should-ignore-heritage-plan-gut-federal-investment) put forward by the Heritage Foundation. It is proposing to slash federal investments in critical areas that contribute significantly to economic growth. The immediate takeaway is that the Trump administration is advocating a huge increase in defense spending, which it proposes to pay for with large cuts to almost all other federal departments. In doing this, the budget would significantly shift spending away from public investment in education, research, and infrastructure, among other areas. This matters because these kinds of investments are essential for faster economic growth, and without that, living standards will stagnate. The reality is that if the United States is going to successfully manage its growing financial problems and improve living standards for all Americans, it needs to increase its investment in the primary drivers of innovation, productivity, and competitiveness. The Trump budget goes in the opposite direction. If these cuts were to be enacted, they would signal the end of the American century as a global innovation leader. America’s lead in science and technology was built on the fact that in the 1960s the U.S. government alone invested more in R&D than the rest of the world combined, business and government. The Trump budget throws this great legacy away and puts the country on a path to being an economy that is a “hewer of wood and drawer of water.” Although the budget does not contain enough detail to see what would happen to every individual program, such as the Defense Advanced Research Projects Agency (DARPA), it does mention many that are important for innovation, productivity, and competitiveness. For example, it would eliminate funding for the Overseas Private Investment Corporation and the U.S. Trade and Development Agency, both of which help U.S. exporters compete in foreign markets. Also gone are the Manufacturing Extension Partnership (MEP) program, which helps disseminate technology and management improvements to small- and medium-sized manufacturing companies. In education, the president would eliminate more than 20 programs, including the Teacher Quality Partnership and Impact Aid Support Payments for Federal Property, dumping more of the burden of improving education onto states and localities. In research, the administration proposes to eliminate ARPA-E, just as new energy technologies are becoming competitive with traditional sources, on the specious premise that “the private sector is better positioned to finance disruptive energy research and development and to commercialize innovative technologies.” The Department of Energy’s Office of Science would lose $900 million, or nearly 20 percent of its funding. The budget cuts funding for the National Institutes of Health, perhaps the world’s premiere medical research facilities, by over 18 percent. This accompanies cuts of 40 percent in the science programs at the Environmental Protection Agency and 26 percent for the research arm at the National Oceanic and Atmospheric Administration. Although the budget does not mention the National Science Foundation, cuts there also seem probable. Since these agencies fund a great deal of research in universities, cuts to them may prematurely end many careers among the next generation of research scientists. The federal government does a lot of things that contribute to economic growth. Key among these are funding education, supporting research, and building infrastructure. Although some of this is also done at the state and local levels and in the private sector, federal involvement often plays a big role in encouraging additional spending from other sources. In the absence of contrary evidence, there is no reason to think that a reduction in federal funding will be made up by higher spending somewhere else. Indeed, withdrawing the federal government from some of its core responsibilities may cause others to also cut back their investment because they anticipate slower growth and fewer opportunities going forward. Any spending cuts will slow economic growth in the short-run. However, cuts in the government’s efforts to boost innovation and investment have a more lasting effect because they also eliminate the contributions to higher growth that are the result of this spending. ITIF has already outlined [a plan](http://www2.itif.org/2014-innovation-competitiveness-approach-deficit-reduction.pdf) for cutting the deficit while still protecting federal efforts to boost innovation and competitiveness.

#### Locking in early STEM jump-starts American industry – business leaders follow the plan’s signal by creating jobs

John Engler, Contributor | June 15, 2012. “STEM Education Is the Key to the U.S.'s Economic Future,” https://www.usnews.com/opinion/articles/2012/06/15/stem-education-is-the-key-to-the-uss-economic-future

The hardest jobs to fill were skilled positions, including well-compensated blue collar jobs like machinists, operators, and technicians, as well as engineering technologists and sciences. As Raytheon Chairman and CEO William Swanson said at a Massachusetts' STEM Summit last fall, "Too many students and adults are training for jobs in which labor surpluses exist and demand is low, while high-demand jobs, particularly those in STEM fields, go unfilled." STEM-related skills are not just a source of jobs, they are a source of jobs that pay very well. A report last October from the Georgetown University Center on Education and the Workforce found that 65 percent of those with Bachelors' degrees in STEM fields earn more than Master's degrees in non-STEM occupations. In fact, 47 percent of Bachelor's degrees in STEM occupations earn more than PhDs in non-STEM occupations. But despite the lucrative potential, many young people are reluctant to enter into fields that require a background in science, technology, engineering, or mathematics. In a recent study by the Lemselson-MIT Invention Index, which gauges innovation aptitude among young adults, 60 percent of young adults (ages 16 to 25) named at least one factor that prevented them from pursuing further education or work in the STEM fields. Thirty-four percent said they don't know much about the fields, a third said they were too challenging, and 28 percent said they were not well-prepared at school to seek further education in these areas. This is a problem—for young people and for our country. We need STEM-related talent to compete globally, and we will need even more in the future. It is not a matter of choice: For the United States to remain the global innovation leader, we must **make the most of all of the potential STEM talent** this country has to offer. Government can play a critical part. President Barack Obama's goal of 100,000 additional science, technology, engineering, and math teachers is laudable. The president's STEM campaign leverages mostly private-sector funding. Called Educate to Innovate, it has spawned Change the Equation, whose study was cited above. A nongovernmental organization, Change the Equation was set up by more than 100 CEOs, with the cooperation of state governments and educational organizations and foundations to align corporate efforts in STEM education. Meanwhile, from June 27 to 29, U.S. News will draw together, for the first time, hundreds of business executives, educators, policymakers, government officials, technology experts, philanthropists, community leaders, and association chiefs to develop solutions to the jobs crisis in the STEM fields. This public-private cooperation is an example of business's recognition of the importance of STEM to our economic future. **Business needs a talent pipeline** providing the skilled employees who can routinely use scientific and technological skills in their jobs. Fortunately, more and more companies and their senior executives recognize this and are putting their money where their long-term interests are. For America, improving achievement in science, technology, engineering, and math will go a long way to ensuring that our country can compete globally, **create jobs**, and achieve the levels of economic growth that will buttress Americans' standard of living and social safety net. High-quality STEM education represents an opportunity that students, workers, educators, and business **must seize** if we are to keep the country strong.

#### We solve fast – high school education triggers a wave of innovation – empirically proven

U.S. DEPARTMENT OF COMMERCE, January 2012, “The Competitiveness and Innovative Capacity of the United States,” http://www.esa.doc.gov/sites/default/files/thecompetitivenessandinnovativecapacityoftheunitedstates.pdf

Innovation is the key driver of competitiveness, wage and job growth, and long‐ term economic growth. Therefore, one way to approach the question of how to improve the competitiveness of the United States is to look to the past and examine the factors that helped **unleash** the **tremendous innovative potential** of the private sector. Among these factors, three pillars have been key: Federal support for basic research, education, and infrastructure. Federally supported research laid the groundwork for the integrated circuit and the subsequent computer in‐ dustry; the Internet; and advances in chemicals, agriculture, and medical science. Millions of workers can trace their industries and companies back to technologi‐ cal breakthroughs funded by the government. The U.S. educational system in the 20th century produced increasing numbers of high school and college graduates, more so than anywhere else in the world. These highly skilled workers, in turn, **boosted innovation**. The transformation of infrastructure in the 20th century was nothing short of amazing: the country became electrified, clean water became widely available, air transport became ubiquitous, and the interstate highway system was planned and constructed. All of these developments helped busi‐ nesses compete by opening up markets and keeping costs low.

#### Competitiveness is key to hegemony

Khalilzad, fellow at RAND, 95

(Zalmay, “Losing the moment? The United States and the World after the Cold War?” Washington Quarterly Vol 18 no 2 Spring)

The United States is unlikely to preserve its military and technological dominance if the U.S. economy declines seriously. In such an environment, the domestic economic and political base for global leadership would diminish and the United States would probably incrementally withdraw from the world, become inward-looking, and abandon more and more of its external interests. As the United States weakened, others would try to fill the Vacuum.

To sustain and improve its economic strength, the United States must maintain its technological lead in the economic realm. Its success will depend on the choices it makes. In the past, developments such as the agricultural and industrial revolutions produced fundamental changes positively affecting the relative position of those who were able to take advantage of them and negatively affecting those who did not. Some argue that the world may be at the beginning of another such transformation, which will shift the sources of wealth and the relative position of classes and nations. If the United States fails to recognize the change and adapt its institutions, its relative position will necessarily worsen.

#### Hegemonic decline causes great power war

Zhang et al., Carnegie Endowment researcher, 2011

(Yuhan, “America’s decline: A harbinger of conflict and rivalry”, 1-22, <http://www.eastasiaforum.org/2011/01/22/americas-decline-a-harbinger-of-conflict-and-rivalry/>, ldg)

This does not necessarily mean that the US is in systemic decline, but it encompasses a trend that appears to be negative and perhaps alarming. Although the US still possesses incomparable military prowess and its economy remains the world’s largest, the once seemingly indomitable chasm that separated America from anyone else is narrowing. Thus, the global distribution of power is shifting, and the inevitable result will be a world that is less peaceful, liberal and prosperous, burdened by a dearth of effective conflict regulation. Over the past two decades, no other state has had the ability to seriously challenge the US military. Under these circumstances, motivated by both opportunity and fear, many actors have bandwagoned with US hegemony and accepted a subordinate role. Canada, most of Western Europe, India, Japan, South Korea, Australia, Singapore and the Philippines have all joined the US, creating a status quo that has tended to mute great power conflicts. However, as the hegemony that drew these powers together withers, so will the pulling power behind the US alliance. The result will be an international order where power is more diffuse, American interests and influence can be more readily challenged, and conflicts or wars may be harder to avoid. As history attests, power decline and redistribution result in military confrontation. For example, in the late 19th century America’s emergence as a regional power saw it launch its first overseas war of conquest towards Spain. By the turn of the 20th century, accompanying the increase in US power and waning of British power, the American Navy had begun to challenge the notion that Britain ‘rules the waves.’ Such a notion would eventually see the US attain the status of sole guardians of the Western Hemisphere’s security to become the order-creating Leviathan shaping the international system with democracy and rule of law. Defining this US-centred system are three key characteristics: enforcement of property rights, constraints on the actions of powerful individuals and groups and some degree of equal opportunities for broad segments of society. As a result of such political stability, free markets, liberal trade and flexible financial mechanisms have appeared. And, with this, many countries have sought opportunities to enter this system, proliferating stable and cooperative relations. However, what will happen to these advances as America’s influence declines? Given that America’s authority, although sullied at times, has benefited people across much of Latin America, Central and Eastern Europe, the Balkans, as well as parts of Africa and, quite extensively, Asia, the answer to this question could affect global society in a profoundly detrimental way. Public imagination and academia have anticipated that a post-hegemonic world would return to the problems of the 1930s: regional blocs, trade conflicts and strategic rivalry. Furthermore, multilateral institutions such as the IMF, the World Bank or the WTO might give way to regional organisations. For example, Europe and East Asia would each step forward to fill the vacuum left by Washington’s withering leadership to pursue their own visions of regional political and economic orders. Free markets would become more politicised — and, well, less free — and major powers would compete for supremacy. Additionally, such power plays have historically possessed a zero-sum element. In the late 1960s and 1970s, US economic power declined relative to the rise of the Japanese and Western European economies, with the US dollar also becoming less attractive. And, as American power eroded, so did international regimes (such as the Bretton Woods System in 1973). A world without American hegemony is one where great power wars re-emerge, the liberal international system is supplanted by an authoritarian one, and trade protectionism devolves into restrictive, anti-globalisation barriers. This, at least, is one possibility we can forecast in a future that will inevitably be devoid of unrivalled US primacy.

#### Plan is a prerequisite to sustainable hegemony.

Levy et al., project director of the Council on Foreign Relations' independent task force on US education reform and national security, 12

[Julia, project director of the Council on Foreign Relations' independent task force on US education reform and national security, “US Education Reform and National Security”, 3-12-12, <https://www.cfr.org/report/us-education-reform-and-national-security>, accessed 6-28-17, NW]

The United States' failure to educate its students leaves them unprepared to compete and threatens the country's ability to thrive in a global economy and maintain its leadership role, finds a new Council on Foreign Relations (CFR)–sponsored Independent Task Force report on U.S. Education Reform and National Security. "Educational failure puts the United States' future economic prosperity, global position, and physical safety at risk," warns the Task Force, chaired by Joel I. Klein, former head of New York City public schools, and Condoleezza Rice, former U.S. secretary of state. The country "will not be able to keep pace—much less lead—globally unless it moves to fix the problems it has allowed to fester for too long," argues the Task Force. The report notes that while the United States invests more in K-12 public education than many other developed countries, its students are ill prepared to compete with their global peers. According to the results of the 2009 Program for International Student Assessment (PISA), an international assessment that measures the performance of 15-year-olds in reading, mathematics, and science every three years, U.S. students rank fourteenth in reading, twenty-fifth in math, and seventeenth in science compared to students in other industrialized countries. Though there are many successful individual schools and promising reform efforts, the national statistics on educational outcomes are disheartening: More than 25 percent of students fail to graduate from high school in four years; for African-American and Hispanic students, this number is approaching 40 percent. In civics, only a quarter of U.S. students are proficient or better on the National Assessment of Educational Progress. Although the United States is a nation of immigrants, roughly eight in ten Americans speak only English and a decreasing number of schools are teaching foreign languages. A recent report by ACT, the not-for-profit testing organization, found that only 22 percent of U.S. high school students met "college ready" standards in all of their core subjects; these figures are even lower for African-American and Hispanic students. The College Board reported that even among college-bound seniors, only 43 percent met college-ready standards, meaning that more college students need to take remedial courses. The lack of preparedness poses threats on five national security fronts: economic growth and competitiveness, physical safety, intellectual property, U.S. global awareness, and U.S. unity and cohesion, says the report. Too many young people are not employable in an increasingly high-skilled and global economy, and too many are not qualified to join the military because they are physically unfit, have criminal records, or have an inadequate level of education. "Human capital will determine power in the current century, and the failure to produce that capital will undermine America's security," the report states. "Large, undereducated swaths of the population damage the ability of the United States to physically defend itself, protect its secure information, conduct diplomacy, and grow its economy." The Task Force proposes three overarching policy recommendations: *Implement educational expectations and assessments in subjects vital to protecting national security. "*With the support of the federal government and industry partners, states should expand the Common Core State Standards, ensuring that students are mastering the skills and knowledge necessary to safeguard the country's national security." *Make structural changes to provide students with good choices.* "Enhanced choice and competition, in an environment of equitable resource allocation, will fuel the innovation necessary to transform results." *Launch a "national security readiness audit" to hold schools and policymakers accountable for results and to raise public awareness.* "There should be a coordinated, national effort to assess whether students are learning the skills and knowledge necessary to safeguard America's future security and prosperity. The results should be publicized to engage the American people in addressing problems and building on successes." The Task Force includes thirty-one prominent education experts, national security authorities, and corporate leaders who reached consensus on a set of contentious issues. The report also includes a number of additional and dissenting views by Task Force members. The Task Force is directed by Julia Levy**,** an entrepreneur and former director of communications for the New York City Department of Education. The Task Force believes that its message and recommendations "can reshape education in the United States and put this country on track to be an educational, economic, military, and diplomatic global leader."

#### Failing to maintain innovation pulls the rug out from under the economy

Atkinson, founder and president of the Information Technology and Innovation Foundation, and Mayo, founder of Mayo Enterprises, LLC, a consultancy in the areas of innovation, workforce, technology and the future of learning. Her recent work has included projects for NASA’s Office of the Administrator, 2010 [Robert and Merrilea, “Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education” Information Technology & Innovation Foundation, December 10, p. 21, https://www.itif.org/files/2010-refueling-innovation-economy.pdf, Accessed 6/27/17, SKS]

Countries seek to spur more innovation for three primary reasons. First, innovation helps countries realize an economy characterized by a consistently improving standard of living, which can only be achieved by continuously increasing productivity levels. In fact, the U.S. Department of Commerce has found that technological innovation has been responsible for as much as 75 percent of the growth in the American economy since World War II.56 Through its contributions to total factor productivity (TFP) and capital deepening, innovation appears directly responsible for at least 55 percent of U.S. productivity growth from 1959 to 2005.57 Some studies have estimated that innovation drives up to 90 percent of per-capita income growth.58 Additionally, differences in total factor productivity per worker ex- plain 90 percent of the cross-country variation in the growth rate of income per worker.59 Innovation achieves its impact by enabling the productivity improvements that lie at the core of economic growth; for example, the innovative use of information technologies has accounted for half of U.S. productivity growth over the past 15 years.60 Science-based innovation is particularly important. The societal return on investment from publicly funded research and development (R&D) are estimated to range from 20 percent to 67 percent.61 Economist Edwin Mansfield estimates that the societal rate of return from investment in academic research is as high as 40 percent (updating earlier work estimating the rate of return at 28 percent).62 Coe and Helpman find that societal rates of return on R&D are very high, both in terms of domestic output and international spillovers.63 Innovation also leads to job growth. As the Organization for Economic Cooperation and Development (OECD) found in a definitive review of studies on productivity and employment, “Technology both eliminates jobs and creates jobs. Generally, it destroys lower-wage, lower-productivity jobs, while it creates jobs that are more productive, higher- skilled, and better-paid. Historically, the income generating effects of new technologies have proved more powerful than the labor-displacing effects: technological progress has been accompanied not only by higher output and productivity, but also by higher overall employment.”64 Using cross-country firm-level data, the OECD has shown that technology-using industries have higher than average productivity and employment growth.65

#### Growth averts global nuclear war.

Walter Russel Mead (Policy Analyst, World Policy Institute) 1992. “Depending on the Kindness of Strangers,” New Perspectives Quarterly, Summer v. 9, n. 3

Hundreds of millions--billions--of people have pinned their hopes on the international market economy. They and their leaders have embraced market principles--and drawn closer to the west--because they believe that our system can work for them. But what if it can't? What if the global economy stagnates--or even shrinks? In that case, we will face a new period of international conflict: South against North, rich against poor. Russia, China, India--these countries with their billions of people and their nuclear weapons will pose a much greater danger to world order than Germany and Japan did in the 30s.

#### Continued federal investment shields education from political cycles – only way to protect the foundation of growth and hegemony from budget cuts.

Epstein, Senior Education Policy Analyst at American Progress, ’11

[Diana, “Investing in Education Powers U.S. Competitiveness”, Center for American Progress, September 6, Accessed July 1, 17. https://www.americanprogress.org/issues/education/reports/2011/09/06/10376/investing-in-education-powers-u-s-competitiveness/, SKS]

Education is the key to American competitiveness and a strong economy, and continued federal investment in education is needed in order to support improvements in student achievement and put our economy on the path to sustained growth. The United States suffers from persistent differences in achievement between groups of students defined by race/ethnicity or family income, and our students also rank well behind those in economically competitive countries on international tests. We must continue to invest in education in order to create a system that is more equitable and that produces American students who are more competitive in the global marketplace for talent.

**Federal education spending needs to be protected** in the congressional super committee negotiations this fall. The super committee is charged with coming up with at least $1.2 trillion in deficit reduction, which comes on top of additional caps that were imposed on future discretionary appropriations as part of the debt-ceiling deal. Federal education spending is included in the pot of discretionary money subject to deficit-reducing cuts. If the committee can’t reach agreement and the automatic sequestration kicks in, education programs are projected to be cut by about 9 percent. That translates to about $4 billion worth of cuts to the education system. This would be a devastating blow to children across the country, especially during a time when almost half the states have slashed their education budgets.

Education has already taken a hit in this year’s budget battle. The spring continuing resolution cut about $1.3 billion from the Department of Education, excluding Pell Grants—the federal program for qualified low-income college students. While President Barack Obama’s budget wisely proposed consolidating some education programs into new funding streams, the complete elimination of funding means fewer resources available to advance important education priorities. Of course, it matters how money is spent—education funding needs to be efficient and effective, and targeted to where it is needed most. In addition, innovations in federal funding such as the competitive Race to the Top program have demonstrated that federal funds can be used as a powerful lever to prompt important reforms in longstanding state policies.

Cutting education spending would be shortsighted and harmful to our country’s future. Education spending makes up only 3 percent of the total federal budget, and cuts in this area would put a minuscule dent in the deficit. Not only would education cuts fail to contribute meaningfully to deficit reduction, but **every cut now is a missed opportunity to lay the necessary foundation** for future economic growth and a strong middle class. Education is one of those areas where spending now may not pay off right away because it takes years for school-age children to become working adults. This means it can be difficult for policymakers concerned with short-term election cycles to effectively make the case for this kind of long-term investment. Nonetheless, the strength of the American economy depends on a well-educated workforce. Smart and efficient federal investments in education can improve student achievement and put our economy on the path to sustained and robust growth.

# \* \* CASE \* \*

## CASE UNIQUENESS

### STEM low now

#### Trump Plans Deep Cuts to STEM Education

Wolfe, science policy analyst and writer, ‘17

(Alexis, *American Institute of Physics*, “Trump Budget Proposes Deep Cuts to STEM Education,” 13 June 2017, https://www.aip.org/fyi/2017/trump-budget-proposes-deep-cuts-stem-education, 27 June 2017, RV).

President Trump’s fiscal year 2018 budget request proposes deep cuts to STEM education programs across the federal science agencies. It would zero out two Department of Education grant programs that states use to support STEM education, and terminate the Offices of Education at NASA and the National Oceanic and Atmospheric Administration.

The Trump administration is proposing to slash funding for major federal STEM education programs in fiscal year 2018. Under the president's budget, STEM programs at the National Science Foundation, Department of Energy, and Department of Defense would see deep cuts, while the Offices of Education at NASA and the National Oceanic and Atmospheric Administration would be eliminated. Two major grant programs at the Department of Education that states use to support STEM initiatives — the Student Support and Academic Enrichment Grants and the 21st Century Community Learning Centers — have also been targeted for elimination.

#### Trump and DeVos To Pull Money away from STEM Education

Brown et al, Reporting team — Washington, D.C., Strauss, Reporter — Washington, D.C, and Douglas-Gabriel, Reporter — Washington, D.C ‘17

(Emma, Valerie, and Danielle, *Washington Post*, “Trump’s first full education budget: Deep cuts to public school programs in pursuit of school choice,” 17 May 2017, https://www.washingtonpost.com/local/education/trumps-first-full-education-budget-deep-cuts-to-public-school-programs-in-pursuit-of-school-choice/2017/05/17/2a25a2cc-3a41-11e7-8854-21f359183e8c\_story.html?utm\_term=.ab5c55fcefe2, 28 June 2017, RV).

Funding for college work-study programs would be cut in half, public-service loan forgiveness would end and hundreds of millions of dollars that public schools could use for mental health, advanced coursework and other services would vanish under a [Trump](http://www.chicagotribune.com/topic/politics-government/donald-trump-PEBSL000163-topic.html) administration plan to cut $10.6 billion from federal education initiatives, according to budget documents obtained by The Washington Post.

The administration would channel part of the savings into its top priority: school choice. It seeks to spend about $400 million to expand charter schools and vouchers for private and religious schools, and another $1 billion to push public schools to adopt choice-friendly policies.

President Donald Trump and Education Secretary [Betsy DeVos](http://www.chicagotribune.com/topic/politics-government/betsy-devos-PEGPF00208-topic.html) have repeatedly said they want “to shrink the federal role in education.” The documents - described by an Education Department employee as a near-final version of the budget expected to be released next week - offer the clearest picture yet of how the administration intends to accomplish that goal.

### STEM low now – PISA

#### US students lag behind others in the PISA

DeSilver, a senior writer at Pew Research Center, 15 [Drew, “U.S. students’ academic achievement still lags that of their peers in many other countries,” The Pew Research Center, Feb. 2, http://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/SKS]

How do U.S. students compare with their peers around the world? Recently released data from international math and science assessments indicate that U.S. students continue to rank around the middle of the pack, and behind many other advanced industrial nations. One of the biggest cross-national tests is the Programme for International Student Assessment (PISA), which every three years measures reading ability, math and science literacy and other key skills among 15-year-olds in dozens of developed and developing countries. The most recent PISA results, from 2015, placed the U.S. an unimpressive 38th out of 71 countries in math and 24th in science. Among the 35 members of the Organization for Economic Cooperation and Development, which sponsors the PISA initiative, the U.S. ranked 30th in math and 19th in science. Younger American students fare somewhat better on a similar cross-national assessment, the Trends in International Mathematics and Science Study. That study, known as TIMSS, has tested students in grades four and eight every four years since 1995. In the most recent tests, from 2015, 10 countries (out of 48 total) had statistically higher average fourth-grade math scores than the U.S., while seven countries had higher average science scores. In the eighth-grade tests, seven out of 37 countries had statistically higher average math scores than the U.S., and seven had higher science scores. Another long-running testing effort is the National Assessment of Educational Progress, a project of the federal Education Department. In the most recent NAEP results, from 2015, average math scores for fourth- and eighth-graders fell for the first time since 1990. A team from Rutgers University is analyzing the NAEP data to try to identify the reasons for the drop in math scores. The average fourth-grade NAEP math score in 2015 was 240 (on a scale of 0 to 500), the same level as in 2009 and down from 242 in 2013. The average eighth-grade score was 282 in 2015, compared with 285 in 2013; that score was the lowest since 2007. (The NAEP has only tested 12th-graders in math four times since 2005; their 2015 average score of 152 on a 0-to-300 scale was one point lower than in 2013 and 2009.) Looked at another way, the 2015 NAEP rated 40% of fourth-graders, 33% of eighth-graders and 25% of 12th-graders as “proficient” or “advanced” in math. While far fewer fourth- and eighth-graders now rate at “below basic,” the lowest performance level (18% and 29%, respectively, versus 50% and 48% in 1990), improvement in the top levels appears to have stalled out. (Among 12th-graders, 38% scored at the lowest performance level in math, a point lower than in 2005.) NAEP also tests U.S. students on science, though not as regularly, and the limited results available indicate some improvement. Between 2009 and 2015, the average scores of both fourth- and eight-graders improved from 150 to 154 (on a 0-to-300 scale), although for 12th-graders the average score remained at 150. In 2015, 38% of fourth-graders, 34% of eighth-graders and 22% of 12th-graders were rated proficient or better in science; 24% of fourth-graders, 32% of eighth-graders and 40% of 12th-graders were rated “below basic.” These results likely won’t surprise too many people. In a 2015 Pew Research Center report, only 29% of Americans rated their country’s K-12 education in science, technology, engineering and mathematics (known as STEM) as above average or the best in the world. Scientists were even more critical: A companion survey of members of the American Association for the Advancement of Science found that just 16% called U.S. K-12 STEM education the best or above average; 46%, in contrast, said K-12 STEM in the U.S. was below average.

#### The US lags behind others in the PISA test

Klein, Chancellor of the New York City Department of Edu. And Rice, the 66th United States Secretary of State 2014 (Joel and Condoleezza, “U.S. Education Reform and National Security”Council on Foreign Relations, May 14, p. 23-25, <https://books.google.com/books>id=rPvT2NUhdRgC&printsec=frontcover&dq=STEM+cell+cells+education+United+States+US+Foreign+international+National+Security+AROUND+20+perception&hl=en&sa=X&ved=0ahUKEwirro6f1-HUAhVR4WMKHaaSBuMQ6AEIOTAD#v=snippet&q=PISA&f=false, SKS)

As the United States struggles to educate its youngest citizens, educational systems around the globe are steadily improving. According to the results of the 2009 Program for International Stu-dent Assessment (PISA), an international assessment that measures the performance of fifteen-year-olds in reading, mathematics, and science every three years, U.S. students rank fourteenth in reading, twenty-fifth in math, and seventeenth in science among students in industrial countries.' The results of the test, administered by the Organization for Economic Cooperation and Development (OECD), show that since the exam was first administered in 1999, some European and Asian students have academically surpassed students in the United States.' For example, Germany, Luxembourg, and Hungary were behind the United States in math on the 2000 PISA exam. In 2009, however, each outperformed the United States.' In 2009, when students in Shanghai, China, took the PISA for the first time, they outscored the average U.S. student in reading, math, and science.59 This might not be an apples-to-apples comparison, but U.S. secretary of education Arne Duncan called the results "a wake-up call." He added, "I know skeptics will want to argue with the results, but we consider them to be accurate and reliable, and we have to see them as a challenge to get better. . . . We can quibble, or we can face the brutal truth that we're being out-educated."' The results of international exams do not show merely that the aver-age U.S. student is falling behind; they also show that the top students in the United States would not be considered top students elsewhere in the world, particularly in mathematics. One recent report found that thirty countries have a higher percentage of advanced math students than the United States does. Only 6 percent of American students are advanced, against at least 20 percent in Taiwan, Hong Kong, Korea, and Finland.61 Another study found that even the top-performing U.S. state, Massachusetts, is not at the top of the international pack in math.62 Yet another found that students in wealthy U.S. public school districts would score in only about the fiftieth percentile in math relative to students in other developed nations. "If the city were Singapore," the report found, "the average student in Beverly Hills would only be at the thirty-fourth percentile in math performance."63

### STEM low now – Engineering

#### American engineering is endangered – STEM is key to a reversal

**SWE** (SWE Public Policy initiatives support the Society’s mission by engaging in policy issues that impact the advancement of women in engineering. Their goals are to educate other professional societies and policy makers on how to apply Title IX to STEM fields.) **6/17**

If passed unaltered, the proposed FY18 Federal Budget will negatively impact the pipeline of engineering talent that is critical to increasing access to jobs to strengthen the United States’ economy. The engineering field is growing and the education system in the United States needs to keep up. According to the U.S. Department of Labor (DOL), Bureau of Labor Statistics, Employment, the engineering field will grow by 4 percent by 2024 and will add over 65,000 new jobs. Additionally, some engineering fields will experience more significant growth: biomedical engineering will grow by 23 percent, environmental engineering by over 12 percent, and civil engineering by over 8 percent. Without strong STEM education programs, the United States and its workers will lack the necessary technical skill to meet the growing demand within these critical engineering fields. While the FY18 budget proposes an increase in funding for various military initiatives, this spend on the military will suffer without a strong STEM workforce development program. A detailed analysis of Department of Education funding cuts provided by the STEM Education Coalition is provided below: The FY18 budget proposes $59 billion for the Department of Education, a $9 billion or 13 percent reduction. Title II: Eliminated entirely the $2.4 billion Supporting Effective Instruction State Grants program. NASA Office of Education is totally eliminated.

### A2 Funding now

#### Current STEM funding doesn’t go far enough – combined with a lack of regulation, STEM is taking a backseat in public education

Shastri, Founder of undergraduate science writing program and writing for AAAS, 2016 (Devi, American Association for the Advancement of Science, “STEM Educators Fear Spending Bill Undermines Goal of New U.S. Law,” 6-21-16, <http://www.sciencemag.org/news/2016/06/stem-educators-fear-spending-bill-undermines-goal-new-us-law>, 6-29-17, APW)

A federal grant has helped 500 teachers in Tampa, Florida, discover new ways to teach science at every grade level. The knowledge they’ve gained over the past 3 years has translated into 24 new lessons and a curriculum that includes hands-on strategies such as engineering design challenges. But the fate of that and dozens of other federally funded programs to improve STEM (science, technology, engineering, and mathematics) education in U.S. elementary and secondary schools is up in the air following the first move by Congress to fund a new education law that reshuffles money allocated for STEM activities. A 2017 spending bill approved earlier this month by the Senate appropriations committee falls well short of what STEM educators had expected, setting off a potentially zero-sum game between science and other parts of the curriculum. Last year Congress replaced the 2002 No Child Left Behind (NCLB) Act, reviled for its emphasis on annual testing, with the Every Student Succeeds Act (ESSA). The new blueprint for federal oversight of public education wiped out the $153-million-a-year Math and Science Partnership (MSP) program that had funded the training of Tampa-area teachers, along with three smaller accounts to support physical education, school counseling, and advanced placement courses. Those activities must now compete for money in a new account, called Student Support and Academic Enrichment Grants. The block grants are designed to give local educators greater flexibility to tailor programs that meet the needs of their districts, according to federal lawmakers, while keeping STEM education a high priority. And to sweeten the pot, Congress authorized $1.65 billion for the grants, some six times the combined amount earmarked for the four programs under the old law. Top of Form

Bottom of Form

“Everyone who was involved had to give a little to get a little,” said David Evans, executive director of the [National Science Teachers Association](http://www.nsta.org/default.aspx) (NSTA) in Arlington, Virginia. “Losing the MSP program was a real loss—I won’t pretend that that is something that we were willing to put on the chopping block easily. [But] given the authorized value of the bill, we were very hopeful that with the addition of the STEM language and the attention that it specifically called to those programs, the loss of the MSP would be something we could sustain.” But instead of the $1.65 billion the lawmakers authorized for the new grants, Senate appropriators this month allocated just $300 million. Although the total is $22 million higher than current levels for the four combined programs, it is lower than what they received from 2005 through 2010. (The amount has fluctuated in recent years, with a low of $222 million during the 2013 sequester.) The full Senate has yet to act on the spending bill, and the House of Representatives has not begun debating its version, but House legislators are not expected to be any more generous than their Senate counterparts. The reduced funding has turned the increased local flexibility into a potentially catastrophic situation, says Larry Plank, director of K–12 STEM education for the Hillsborough County School District, which includes Tampa. Its $4.5 million MSP grant application won out over other STEM proposals from districts across the state. And although Plank couldn’t count on always being successful, he was at least guaranteed a chance to compete. Not any longer. “Perhaps [states] will maintain a significant level of funding for STEM or perhaps they won’t,” he says. “With MSP, we knew that [some] funding would be available for those types of things.” Under ESSA, school districts are required to spend at least 20% of their grants on each of two areas—providing students with a well-rounded education, and ensuring a safe and healthy environment. Another unspecified portion of the award must expand the use of technology to improve instruction. The money will be given out as block grants based on the overall size of the school district and the proportion of impoverished students it serves. Districts that receive less than $30,000 don’t have to do a needs assessment and are exempt from the allocations in the law. With everything a possible priority, Evans says, the money won’t go very far—and the students could lose out. “[The funding level] is likely to engender more competition between subjects rather than what could have been an opportunity for collaboration that would really benefit the kids,” he said. The low appropriation from the Senate, he adds, leaves the bill “rather hollow.” Innovation could also fall by the wayside. “My biggest fear is that, with the language and the minimal appropriations, there is a risk that our country loses the ability to test new ways to teach kids science and engineering,” Plank says. That’s true for all fields, says Myrna Mandlawitz, director of government relations for the School Social Work Association of America based in London, Kentucky. She says that many school districts used the nearly $50 million allocated to school counseling under NCLB as seed money to hire their first social worker, psychologist, or counselor, who then demonstrated their value to students. But she worries that grants to individual districts under the new law may be too small to finance such positions. The shift in power is forcing states and national groups like NSTA to work on a local level to guide STEM programs. Plank says that his district, the eighth largest in the country with 211,000 students, has plenty of experience assessing needs and deciding how to allocate for STEM programs. But he worries that smaller districts may receive little guidance from their state and, given sparse funds, decide not to make STEM a priority.

### A2 States solve now

#### States fail now – especially bad at providing opportunities for marginalized students

Halstead, founder of three public policy think tanks (Redefining Progress, New America, and Climate Leadership Council) and author of two books including *The Radical Center: The Future of American Politics*(with Micheal Lind), Lind, an editor of [*Politico*](https://en.wikipedia.org/wiki/Politico) and [*The National Interest*](https://en.wikipedia.org/wiki/The_National_Interest) and a columnist for [*Salon*](https://en.wikipedia.org/wiki/Salon_(website)). Ted, Michael, LA Times, “The National Debate over Education needs a Funding Focus” 8 October 2000 <http://search.proquest.com/usmajordailies/docview/421550179/fulltext/4F2F641AF59E47DEPQ/1?accountid=1557>, accessed 27 June 2017 KMV

You would never know it from listening to the presidential candidates, but the federal role in funding education is minuscule. Until recently, the primary source of school funding has been local property taxes, supplemented by a small amount of aid from state governments and even less from the federal government. Other countries do not organize school financing the way that we do. Among countries belonging to the Organization for Economic Cooperation and Development (OECD) in 1995, an average of 54% of funding for primary and secondary education came from central governments, 26% from regional and 22% from local. In the U.S., by contrast, the federal government supplied only 8% of funding, with the rest divided between state and local governments. The largest single federal program for schools, Title I of the Elementary and Secondary Education Act of 1965, provides only about $8 billion, less than 3% of all local, state and federal education expenditures. While these state-level reform efforts are encouraging, they do not go far enough and can sometimes lead to unintended disaster. The experience of California illustrates the danger of equalizing education funding on a statewide basis without reducing or eliminating reliance on property taxes. As Californians discovered in the wake of [Serrano] v. Priest, affluent property owners can all too easily be tempted to take part in revolts against increases in property taxes when such revenues are suddenly diverted to pay for schools in other districts. Many analysts blame Proposition 13, which restricts the ability of California localities to raise property taxes, with the decline of the state's once-great K-12 system. The link between education and localism in the United States is a relic of the colonial and rural past. It is time to consider equalizing school funding on a national basis. If educational opportunity should not depend on the fortuity of a child's residence in this or that county within a state, then surely it should not depend either on the child's residence in this or that state in the United States. If it is unjust and inefficient for school quality to vary wildly between rich and poor neighborhoods within a state, it is equally unjust and inefficient for school quality to vary between rich and poor states within the nation as a whole. Yet, per-pupil spending in 1997-98, adjusted for cost-of-living differences across states, varied from $4,000 in Mississippi to greater than $9,000 in New Jersey. Surely, this is no way to run the education system of a modern nation, least of all one that aspires to remain at the forefront of the information revolution.

### A2 No STEM shortage

#### Not enough STEM workers in the Status Quo, STEM workers necessary for economic growth to continue

Rothwell, Senior Economist at Gallup, 2012 (Jonathan, Brookings Institution, “The Need for More STEM Workers”, June 1 2012, <https://www.brookings.edu/blog/the-avenue/2012/06/01/the-need-for-more-stem-workers/> Accessed June 30 2017, KMV)

Yet, in a troubling development, far too few of the nation’s young men and women are pursuing higher education in STEM fields (e.g. Biology, Physics, Chemistry, Medicine, Engineering, Computer Science, and Math), even as demand soars. I’ve been analyzing data on job openings from the Conference Board’s Help-Wanted Online Series. It’s clear that STEM jobs are taking longer to fill than non-STEM jobs, a sign that finding the right candidate takes more time. More directly, there are simply many more vacancies in STEM fields than there are STEM degree holders. In the average large metro, 30 percent of job openings are in STEM fields but just 11 percent of the population have a STEM degree. This goes way beyond meeting the mercurial needs of corporate America. STEM workers are disproportionately involved in creating and running successful tech companies, as recent work by [Vivek Wadhwa](http://sites.kauffman.org/pdf/Education_Tech_Ent_042908.pdf) has shown, and coming up with breakthrough inventions, as [William Baumol](http://people.stern.nyu.edu/mschilli/superstar.pdf) and others have shown. It’s not an exaggeration to say that STEM workers are the driving force of economic prosperity. Unfortunately, the problem is not being solved by our universities. [Wendy Kauffman](http://www.npr.org/2012/05/31/154040185/seattle-area-lacks-computer-science-majors), of NPR, reported this morning that the University of Washington is actually turning down 75 percent of current students who have completed the prerequisites to major in computer science and applied, because they just don’t have enough space and funding to teach them. Apparently, the Washington state legislature has resisted increasing funding to appropriate levels because it costs more to train science majors than majors in business, art, or other popular degrees. That’s amazingly self-defeating. Meanwhile, in a rush to sacrifice long-run prosperity to resolve short term budget conflicts, many [states](http://www.nytimes.com/2012/03/02/business/dealbook/state-cutbacks-curb-training-in-jobs-critical-to-economy.html) are cutting funding to computer and engineering departments at public universities and colleges. These policies are not quite the modern day equivalent of the Ottoman Empire’s decision to [ban printed books](http://www.pbs.org/wnet/civilization-west-and-rest/killer-apps/science/timeline-the-west-and-the-ottoman-empire/) in 1515 (which lasted two centuries), but they are nearly as ludicrous in our high-tech age.

Just how large a gap in supply and demand is there? I analyzed all occupational categories for which at least half of all workers have a Bachelor’s degree or higher. In 2010, not exactly a great year in the U.S. economy, there were seven job openings in computer occupations for every graduate from a relevant computer major. This was more than any other occupation, with the exception of occupations for which there are no relevant majors, like retail sales and the military. In high-demand metros like San Francisco and San Jose, there are 25 and 19 job openings in computers per graduate. Yet, the problem is widespread, with metros like Austin, Seattle, Washington D.C., Des Moines, Charleston, and Charlotte registering skill mismatches for computer occupations that are nearly as severe. Other STEM fields are also being massively undersupplied. In 2010, there were six job openings for health care practitioners for every graduate and four job openings for each engineer. By contrast, there was just one job opening per graduate for art and design workers, financial specialists, counselors, and architects. For lawyers, there were 0.6 jobs per graduate, and for social science majors—my field—there were a mere 0.3 job openings for every graduate. The other problem is that—at the graduate level—more than half of [computer and engineering](http://www.nsf.gov/statistics/seind12/appendix.htm#c3) graduates are not U.S. citizens, meaning many will put their skills to use in another country. STEM majors also have lower unemployment rates than other college graduates. It’s not a huge difference (4.7 vs. 5.4 percent), according to the 2010 American Community Survey, but it is statistically significant. Curiously, however, computer and information science majors have unemployment rates that are no lower than other graduates. It seems computer majors with mediocre skills are no more easy to employ than typical English or Psychology majors. Communications and Art majors have somewhat higher unemployment rates, but in general, college graduates, even at the Associate’s degree level, are still much more likely to be working than those with just a high school diploma or less education. As further evidence, the [Wall Street Journal](http://online.wsj.com/article/SB10001424052702303360504577408431211035166.html) reports today that computer science majors from top programs—like Carnegie Mellon—are being lured into big and small tech companies before they even graduate. Google has launched a major recruitment effort, but even CEOs of small tech companies are meeting with talented undergrads. In short, we have a major deficit in the supply of STEM workers. Look for new evidence of this from Brookings Metropolitan Policy Program reports to be rolled out in the next few months. It will take a big effort at all levels of government and outside of it to re-orient towards a more science-oriented society, but that is what it will take for economic growth to continue. Either we respond to the challenge, or we accept a gradual decline in our relative standard of living, as other nations, some of which are rather unpleasant dictatorships, gain influence.

### A2 STEM teachers solve now

#### Their ev refers to higher education – early STEM is the gap

Bureau of Labor Statistics, May 2015, “STEM crisis or STEM surplus? Yes and yes,” https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm

Across all the different disciplines, yes, there is a STEM crisis, and no, there is no STEM crisis. It depends on how and where you look. For most Ph.D.’s, the United States has a surplus of workers, especially in tenure-track positions in academia. The exceptions are certain fields within industry, such as petroleum engineering, process engineering, and computer engineering, and other fields in the government sector, such as nuclear engineering, materials science, and thermohydraulic engineering. Academia tends to absorb the Ph.D.’s who are unable to find positions in industry into postdoc positions. At the bachelor’s and master’s levels, there is consistent demand for employees in software development, as well as in high-growth areas such as mobile application development, data science, and petroleum engineering. There is also demand below the bachelor’s level in the manufacturing industry, which needs workers in the skilled trades, such as machinists and technicians. Hence, we have a heterogeneous mixture of supply and demand for different occupations: some have a queue of workers, others a queue of unfilled positions.

### A2 Obama already solved STEM

#### Obama’s programs weren’t doing enough to promote STEM in schools

Burke, Director of Center for Education Policy, and McNeill, Senior Associate Fellow of Heritage Foundation 11

[Lindsey, Director of Center for Education Policy and Will Skillman Fellow in Education in the Institute for Family, Community, and Opportunity and Jena Baker, Senior Associate Fellow of Heritage Foundation, Heritage Foundation, “Educate to Innovate: How the Obama Plan for STEM Education Falls Short”, 1-5-2011, <http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short>, accessed 6-27-17, NW]

A More Fundamental Problem When President Obama announced his Administration’s plan to enhance STEM education, he affirmed that “we know that the nation that out-educates us today will out-compete us tomorrow.”[[8]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn8) The President’s plan to enhance STEM education, much like similar efforts in the past to improve education through short-term bursts with federal dollars, falls short of the dramatic changes needed in the educational system to truly fill the gap. The need to improve STEM education in the United States is no recent revelation. Over the past 50 years, American leaders have repeatedly discussed the need to enhance STEM education. Yet, despite increasing federal efforts and spending, U.S. students continue to under-perform in STEM subjects. In 2007, for instance, the America COMPETES Act created new federal funding for STEM education. The act included the creation of a new federal initiative to train 70,000 new teachers in Advanced Placement and International Baccalaureate courses, as well as initiatives intended to provide existing teachers with STEM training and to encourage university students pursuing STEM degrees to concurrently obtain teaching certifications. Despite these efforts, there remains a major shortage of qualified STEM teachers throughout the nation—and American students continue to perform worse than their peers in STEM subjects.[[9]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn9) Encouraging the private sector to get involved in the education of tomorrow’s workforce can align the education of today with the skills needed for tomorrow. Using creative approaches to tackle learning challenges is certainly a concept that should be embraced. The problem with the President’s approach, however, is that the root of America’s STEM education deficit is much more fundamental than the problems addressed by the President’s initiatives. The American K–12 education system is meant to function as a pipeline that prepares students for higher education and careers. But with an average annual dropout rate of close to 10 percent, there is little doubt that this pipeline has sprung a leak.[[10]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn10) Even many of those who do graduate with a high school diploma lack the knowledge and skill-base to succeed in the STEM field. In the United States today, just 73 percent of freshmen entering high school will graduate within four years, and those who do are often not adequately prepared for higher education and careers in STEM fields.[[11]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn11) Too many students are not making it through the leaky pipeline of the American education system with the skills they need to succeed. The reasons for their underperformance stems from a number of problems: A One-Size-Fits-All Approach. Despite increasing federal control over the American education system over the past 50 years, educational achievement across the country has continued to deteriorate.[[12]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn12) A large part of the problem is that the federal focus centers on a one-size-fits-all approach. Most recently, this approach is part of the Obama Administration’s efforts to impose national education standards and tests on states. This is a significant federal overreach into states’ educational decision-making authority, and will likely result in the standardization of mediocrity, rather than a minimum benchmark for competency in math and English.[[13]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn13) Applying a blanket approach to education reform undermines innovation in STEM education, increasing conformity at the expense of meeting the diverse needs of students and parents. Recruiting Quality Teachers. The Educate to Innovate initiative increases Department of Education grants to train teachers in the STEM fields by $10 million, and lauds a promise by 75 of the nation’s largest public universities to train 10,000 new teachers by 2015. But in pledging to train 10,000 new teachers over the next five years, public universities will be training just 2,500 more teachers in the STEM fields than are currently being trained. This means that each of the 75 schools will train just six new teachers per year.[[14]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn14) A major impediment to improving STEM education in the public school system, however, is the ability of schools to recruit quality teachers in the field. The average salary for K–12 teachers in the 2006–2007 school year was $51,000, 86 percent of the yearly salary of occupations requiring similar education.[[15]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn15) More than half of the workers in science and engineering fields earned a salary of $70,600 or more in 2007.[[16]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn16) Students graduating from college with STEM degrees recognize that they can earn more in non-teaching professions and are shying away from careers in education. The Business Higher-Education Forum estimates that by 2015 there will be a shortage of 283,000 science and education teachers in secondary education alone.[[17]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn17) Concurrently, barriers also exist discouraging those who are currently in STEM professions from becoming teachers. Individuals with a professional background in STEM have the potential to be outstanding teachers because of their in-depth understanding of the subjects and practical experience. In many cases, however, these individuals face difficulties in obtaining teaching certifications, in terms of time, cost, and prohibitions imposed, often from federal policymakers. Fixating on the Traditional School Model. While alternative education programs have long been in development, the American education system has continued to fixate on the traditional school model. Alternative education programs offer much promise for fostering innovation in education across the country. Online or virtual learning programs, for example, allow a break from the traditional model in which educational opportunity is tied to one’s zip code and enables students to gain access to the best teachers regardless of where they are located. In 2009, the U.S. Department of Education conducted a meta-analysis of online-learning studies and concluded that “students who took all or part of their class online performed modestly better, on average, than those taking the same course through traditional face-to-face instruction.”[[18]](http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short#_ftn18)

### A2 No skilled worker shortage

#### Surplus good – generates its own demand

Berger and Fisher, President of Mass Budget and Policy Center and Professor of Physics, ‘13

(Noah and Peter, Economic Policy Institute, “A Well Educated Workforce is Key to State Prosperity, August 22, <http://www.epi.org/publication/states-education-productivity-growth-foundations/>, 7-1-17, LNM)

Some state officials may be tempted to ask, “What good would it do to produce more college graduates if better-paying jobs for college graduates are not available?” “Shouldn’t the state focus on attracting higher-skilled jobs instead of creating more skilled workers who have to leave the state to find work?” But in this instance, if not in most others in economic policymaking, increased supply can actually help create its own demand. As Bartik has put it, “An increase in the labor supply probably stimulates labor demand by at least two-thirds the supply increase. This is because additional labor attracts employers, and additional higher-skilled labor attracts employers with more skilled jobs” (Bartik 2009). To a degree then, the answer to these concerns is, “If you educate them, jobs will come,” though national strategies to increase the demand for skilled workers may also be needed.

#### The demand for STEM skills greatly surpasses the supply, harming innovation, Economic Growth, and National Security

Swanson, chairman of Raytheon Company, 2014 [William, “STEM Proficiency: A Key Driver of Innovation, Economic Growth and National Security,” US News and World Report, April 23, Accessed July 1, 2017, https://www.usnews.com/news/stem-index/articles/2014/04/23/stem-proficiency-a-key-driver-of-innovation-economic-growth-and-national-security, SKS]

STEM: what a terrible acronym. It’s one of those awkward labels that become accepted shorthand for a wonky policy topic because no one can figure out a better way to say it. But don’t let clunkiness obscure significance. STEM is also an under appreciated, and troubling, component of the U.S. economy. The real meaning behind “STEM” is the mismatch between supply and demand in a key part of the country’s labor pipeline. The demand for the many jobs requiring STEM skills—science, technology, engineering and math—is outstripping the supply, and the problem will only get worse. That’s what we found when we crunched the numbers in the first-ever STEM Index, a basket of data measuring the state of STEM jobs and education since 2000. We wanted to impose some metrics on a much-discussed but ill-defined subject that has become a concern for most major industries in the U.S. STEM proficiency is a key driver of innovation, economic growth and ultimately national security. For instance, some of the most coveted and scarce skills today are in the fields of cybersecurity. [SPECIAL REPORT: The U.S. News/Raytheon STEM Index] But STEM is not just about tech companies. It’s not just about people who wear lab coats. STEM skills are needed in the many millions of jobs that will have to be filled in sectors such as energy, manufacturing, food production and perhaps most significantly, health care. What industry does not need more workers with science and math know-how? And not just at the high end. Having STEM skills could mean making it into the middle class, or not. Going back to studies like the seminal “Rising Above the Gathering Storm” report of 2005, the problem has been a focus of much attention. But we wanted to add some new rigor by creating a unique set of data that looked at how the U.S. has fared in tackling this supply-demand challenge. We plotted dozens of statistics that measured student test performance, aptitude, and interest against job demand (read the full methodology). The result is a 14-year average that tells an important part of the STEM story, with limits. Our new benchmark, the U.S. News/Raytheon STEM Index, is a starting point that’s meant to lead to deeper discussions, and ultimately solutions. And of course any broad-based graph can only tell you so much; the analyses behind the component parts are ultimately the most revealing. What the numbers tell us is that the country has made little progress on a problem we’ve seen coming for a long time. Despite growing job demand, the pipeline of talent is weak and will remain that way for at least a decade if nothing changes. There are some recent glimmers of hope, reflected in an uptick over the past two years, but they are coming from a select part of the population. Our top-line data, supported by other studies, shows that some portion of white males, along with Americans of Asian descent, are increasingly drawn to STEM subjects, while those who represent the bulk of the future labor pool—women, Latinos and African-Americans—are showing disproportionately little interest. The increased demand for STEM skills is evident despite a key shortcoming in the STEM Index: our need to rely on federal government data. Using the sometimes out-of-date definitions of what is a STEM job, the Index still charts a 30 percent growth, from 12.8 million in 2000 to 16.8 million in 2013. More granular estimates put actual jobs requiring STEM skills at as much as 50 percent of the job market. We’ll be refining that and other data for next year’s edition. Among the biggest problems surfaced in the STEM Index: Between 2000 and 2013, an average of 37.6 percent of high school males reported having interest in at least one of the STEM disciplines, vs. 14.8 percent of females. In 2013, the average SAT math score for white students was 534, compared to 461 for Hispanic students and 429 for black students. The average ACT science scores were 22 for whites, 18.8 for Hispanic students and 16.9 for black students. As high school students’ interest in STEM has waned, their scores on international assessments like PISA have also dropped. In 2000, the average U.S. PISA math score was 493. In 2012, that score dropped to 481. Relative to other developed countries, we remain near the back of the pack. STEM may be a simple label, but the problem it speaks for is deeply complex. Why do fourth-grade girls sour on math? Teacher prep programs ignore science training? University curriculums wash out too many talented students? The solutions require the interaction of industry, academia, government and non-profits. There is work being done in all these areas, but the evidence suggests it is not enough. Better awareness and more-realistic assessments are important next steps. This new STEM Index is a start.

## SOLVENCY

### Fed key

(the best cards on this issue are elsewhere – 1AC, 2AC to states, etc…)

#### The federal Government is Key to bring in special programs individual States cannot

National Science and Technology Council Vice President, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other White House officials. ’13 (National Science and technology FEDER A L SCIENCE, TECHNOLOGY, ENGINEER ING, A ND M ATHEM AT ICS (STEM) EDUCATION 5-YEAR STRATEGIC PLAN, page number 5-6, EM)

The majority of the Federal investment in STEM education – which totals approximately $3 billion annually (see Appendix A) – is funded largely through programs executed at the NSF, the Department of Education (ED), and, in the biomedical sciences, at the National Institutes of Health. NSF, within its mission to support basic science research and STEM improve education, invests in advancing knowledge through research and development of tested models about how to understand and improve STEM learning. This encompasses teaching and learning from the K-16 through post-graduate levels, as well as continuing education, retraining, and informal education in out-of-school settings. NSF also has a well established graduate fellowship program that spans all areas of STEM except the biomedical sciences. NSF also has a history of partnering with a number of other CoSTEM agencies in areas of science and education. ED supports programs to improve education in the United States and has a broad mission to promote student achievement and preparation for global competitiveness. Although only a small fraction of ED’s funding supports specific STEM education programs, STEM initiatives have been a competitive priority in such significant programs as Race to the Top31 and the Investing in Innovation Fund.32 Given its mission, ED does not have substantial direct access to science and engineering research activities or to a STEM workforce through substantial in-house or external research and development (R&D) programs, but is developing approaches to partner effectively with the other CoSTEM agencies. ED brings unmatched reach to schools, teachers, and students across the Nation, and so this plan provides approaches for leveraging these important connections. Furthermore, ED is building a staff with expertise in STEM teaching, and the National Center for Education Statistics cultivates data critical for STEM education research, including for efforts like the Institute of Education Sciences (IES) Mathematics and Science Education Research Grants Program.The Smithsonian Institution (the Smithsonian), founded in 1846 and comprising19 museums andgalleries, the National Zoological Park, and nine research facilities, promotes a number of engagement opportunities across a variety of disciplines. In 2012, the Smithsonian welcomed 30 million visitors to its public institutions and 103 million users to its website. In the context of Federal STEM activities, the Smithsonian has unique capabilities for serving as a clearinghouse that can reach a wide public audience. Particular agencies, because of their mandates and goals, have specific expertise and assets to bring to the Federal STEM education investment in collaboration with the designated lead agencies. NASA has exciting assets associated with space exploration, and the USDA has networks that reach across the country through 4-H, extension services programs, and regional networks and laboratories. The NIH oversees traineeship and fellowship programs with a focus on graduate and post-doctoral research that prepare tomorrow’s leading biomedical scientists. In addition, agencies such as NASA, HHS, DOD, DOC, DOE, and USDA support the teaching of mission-related science and engineering through connections to the scientific and technical assets that they oversee. Many of the CoSTEM agencies invest in or manage scientific, technological, engineering, and mathematics experts, research facilities and technology, data sets, and natural resources that can be leveraged as sites for STEM learning and workforce training. Some agencies (e.g., NSF, ED/Institute for Education Sciences) focus on building and gathering evidence about effective professional development practices or models, while others (e.g. ED) have mechanisms for scaling up effective practices or systemic changes in professional development. This diversity of missions and approaches has over time led to an uncoordinated Federal investment in STEM education and STEM programs have proliferated to the point where in FY 2012, there were 226 programs across 13 different agencies described in Appendix A. This distributed approach to making critical investments in STEM education has made it difficult to ensure that Federal efforts are coherent, strategic, and leveraged for greatest impact. At the same time, the activities supported by the agencies have important functions and with coordination the combined efforts can unquestionably be greater. Aside from STEM-specific education programs, the Federal Government also supports the development of STEM skills through investments that have goals that extend beyond STEM education (e.g., the many general education programs at ED), or those that focus on STEM research. At the postsecondary level, a portion of the Federal research and development (R&D) expenditure supports investigator-driven research awards at colleges and universities where research teams may include STEM-focused undergraduate students and graduate research assistants. While science R&D funding provides critical training opportunities for aspiring STEM graduates, and contributes to the development of a skilled workforce, such investments are outside the scope of STEM education considered in this Plan.

### Fed key – NSF

#### National Science Foundation is key to STEM education because of its K-12 teaching programs and financial aid that are educational and financial incentives for STEM students to go into the field, and programs that are designed to increase participation of historically underrepresented groups in STEM.

Gonzalez, Specialist in Science and Technology Policy, 12

[Heather B., Specialist in Science and Technology Policy, Congressional Research Service, “An Analysis of STEM Education Funding at the NSF: Trends and Policy Discussion”, 12-12-2012, <https://pdfs.semanticscholar.org/d7b6/ce6b2ed7be025e19259fb91302cae62ee564.pdf>, accessed 6-30-17, NW]

The NSF plays a key role in the federal STEM education portfolio. As noted previously, the Foundation is responsible for one of the largest pieces of the federal STEM education budget pie and manages a large percentage of total federal STEM education programs. The NSF is also the only federal agency whose primary mission includes education across all fields of science and engineering. This key position means changes at the NSF may disproportionally affect the entire federal STEM education effort (funding and character). The specific debate about FY2013 funding for STEM education programs at the NSF is also taking place within a broader conversation about governance of the federal STEM education effort. This conversation has focused on the potential for duplication in the portfolio and on the perception that the federal effort lacks both coordination and an overarching strategy, among other things. The NSTC estimates that total federal STEM education investments in FY2010 were $3.4 billion." The NSF portion of that total was $1.2 billion (rounded). An increase of $ l75-0 million (approximately 15%) in the NSF STEM education budget in FY2010 would have increased the federal STEM education total by 5%. To the extent that NSF STEM education programs are integrated with similar programs at other agencies-as are the Mathematics and Science Partnership programs at NSF and ED-changes at NSF may impact other federal programs. The degree to which federal STEM education programs are integrated and coordinated across federal agencies is not well understood by analysts. Also, although NSF is a major contributor to the federal STEM education portfolio, some analysts may argue that national STEM education objectives could be met without NSF programs. However, the widely held belief that the NSF is a primary federal agency for STEM education may increase demand for NSF’s STEM education funding at a time when, as has been shown in previous sections, those accounts are decreasing. For example, in the House Appropriations Committee report on the Energy and Water Development Appropriations Bill, 2012 (H.Rept. 11-118), congressional appropriators directed the Department of Energy, Office of Science (SC) to "justify to the Committee why fellowships should be funded within the Office of Science when other agencies, in particular the National Science Foundation, are the primary federal entities for such purposes."23 The Department of Energy did not ask for new funding for this fellowship increases as other federal agencies reduce support for STEM education. Similarly, demand for NSF fellowships may not increase if potential fellows look to non-federal sources for research funding or pursue alternative careers. In terms of the character of its contribution to the federal STEM education portfolio, NSF highlights its STEM education research and development (R&D) functions. The Foundation states that it focuses on identifying effective STEM education practices through research and small-scale testing, but that it is not well-positioned to bring these practices to scale. The dissemination of NSF 's STEM education research-including research evaluating the effectiveness of NSF STEM education programs-to other federal agencies and education stakeholders is an ongoing policy challenge. Some policymakers have responded to this challenge by seeking improved collaboration between federal agencies at both the portfolio and program levels. For example, at the portfolio level, the federal STEM education strategy currently under development by the NSTC proposes sharing evidence-based approaches as a primary strategy toward accomplishing federal STEM education goals-" At the program level, the Administration's FY2013 budget request seeks funding for three STEM education collaborations between NSF and ED. Whether these collaborations, if they are funded, will prove successful depends on program managers' willingness to collaborate, on executive branch leadership support for collaboration, and on the institutional cultures of the respective agencies, among other things. Other current strategies that seek to address the dissemination challenge include policies that direct NSF to independently distribute STEM education research to stakeholders (as opposed to dissemination via collaboration with other agencies). For example, the House Appropriations Committee report on Commerce, Justice, Science, and Related Agencies Bill, 2012 (H. Rept. 112- I69) directed NSF to independently distribute research on best practices in STEM education to stakeholders. H-Rept- I12-I69 also directed the NSF to develop methods to track and evaluate stakeholders' implementation of that research and to report to Congress on progress. The results from that progress report may provide further insight into independent dissemination strategies for the Foundation. NSF is also an important source of scholarships, fellowships, and financial support to STEM students as well as institutions of higher education- For example, since the establishment of the Graduate Research Fellowship (GRF) program in l952-two years after NSF 's own founding in 1950-NSF has supported researchers and students in STEM fields- This funding serves integrated research and education purposes. It seeks to support the national research effort through support of the STEM workforce, and it seeks to support the national STEM education effort by providing financial and educational incentives for students to go into STEM and STEM-related fields (such as K-12 science teaching)- NSF estimates that it provides financial support to about 5% of the science and engineering graduate students in the United States." In addition to NSF 's relatively large role as a provider of STEM education R&D and STEM student support in the federal portfolio, the Foundation also operates smaller (measured by funding levels) programs that seek to advance other federal STEM education policy priorities. These include programs designed to increase the participation of historically underrepresented groups in STEM fields.

### Fed key – Smithsonian

#### Federal agencies and the Smithsonian Institution are key to spillover of equal STEM educational opportunities—the fed is central to coordination, alignment, research, and bringing crucial agencies to the table

Holdren, Former White House science advisor, 2013

(John, National Science and Technology Council, “FEDERAL SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) EDUCATION 5-YEAR STRATEGIC PLAN,” May 2013, <https://www.whitehouse.gov/sites/whitehouse.gov/files/ostp/Federal_STEM_Strategic_Plan.pdf>, accessed 06/27/17, pg. 22-24, AS)

Engagement is part of the larger process of learning. It is the critical component for capturing the learner’s interest and involvement, and for inspiring further development of knowledge and understanding. To ensure a STEM-skilled workforce of the future, the Federal Government has considerable assets that can engage youth so that the pathway through their education leads to the challenging STEM-related careers of tomorrow, and to a “culture of STEM” in the public. Background: Given the importance of STEM engagement at a national level, a common understanding of the terminology is necessary. As defined in The 2011 Federal STEM Education Portfolio, investments that focus on engagement are designed to increase learners’ involvement and interest in STEM, inform their view of STEM’s value in their lives, or positively influence the perception of their ability to participate in STEM. The scope of STEM engagement is vast, and includes investments in a wide range of areas, such as development of learning materials; programs at museums, science centers, or parks; games, simulations, and virtual environments; “Citizen Science” initiatives; public talks, and educational broadcast programming. Thus, there are many avenues available to the Federal Government for reaching learners, and many possibilities for tailoring content for STEM-learning audiences. Research indicates that instructional approaches or learning opportunities that engage students actively increase skill acquisition and information retention, encourage more positive attitudes toward STEM disciplines, and strengthen retention of students in STEM majors.73, 74 For example, learning theory and empirical evidence about how people learn75 suggest that STEM experiences that engage learners in “active learning” improve retention of information and critical thinking skills.76 Furthermore, research studies in STEM education support this positive relationship between STEM engagement experiences and student achievement. For example, one study demonstrated that a 2- to 3-week university Summer Science Academy program, which provided students in grades 6-12 with field trips, laboratory experimentation, and other authentic, science-related, learning opportunities nonexistent in the students’ schools, produced significant, long-term outcomes on student achievement and attitudes toward science.77 This growing body of research literature on effective STEM engagement and evidence-based practices can guide Federal Government investments. Additionally, agencies are already exploring or supporting a number of promising new and emerging strategies in the area of youth STEM engagement and have started to generate great momentum within grassroots networks and crowd-driven virtual platforms. For instance, the Maker Education Initiative, which grew out of a network of self–directed STEM enthusiasts who share their creations with students and the general public through Maker Faires across the world, recently announced its intention to create a Maker Corps of student maker leaders. These youth, embedded in informal learning institutions across the country, will provide hands-on learning opportunities to interested students, exciting their desire to be, as the President has said, “makers of things, not just consumers.” Additional new opportunities for engagement include the digital badge movement bolstered by NASA78 as well as the MacArthur and Mozilla Foundations. Additionally, crowd-sourced collection of data through “citizen science” activities like “Backyard Biofuels,” provide an opportunity to evaluate and scale exciting new avenues for inspiring students in STEM fields while building an evidence base for novel activities. In the years ahead, the Smithsonian Institution will convene agencies to help improve the reach of informal STEM learning opportunities by ensuring that materials are aligned with what students are learning in the classroom as appropriate, and that exciting, emerging science is accessible to students through innovative means. Priority will be placed on effective, authentic STEM experiences. The Smithsonian will work with the CoSTEM agencies such as NASA, USDA, NIH, DOI, NOAA, and other science partners to harness their unique expertise and resources to enable the use of promising materials and curricula, on-line resources, and effective delivery and dissemination mechanisms by more learners both inside and outside the classroom. Significant Related Efforts: Over half of the Federal Government’s STEM education investments identified in The 2011 Federal STEM Education Portfolio provided engagement as the primary or secondary objective (156 of 233 programs). Funding for investments with the primary objective of engagement totaled $164 million. Of these investments, about half (approximately 44 percent) are categorized as large-scale programs. The budget of each investment was under $30 million. CoSTEM agencies are heavily involved in engagement. For example, USDA houses the Cooperative Extension System through land-grant universities and includes a mission to bring research, education and extension, and applied research-based practices, to both youth and adults. This occurs through 4-H, a unique public-private partnership with USDA, extension land-grant universities and local governmental entities providing public support along with a private, non-profit national partner, the National 4-H Council. Together with private donors and foundations, these entities support the programmatic efforts for over 6 million youth participants and half a million volunteers, both youth and adults. Since 2010, 4-H’s Science Leadership Academies have engaged 1,266 4-H professionals in training workshops with the ultimate goal of equipping more 4-H staff and volunteers with the ability to engage students in informal learning environments. The Corporation for National and Community Service (CNCS) is launching a new STEM AmeriCorps, multi-year initiative to place hundreds of AmeriCorps members in nonprofits across the country to mobilize STEM professionals with the goal of inspiring young people to excel in STEM education.79 The U.S. Department of Education also hosts a network of 21st Century Community Learning Centers to provide academic enrichment opportunity during non-school hours for children in high-poverty and lowperforming schools. The Smithsonian sponsors a Youth Engagement through Science (YES!) effort, which connects local youth with Smithsonian collections, experts, and training to inspire them to pursue STEM careers.80 The Federal Government has a diverse range of assets to increase interest in STEM. These assets include, but are not limited to scientific data, technology, research and engineering facilities, natural environments, science-technology centers, engineers, technologists, and scientists. The agencies use these assets to provide online, place-based (e.g., research and engineering facilities, federally managed lands and waterways, and museums or visitor centers), and other experiential or hands-on learning opportunities primarily in informal learning environments for people of all ages. In addition, NSF provides development and research grants in the area of informal STEM education, while some CoSTEM agencies have legislative mandates to promote direct public participation in exploration, STEM research, and environmental stewardship. The private sector can help in these efforts, leveraging the passion and expertise of its science and technology trained workforce. For example, leading U.S. technology companies have launched an effort called US2020, an all-hands-on-deck effort to have many more STEM professionals mentor children from kindergarten through college.81 Alignment, coordination, and continued research on such experiences can support the development of multiple pathways to continued and deeper exploration of STEM learning in informal learning environments, connections between formal and informal learning settings,82 and the impact of engagement experiences on outcomes such as student learning. Together, these efforts will move the STEM engagement enterprise forward while building evidence-based practices. In this rich and diverse context for providing engagement, the Smithsonian will assume an initial lead role for coordination and developing the infrastructure to allow the more efficient and open access83 to these extraordinary Federal resources. A key focus within the Engagement priority is on assessing the impact of engagement experiences with appropriate outcome measures and better understanding the connections between inspiration and excitement and persistence and achievement in STEM for school and careers. Strategies: With the Smithsonian playing an initial lead coordination role, Federal agencies will focus investments on three main strategies. Federal investments in engagement that draw explicitly on the scientific, technological, and engineering assets (e.g., facilities, scientific and engineering staff, instruments, data, and federally-managed public lands and waterways) of the Federal Government, where feasible, to provide authentic experiences; Federal engagement investments that support the integration of STEM into existing school readiness and after-school programs with significant local, regional, or national reach; and Federal engagement investments that contribute to improving empirical understanding of how engagement in authentic STEM experiences relates to improved student learning or interest outcomes.

### Solvency – Block grants

#### Block grants incentivizing STEM students to pursue K-12 teaching and success on AP/IB exams and convening a national panel to develop K-12 STEM curriculum and standards key to increasing America’s talent pool.

National Academy of Sciences, et. al, nonprofit society of distinguished scholars engaged in scientific and engineering research, 07

[Private, nonprofit society of distinguished scholars engaged in scientific and engineering research, “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future”, 4-8-2007, <https://www.nap.edu/read/11463/chapter/2#3>, accessed 7-1-2017, NW]

Recommendation A: Increase America’s talent pool by vastly improving K–12 science and mathematics education. Implementation Actions The highest priority should be assigned to the following actions and programs. All should be subjected to continuing evaluation and refinement as they are implemented. Action A-1: Annually recruit 10,000 science and mathematics teachers by awarding 4-year scholarships and thereby educating 10 million minds. Attract 10,000 of America’s brightest students to the teaching profession every year, each of whom can have an impact on 1,000 students over the course of their careers. The program would award competitive 4-year scholarships for students to obtain bachelor’s degrees in the physical or life sciences, engineering, or mathematics with concurrent certification as K–12 science and mathematics teachers. The merit-based scholarships would provide up to $20,000 a year for 4 years for qualified educational expenses, including tuition and fees, and require a commitment to 5 years of service in public K–12 schools. A $10,000 annual bonus would go to participating teachers in underserved schools in inner cities and rural areas. To provide the highest-quality education for undergraduates who want to become teachers, it would be important to award matching grants, on a one-to-one basis, of $1 million a year for up to 5 years, to as many as 100 universities and colleges to encourage them to establish integrated 4-year undergraduate programs leading to bachelor’s degrees in the physical and life sciences, mathematics, computer sciences, or engineering with teacher certification. The models for this action are the UTeach and California Teach program. Action A-2: Strengthen the skills of 250,000 teachers through training and education programs at summer institutes, in master’s programs, and in Advanced Placement (AP) and International Baccalaureate (IB) training programs. Use proven models to strengthen the skills (and compensation, which is based on education and skill level) of 250,000 current K–12 teachers. Summer institutes: Provide matching grants to state and regional 1- to 2-week summer institutes to upgrade the skills and state-of-the-art knowledge of as many as 50,000 practicing teachers each summer. The material covered would allow teachers to keep current with recent developments in science, mathematics, and technology and allow for the exchange of best teaching practices. The Merck Institute for Science Education is one model for this action. Science and mathematics master’s programs: Provide grants to research universities to offer, over 5 years, 50,000 current middle school and high school science, mathematics, and technology teachers (with or without undergraduate science, mathematics, or engineering degrees) 2-year, part-time master’s degree programs that focus on rigorous science and mathematics content and pedagogy. The model for this action is the University of Pennsylvania Science Teacher Institute. AP, IB, and pre-AP or pre-IB training: Train an additional 70,000 AP or IB and 80,000 pre-AP or pre-IB instructors to teach advanced courses in science and mathematics. Assuming satisfactory performance, teachers may receive incentive payments of $1,800 per year, as well as $100 for each student who passes an AP or IB exam in mathematics or science. There are two models for this program: the Advanced Placement Incentive Program and Laying the Foundation, a pre-AP program. K–12 curriculum materials modeled on a world-class standard: Foster high-quality teaching with world-class curricula, standards, and assessments of student learning. Convene a national panel to collect, evaluate, and develop rigorous K–12 materials that would be available free of charge as a voluntary national curriculum. The model for this action is the Project Lead the Way pre-engineering courseware. Action A-3: Enlarge the pipeline of students who are prepared to enter college and graduate with a degree in science, engineering, or mathematics by increasing the number of students who pass AP and IB science and mathematics courses. Create opportunities and incentives for middle school and high school students to pursue advanced work in science and mathematics. By 2010, increase the number of students who take at least one AP or IB mathematics or science exam to 1.5 million, and set a goal of tripling the number who pass those tests to 700,000.4 Student incentives for success would include 50% examination fee rebates and $100 mini-scholarships for each passing score on an AP or IB science or mathematics examination. Although it is not included among the implementation actions, the committee also finds attractive the expansion of two approaches to improving K–12 science and mathematics education that are already in use: Statewide specialty high schools: Specialty secondary education can foster leaders in science, technology, and mathematics. Specialty schools immerse students in high-quality science, technology, and mathematics education; serve as a mechanism to test teaching materials; provide a training ground for K–12 teachers; and provide the resources and staff for summer programs that introduce students to science and mathematics. Inquiry-based learning: Summer internships and research opportunities provide especially valuable laboratory experience for both middle-school and high-school students.

### A2 Nobody takes the jobs

#### Students don’t have the skill to take STEM jobs because they weren’t introduced to these areas during school

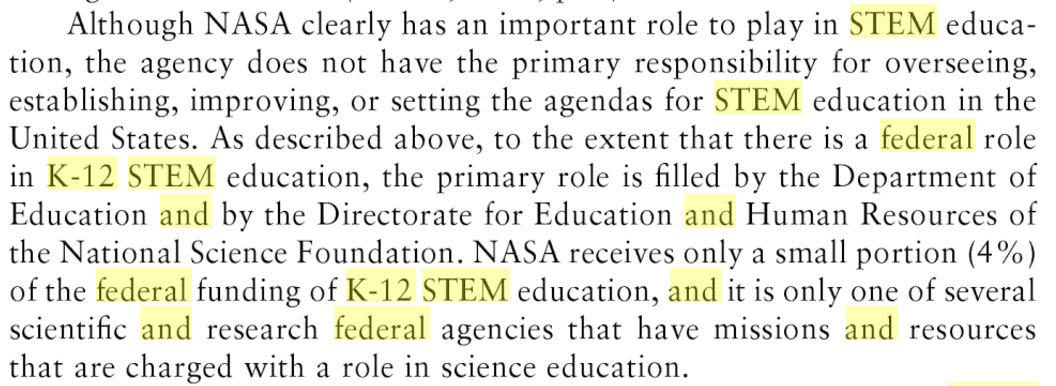
Oberoi, Education Management at Salt Lake City, Utah, 2016 (Sidharth, *Committee For Economic Development,* “The Economic Impact of Early Exposure to STEM Education”, June 21 2016, <https://www.ced.org/blog/entry/the-economic-impact-of-early-exposure-to-stem-education>, accessed July 1 2017, KMV)

The May 2016 jobs report indicated that there are currently 5.8 million job openings (CNNMONEY), which is a symptom of a growing problem in the US: employers can’t find skilled workers for jobs in a number of sectors. Much of this can be attributed to increasing disparity known as the job skills gap. This gap is a critical issue that the country faces as vacant jobs can cost companies hundreds of dollars a day in lost profits and can negatively drive America’s economic growth. When we look at Science, Technology, Engineering, and Math (STEM) jobs specifically, economic projections point to a need for 1 million more STEM professionals than the US will produce at the current rate over the next decade, according to the President’s Council of Advisors on Science and Technology. STEM jobs alone have grown 17 percent, which is much faster than the nearly 10 percent growth rate in all other areas. Yet the civic infrastructure is not there to support this growth. One of the most important factors that limits the United States’ ability to stay ahead of the STEM curve is the lack of introduction to these educational areas at an early age. More school districts are providing laptops as resources for their students. Laptops or iPads are great in terms of exposure to technology and a step in the right direction. However, the use of this technology is not enough to meet the future workplace skills that students need. This is not the fault of teachers who hope to positively impact the lives of their students through more effective learning tools. Teachers continue to do their job, but education has not embraced the notion of teaching students about technology itself. Students use technology as consumers, but not as innovative developers through their formal education experience. The need for this at an institutional level is increasingly important, and schools simply do not have sufficient time, flexibility, or resources to offer these types of curricula. Looking at countries that are leading the way in technological innovation, we find students spend a greater amount of time in education outside of school – traditionally in a tutoring or enrichment capacity. The amount of time that a student spends weekly on their educational enrichment activities is significantly greater around the world compared to the US. This may be associated with a cultural influence which is directly correlated to the rising importance of education needs in different industries, but can also be attributed to increased importance placed on science and technology solutions provided to students. In the United States we are in the midst of a STEM revolution. STEM is at the forefront of educators and policymakers around the country. This is now also becoming increasingly important among parents as they begin to see the paradigm shift in the economy that continues to favor individuals seeking STEM jobs versus their counterparts. STEM is finally being integrated in schools, but not early nor extensively enough. 38 percent of students who start college with a STEM major do not graduate with one, which is reflected by the fact that 69 percent of high school graduates are not prepared for college-level math or science, according to the National Math and Science Initiative. This is alarming and can be traced back to students not receiving the appropriate supports and interventions they need in early grades.

### Roman Ugarte ev

<https://books.google.com/books?id=bGXNOYJaAYoC&pg=PT70&lpg=PT70&dq=state+and+federal+cooperation+best+STEM+k-12&source=bl&ots=qFe8PRFK8K&sig=e3JAGzJsok8ZPISUWs5NMgaYhwQ&hl=en&sa=X&ved=0ahUKEwjW_NTC3-bUAhVG5oMKHYzoCXcQ6AEITjAI#v=onepage&q=state%20and%20federal%20cooperation%20best%20STEM%20k-12&f=false>

<file:///Users/romanugarte/Downloads/12081.pdf>



# \* \* SCIENCE \* \*

### Youth solves science

#### Early STEM unlocks inspiration and the next wave of creativity and wider understanding – this is how great challenges are solved

Clayton, Education researcher, ‘10

(Eric, District Administration, “STEM Education Can Help Prevent the Next Disaster, June 20, <https://www.districtadministration.com/article/stem-education-can-help-prevent-next-disaster> , 6-30-17, LNM)

With oil continuing to spill into the Gulf of Mexico from the Deepwater Horizon drilling explosion and experts scrambling to discover the elusive solution that will halt the unceasing flow of pollutants, it's time to begin grappling with the necessary question that legislators, bureaucrats and everyday citizens must now address: How do we prevent this kind of disaster from happening again?

There are strategies and proposals being presented by engineers, technicians and other experts throughout the world, but the most sustainable and forward-thinking answer may lie elsewhere—in education. It is within the academic realm of science, technology, engineering and math (STEM), often touted as the Achilles' heel of the U.S. educational system, that the foundations for future disaster-aversion could be built. Educating students through strong STEM programming at an early age would set the stage for providing the next generation of engineers, scientists and mathematicians with the necessary resources and skill sets to address future disasters, but only if students are shown the connections between potentially abstract concepts in the classroom and real-life issues.

"The main thing that needs to be done is to connect the dots for students between learning math and science now, and using it later on to solve real-world problems," says Amy Jaffe, the Wallace S. Wilson Fellow in Energy Studies at the James A. Baker III Institute for Public Policy and associate director of the Rice University Energy Program.

The oil spill is providing just such an opportunity, and educators have only to stretch out their hands and seize this potential gold mine of "real-world problems." "Students may be hearing their families talk about the oil spill and they'll have some awareness of it, so the opportunities in the classroom are pretty extensive," says Francis Eberle, executive director of the National Science Teachers Association (NSTA). Eberle notes the numerous issues to tackle in the classroom: the biological life affected, both plant and animal; the chemical components involved with cleaning up the mess; and the scientific vocabulary associated with this particular type of disaster. And most importantly, this is a chance to make science relevant, to show students why fields like engineering are so important. "Science doesn't always have all the answers," Eberle admits, "and part of the reason to pursue science is to answer questions and solve problems."

Allowing students the opportunity to engage with the oil spill issue can demonstrate exactly this.

Moreover, a disaster like the oil spill presents educators not only with real-world problems, but problems that are real and pertinent to the students themselves. "I've had opportunities to see kids get engaged in problem solving in ways that are a little out of the ordinary. We need more opportunities like this for kids," says J. Michael Shaughnessy, president of the National Council of Teachers of Mathematics (NCTM). "Why can't this oil spill problem be pitched to kids all over the country?" he asks.

This is one of those critical thinking opportunities where teachers can describe to students the situation, give the available information, and then say, "What would you do?" It's about "putting them in a situation that's more real for them," Shaughnessy says. Even the most naive of solutions can provide teachers with a springboard to further discussion, pursue deeper questioning, and engage in more critical thinking. "We should give kids the opportunities to wrestle with this stuff themselves."

Strategies like this can go far in bridging the gap between the classroom and the real world.

Yet bridging the gap cannot be the ultimate goal; getting students to walk across that bridge must be the aim of STEM programs. Unfortunately, this is often where STEM programs fail, where high school graduates get sidetracked and take an alternate route, one that perhaps engages their mathematical minds in finance and accounting rather than engineering and technology.

"We need a shift in our national culture, in our attitude toward math and science," Shaughnessy says. "It just should be something that's exciting and joyful to go into." He describes how a shift like this can only succeed if it starts from the top. Shaughnessy points to President Kennedy's efforts in this area and how math and science were made exciting because of the prospect of space travel and the national enthusiasm that went with it.

Nowadays, "it shouldn't be okay to say, 'Well, I'm not good at math, and no one in my family's good at math,' and have that be socially acceptable in our culture."

In this regard, parents have as much responsibility as students. Without parental support and encouragement, how can students be expected to commit to and pursue studies in one of the STEM disciplines?

Indeed, it is within the home and through extracurricular opportunities that STEM ideas must be cultivated if they are to firmly take root. "When you compare the U.S. to other countries and what they actually teach, the science curriculum isn't different," Eberle says. "It's the way they teach it and the cultural support for it."

The top students in other countries are the ones who are involved in scientific activities outside of school, from browsing scientific Web sites, to watching educational television, to reading books on science and technology. "We need to celebrate the science in our world and not see it as a 'subject.' We don't see art as a 'subject.'" The key lies in making science a part of what we do and, again, connecting it to those real-world experiences.

"STEM education needs to start young," says Daylene Long, a member of the National Science Education Leadership Association and an affiliate member of the Council of State Science Supervisors. "We should be introducing kids to scientific processes, probeware, computer data collection, and robotics in elementary school." For Long, a successfully implemented STEM program is one that trains students to be critical thinkers and problem solvers by teaching them not just the scientific facts, but more importantly, "the practices scientists and engineers use to understand the world and to draw conclusions based on evidence." By encouraging this kind of thinking, STEM not only develops future scientists and engineers, but also responsible citizens. "These disciplines of mind are needed to manage our own health care, understand global climate change, and address world disasters like the oil spill."

The Eco-School program, created in 1994 by the Foundation for Environmental Education and supported by the European Commission, is an example of how to move scientific studies and critical thinking beyond the classroom and make them a part of everyday life. As of 2008, the National Wildlife Foundation (NWF) has been charged with bringing the internationally acclaimed program to the United States. "There's the science of it and the application of the science," says Laura Hickey, senior director of the NWF Eco-Schools USA.

The Eco-Schools give students the opportunity to make environmentally responsible decisions in all aspects of their academic lives. It's a holistic program that involves 'greening' everything from the grounds of the school to the school building to the curriculum. "By helping green their school by conducting a water audit [for example,] students are given a context to the problem and play a part in its solution," Hickey says.

Eco-Schools are on every continent, and, as of November 2009, 270 K12 schools signed up in 38 states. Hickey says, "We hope it becomes a part of life for the [participating] school." She goes on to say that only when STEM "doesn't become extracurricular but routine" will it truly begin to tap into its life-altering potential.

The oil spill is a disaster. But the educational opportunities that such a tragic event offers are nearly limitless, and it would only compound the tragedy to ignore them. Incidents like this provide that real-world context so often sought by educators and students alike, and continuing to find ways to incorporate the lessons learned into everyday life will only serve to propel STEM programs toward further success.

"At 7 or 12 years old, not too many children are sitting around thinking they'd like to make a killing on Wall Street," Jaffe says, "but they do have an honest and sincere interest in earth science, environmentalism, animals. The trick is to show [the] connection between learning [math and science] and being a person that can save the world."

#### Early STEM curriculum is key – students get locked out without exposure

National Academy of Sciences, et. al, nonprofit society of distinguished scholars engaged in scientific and engineering research, 07

[American nonprofit non-governmental organization, 4-8-2017, <https://www.nap.edu/read/11463/chapter/5#102>, accessed 6-30-2017, NW]

Student interest in research careers is dampened by several factors. First, there are important prerequisites for science and engineering study. Students who choose not to or are unable to finish algebra 1 before 9th-grade— which is needed for them to proceed in high school to geometry, algebra 2, trigonometry, and precalculus—effectively shut themselves out of careers in the sciences. In contrast, the decision to pursue a career in law or business typically can wait until the junior or senior year of college, when students begin to commit to postgraduate entrance examinations. Science and engineering education has a unique hierarchical nature that requires academic preparation for advanced study to begin in middle school. Only recently have US schools begun to require algebra in the 8th-grade curriculum. The good news is that more schools are now offering integrated science curricula and more districts are working to coordinate curricula for grades 7–12.60 For those students who do wish to pursue science and engineering, there are further challenges. Introductory science courses can function as “gatekeepers” that intentionally foster competition and encourage the best students to continue, but in so doing they also can discourage highly qualified students who could succeed if they were given enough support in the early days of their undergraduate experience.

### STEM solves science diplomacy

#### In order to solve the STEM centered challenges within the government we MUST have policymakers and diplomats familiar with STEM

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The most daunting challenges that governments face are technologically demanding and global in scope: poverty, lack of access to clean food and water, macroclimate change, inefficient response to disease outbreaks, and the inability to address expanding regional economic opportunities. Addressing these challenges will require nations to harness the knowledge and experience of policymakers and diplomats familiar with science, technology, engineering and mathematics (STEM). Owing to the launch of President Obama's 2012 priorities for STEM education and the 2013 Global Innovation Initiatives1 articulated by policymakers in the United States and United Kingdom, we discuss these science diplomacy priorities and the UN advancing STEM policies for the next decade. Using science diplomacy as a tool, the US State Department can also encourage the engines of society to address the most pressing STEM challenges of this century.

#### STEM paves the way for science diplomacy

Alex Laverty Research Intern, U.S. PD 2.0 in South Africa, Candidate for Master of Public Diplomacy, USC. <https://uscpublicdiplomacy.org/pdin_monitor_article/science-diplomacy> (A.M.M)

Beginning in the summer of 2009, the United States government took a new interest in the use of science diplomacy, the exchange of science and technology across borders. By encouraging cooperation and development in scientific research, not only would American national security and economic prosperity improve it was hoped, but the new technologies and intellectual property would strengthen the United States’ scientific progress. The benefits of new research and partnerships were enumerated by Representative Brian Baird (D-WA) in the U.S. Congress when he submitted the International Science and Technology Cooperation Act of 2009 (H.R. 1736) for consideration. H.R. 1736 recreated a committee under the National Science and Technology Council (NSTC) that would coordinate [science diplomacy activities](http://archives.democrats.science.house.gov/press/PRArticle.aspx?NewsID=2495) across the federal government. A bill that was passed in conjunction with H.R. 1736 was the STEM Education Coordination Act of 2009 (H.R. 1709) which elevated an existing committee in the NSTC to [coordinate science, technology, engineering, and math (STEM) education activities](http://archives.democrats.science.house.gov/press/PRArticle.aspx?NewsID=2495) across the U.S. government including agencies such as NASA, the Department of Energy, the DOD, and the Department of Education. These bills that passed in the House of Representatives followed the passage of a bill in the U.S. Senate that provided for the appointment of the Science Envoys on behalf of the United States. The Senate bill capitalizes on U.S. expertise and innovation in science and technology by creating the position of Scientific Envoy to collaborate with other nations to advance these growing fields surrounding issues of shared interest. This public diplomacy activity would enhance relationships between participating countries; display the United States’ commitment to improving lives throughout the world; and improve the nation’s image through scientist exchanges. This bill from the Senate Foreign Relations committee was eventually taken up in a bill in the House Foreign Affairs Committee. Introduced by Congressman Howard Berman (D-CA) in March of 2010, the bill was to enhance the ability of the United States to share one of its greatest resources, the intellectual and creative capacity of Americans through science. H.R. 4801, The Global Science Program for Security and Competitiveness, and Diplomacy Act would [establish grants for American and foreign scientists](http://www.democrats.foreignaffairs.house.gov/press_display.asp?id=715) in order to foster exchanges, strengthen research infrastructure, and encourage cheaper access to scientific journals online. While the bill was meant to formalize the Obama Administration’s intent to facilitate international cooperation through science, it was referred to the subcommittee in March of 2010 and [has not seen movement since](http://www.govtrack.us/congress/bill.xpd?bill=h111-4801).

### Youth solves science diplomacy

#### Educating the “next generation” in STEM prepares students to be future science diplomats.

Marga Gual Soler Biomedical Sciences PhD. Science Diplomat. Professor. Advancing Women in STEM. Training Scientists and Engineers to Change the World. Dec 30, 2015 <https://medium.com/stem-and-culture-chronicle/how-i-became-a-science-diplomat-aad34983013d> (A.M.M)

Science diplomacy is not new, but is more important than ever. In our 21st-century globalized world, many of the challenges we face, from global health to climate change, from water, food, cyber, and energy security to nonproliferation, have scientific and technological dimensions and cross-national borders, and no country will be able to solve these problems on its own. We must prepare the next generation to tackle these challenges, and although there are limited formal opportunities for “career” science diplomats — working as a science adviser to the foreign ministry or as science attaché at an embassy are some examples — there is a unique opportunity for universities, NGOs, the private sector, multilateral organizations, and civil society at large to harness the potential of science to bridge citizens, institutions, and countries all around the world. The [AAAS Science & Technology Policy Fellowships](http://www.aaas.org/page/st-fellowship-program-areas" \l "diplomacy" \t "_blank) place dozens of scientists and engineers each year in the federal government to infuse scientific and technical expertise into foreign policy, and Arizona State University’s [Science Diplomacy & Leadership](https://asunow.asu.edu/content/new-program-helps-students-navigate-complex-world-science-diplomacy" \t "_blank) effort, which I designed, provides a policy and diplomacy immersion experience for early-career scientists and engineers from all countries in the Americas in Washington, D,C. Similar programs include the [AAAS and World Academy of Sciences summer course in science diplomacy](http://twas.org/article/art-blending-science-and-policy" \t "_blank) held in Trieste, Italy, the [Hurford Science Diplomacy Initiative](http://www.rockefeller.edu/graduate/ScienceDiplomacy/" \t "_blank) at Rockefeller University, and the [science diplomacy course](http://www.med.nyu.edu/research/nyu-science-training-enhancement-program-step/career-development-phase-2b/careers-non%E2%80%90profits-and-government/science-diplomacy" \t "_blank) at New York University.

#### Domestic STEM education reform key to enabling science diplomacy, solves climate—need to develop STEM competency together with policy, climate change controversy solvable by STEM reform, delink from neolib, provide sociocultural/international context.

Chiu, Graduate Institute of Science Education, National Taiwan Normal University, Duit, Leibniz Institute for Science and Mathematics Education, University of Kiel, 11. Mei-Hung and Reinders, “Globalization: Science Education from an International Perspective,” *Journal of Research in Science Teachin*g*,* volume: 48, no. 6, 5-27-11, pp. 558-559, <http://onlinelibrary.wiley.com/doi/10.1002/tea.20427/epdf>, accessed 7-1-17, ATN.

Towards Scientific Literacy Facilitating Understanding of Global Socio-Scientific Issues (SSI) and Active Engagement in Society In his widely cited position article ‘‘Time for action: Science education for an alternative future’’ Hodson (2003) argued that scientific literacy should explicitly include socio-political action. It comprises not only understanding of global socio-scientific issues (such as climate change or the use of nuclear power) but also the willingness and ability to engage in socio-political action.

Since the early 1990s, significant attention has been given to the importance of developing individuals’ competencies related to knowledge and skills of science and technology in the context of socio-scientific issues (SSI) (Roth & Barton, 2004; Sadler & Zeidler, 2009). The significance of this approach is explicitly pointed out by Choi, Lee, Shin, Kim, and Krajcik in the present special issue. The specific area of SSI they refer to is climate change. Also in Bencze and Carter’s contribution (in this issue) socio-scientific issues (here concerning an ‘‘ecological’’ worldview) play a significant role. A recent significant SSI is the use of nuclear energy due after witnessing the failure of the Japanese nuclear power plants in March 2011. Understanding socio-scientific issues has been given significance in various approaches to scientific literacy, as the more recent reviews by Roberts (2007) and Osborne (2007) reveal. In addition, active engagement has been also a concern in approaches like STS (Science, Technology, Society; Solomon & Aikenhead, 1994) or ‘‘socio-scientific’’ oriented science instruction (Ratcliffe, 1997).

Concluding Remarks on the Literature on Globalization and Science Education Available The above attempt to uncover the major issues discussed in the recent globalization literature in science education reveals a rich argumentation culture with critical positions prevailing. Regarding views of society, neoliberal, neoconservative, and capitalist perspectives presently predominating economic and cultural globalization processes are fundamentally questioned (e.g., Carter, 2005; Gough, 2008). A similar emphasis is given to questioning traditional views of instructional practices (e.g., Carter, 2008a,b) arguing in favor of new pedagogies that allow student self-responsibility and active engagement in teaching and learning processes. They should replace traditional passive receiver positions that are attached to the neoliberal, neoconservative, and capitalist positions. With regard to scientific literacy a position is favored that includes active engagement in society and not just an awareness of particular dangers and risks of certain technologies (e.g., Eisenhart, 2008; Hodson, 2003; Martin, 2010). The theoretical perspectives are usually convincingly presented and justified. In addition, examples of how these perspectives may be set into practice are presented (e.g., Carter & Dediwalage, 2010). However, a critical analyses suggests that based what is known about student learning processes and teacher professional development it is unclear whether such justified visions can actually become part of normal practice. Such research is missing so far—or at least is given limited emphasis. Moving the aims into the actual practice of normal schools seems to be rather ambitious. If, for instance, it is claimed that students should become able to actively engage in public debates on risky technologies (nuclear power or biotechnologies, for instance) solid science knowledge about those technologies is needed. Such considerations, for instance, are missing in Hodson’s (2003) otherwise convincing argumentation.

Briefly put, the analyses of science education from the perspective of globalization provide new insights into how science should be taught and what should be emphasized. In addition, they also provide direction for further development of international cooperation regarding science education research. The richness of different traditions and perspectives of science education around the world surely is the major source for further research that leads to improvement of scientific literacy worldwide. Guo (2007) provided an overview of effective means of international cooperation to achieve this aim. It seems that the globalization perspective discussed in the present special issue offers a means to successfully continue the process of international cooperation in science education research. Obviously, ‘‘it becomes impossible to consider contemporary education in isolation from globalization as the dominant logic, rethinking, and reconfiguring social and cultural life in which it is located’’ (Carter & Dediwalage, 2010, p. 275).

Interestingly, there is another issue discussed in the ‘‘globalization’’ literature. Hwang and Roth (2008) argue that worldwide migration results in various cultures in a variety of different national classrooms. Hence, the debate about globalization in science education also provides thinking patterns to deal with teaching and learning in multi-cultural classrooms. Briefly summarized, the literature available and discussed above addresses the significance of economic and cultural globalization in various respects. Particular emphases are given the way science should be taught, taking into account the rapid changes due to economic and cultural globalization and the development of science education research to support these developments.

#### STEM and science diplomacy are intertwined – creating opportunities for new talent unlocks cooperative solutions to interstate problems like global warming

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In a world of diverse transnational priorities across the globe, the advancement of science is seen by many countries as a solution to promote a knowledge-based economy, yet few resources are actually committed to this policy. For example, countries in the Middle East face a range of social, political, economic and security challenges that are unparalleled in the world. Many of these countries are trying to manage their economies during declining oil and gas prices which have now had a negative impact on their ability to make local investments in science and technology (1). Unemployment is high, political upheaval is often at the core of civil war, and the last priority of government officials is the development of science and technology expertise. Except for Israel, most Middle East nations are underperforming in science in this region of the world where only 1% of their expenditures include research and development (R&D) (2). Science diplomats and/or health attaches have tried to assist countries in the Middle East to address the short-falls in scientific and technological program development. These efforts have been welcomed, but the results have been marginal. One way to remedy the situation is for these countries to grow their scientific communities, and this includes the encouragement of a highly under-developed workforce, viz., women and ethnic minorities. Enabling this largely neglected and under-utilized intellectual resource to pursue careers in Science, Technology, Engineering and Mathematics (STEM) is the focus of this article. Indeed, many scientific leaders from Israel and Arab countries have come together to develop strategies and issue policy statements which have called for greater investments in STEM. An example of this occurred where ministers of higher education and science assembled in Riyadh, Saudi Arabia in March 2014 calling for the improvement of science education and research capacity in the Middle East, with the goal of investing 3% of their gross domestic product (GDP) for the expansion of R&D; it was proposed that 30% of this expansion would come from the private sector who are interested in technological breakthroughs. We have written in the past about developing links between investigative science and policy utilizing science diplomacy as a useful tool to advance Middle Eastern knowledge-based economies (3-6). One major reason for “soft power” approach is that it can be used as a valuable mechanism to develop foreign policy in this region of the world, specifically for the purpose of encouraging governmental support of STEM research and education. Between 2013 and 2016, Qatar, Oman, Jordan, Saudi Arabia and Israel all realized this potential; they hosted regional conferences to determine whether science diplomacy can indeed bring positive awareness for the need to develop IT communications, manage climate changes, develop research tools and training opportunities for men and women so that one could build research capacity in their countries (6). An important concept raised at these conferences was the necessity to develop the infrastructure **to develop cutting-edge research opportunities, particularly with new talent**. With these issues in mind, the most daunting challenges that governments face include poverty; lack of access to clean water, food, and electricity; unfavorable climate change; and insufficient responses to disease outbreaks (4-6). Addressing these challenges will require nations to harness the knowledge and experience of its policymakers and diplomats familiar with STEM research. Owing to the launch of President Obama’s 2012 priorities for STEM Education and the 2013 Global Innovation Initiatives articulated by policymakers in the U.S. and the United Kingdom, it was clear that science diplomacy can be a useful and reasonable tool for advancing the STEM disciplines (4). STEM experts working in diplomacy require competencies and skill- sets to effectively counsel officials involved in policy development to train the next generation of STEM scientists and to build research capacity for their countries. For example, academic medical centers in the U.S. are now promoting interdisciplinary collaborations to address various disease epidemics that occur in the Middle East [e.g. severe acute respiratory syndrome (SARS), and Middle Eastern respiratory syndrome (MERS)]. The development of “Education Cities” in the Middle East region of the world (Saudi Arabia, Kuwait, Qatar) exemplify some of the national priorities to advance science and technology, build research capacity, train women physicians-scientists, and deal with emerging health issues (diabetes, cancer, infectious diseases) (3-6). Climate change offers yet another daunting set of challenges as well as opportunities. The importance of science diplomacy in achieving agreement on reducing carbon emissions without undermining the economies of the petroleum-exporting nations cannot be overstated. However, emerging renewable energy technologies represent enormous research and training opportunities for young scientists and engineers. It should be emphasized that training the next generation of scientists has always been considered paramount to societal advancement, whether it involves technological advancements, food security, medical **breakthroughs** or drug development. The U.S. State Department Global Innovation Initiative fosters international exchange of students and faculty, particularly women who have developed scientific skill sets that **can assist under-developed countries in STEM**. This initiative encourages international academic collaborations with the potential of forming business linkages that exploit scientific discoveries. The Bureau of Educational and Cultural Affairs as well as the Institute of International Education in the State Department also fosters mutual understanding between the U.S. and other countries by means of STEM-based educational and cultural exchanges.

#### Education is a venue of science diplomacy.

AAAS ’17 (Moderated by Mandë Holfford a - Associate Professor, Department of Chemistry and Biochemistry, CUNY Hunter College and Graduate Center; American Museum of Natural History) (Mandë, American Association for the Advancement of Science, “Practicing, Science Diplomacy at Museums and Science Centers,” March 29, 2017, https://www.aaas.org/scidip2017-event, June 28, 2017, E.M.)

Natural history museums and science centers are places of wonder that offer opportunities to educate and engage their audiences. Scientists working in these informal education venues are themselves practitioners of science communication, dissemination and diplomacy. Field expeditions to learn about and describe biological and cultural diversity and the history of life and civilization generally require museum scientists engage on a global scale with their counterparts to gain access to field sites, samples, and permits, and to begin a discourse of the study target. In these cases museum scientists are working at transboundaries that are beyond politics but that can generally facilitate policy, such as with climate change and conservation issues This panel will discuss the intersection in which natural history museums and science centers are arenas for shaping and guiding science diplomacy as it pertains to working with nations of conflict, tackling STEM education, and conserving endangered species. Media pieces from the recently opened ¡Cuba! exhibition from the American Museum of Natural History will be displayed in the lobby of AAAS to accompany the panel.

### Science literacy solvency

#### Active science participation in policy works for the betterment of society

Nelson, Professor of Environmental Philosophy at Oregon State U, and Vucetich, Professor of Conservation Ethics at Michigan Technological University, 2009

(Michael and John, “On Advocacy by Environmental Scientists: What, Whether, Why, and How,” Conservation Biology, Volume 23 Issue 5, May 18, 2009, ATH)

Reasons to oppose advocacy by environmental scientists have been made on the grounds that doing so compromises scientific credibility, conflicts with the essential nature of science, and conflicts with the practical requirements of being a productive scientist. Reasons to favor scientist advocacy have been based on the fundamentally similar nature of science and advocacy, concern for the social harm that might arise from not advocating, and the dual nature of a scientist citizen. When examining these positions as formal arguments composed of premises and conclusions, all but two arguments (social harm and citizenship) collapse. Moreover, only one argument seems robustly sound and valid. According to this argument scientists, by virtue of being citizens first and scientists second, have a responsibility to advocate to the best of their abilities and in a justified and transparent manner. Importantly arguments against science advocacy are valuable for offering insight about how one should or should not be an advocate, not whether one should advocate. If these conclusions are accurate, then Hardin (1998) is correct: “[O]ne of today’s cardinal tasks is to marry the philosopher’s literate ethics with the scientist’s commitment to numerate analysis.” Our assessment calls for more active participation by scientists in matters of policy. Nevertheless, each scientist is called according to his or her abilities. Broad participation, however, will undoubtedly result in disagreement among good scientists and in some scientists advocating in an unjustified and dishonest manner. Thus broad participation will substantially complicate the policy-making process. Although this might seem undesirable, our goal here should not be simplicity but rather the betterment of society.

#### Science literacy encourages political advocacy in science—results in environmental justice

Meyer et al., President of the Ecological Society of America, 2010

(Judy L., Peter C Frumhoff, Director of Science and Policy at the Union of Concerned Scientists, Steven P Hamburg, Brown University Associate Professor of Environmental Studies, Carlos de la Rosa, Director of La Selva Biological Station, “Above the din but in the fray: environmental scientists as effective advocates,” Frontiers in Ecology and the Environment, Volume 8 Issue 6, August 1, 2010, accessed on 6/30/17, ATH)

The publication of policy-relevant science in peer-reviewed journals is rarely sufficient, by itself, to draw enough attention to an emerging environmental threat to initiate action. For example, after their groundbreaking discovery that widely used commercial products containing chlorofluorocarbons (CFCs) posed a serious risk to the stratospheric ozone layer, physical chemists F Sherwood Rowland and Mario Molina began speaking out to draw public and policy-maker attention to the dangers posed by CFC use and to urge the cessation of CFC production. Their persistent, science-based advocacy helped facilitate the ban on CFCs under the Montreal Protocol. Reflecting on his decision to step into an advocacy role, Molina later said, “…if you believe that you have found something that can affect the environment, isn’t it your responsibility [as a scientist] to actually do something about it, enough so that action actually takes place?”, adding that “we just have to be clear when we are speaking as scientists and when we are expressing [personal] values” (Rowland and Molina 2001). Controversy and differing interpretations of data are a part of science, and a scientific assessment process (eg the Intergovernmental Panel on Climate Change) can provide decision makers with a consensus-based understanding of policy-relevant science. However, when scientific information runs counter to deeply held beliefs (as is the case with evolution) or deeply entrenched and politically powerful interests (as is the case associated with climate change), even core findings, broadly accepted by the expert community and confirmed through scientific assessment, face formidable hurdles in generating sufficient political will for science-based policy responses. History teaches us that shifts in public and political responses to contentious issues (eg human health threats from tobacco use) can and do occur, but may require years before a change is seen (Figure 1). Approaches to the use of science in generating political will for environmental issues include engaging citizens in environmental monitoring, which can increase awareness of problems, and empowering citizen groups to use science in advocacy (Groffman et al. 2010; Whitmer et al. 2010).

#### Science education is a prerequisite to bringing about effective change within the state—lack of it prevents any solvency

Hodson, Ontario Institute for Studies in Education, University of Toronto, Canada Visiting Professor, University of Hong Kong, 2004

(Derek, “Going Beyond STS: Towards a Curriculum for Sociopolitical Action ,” The Science of Education Review, Volume Three Issue 1, 2004, accessed on 6/30/17, ATH)

The fourth level of sophistication is where the radical character of this curriculum is principally located: helping students to prepare for, and to take, responsible action. Socially and environmentally responsible behaviour will not necessarily follow from knowledge of key concepts or even from the possession of the “right attitudes.” Almost every one of us has personal experience illustrating that it is much easier to proclaim that one cares about an issue than to do something about it. What translates knowledge into action is ownership and empowerment. Those who act are those who have a deep personal understanding of the issues (especially their human and environmental implications) and feel a personal investment in addressing and solving the problems. Those who act are those who feel personally empowered to effect change, who feel that they can make a difference and, crucially, know how to do so. Thus, a prerequisite for action is a clear understanding of how decisions are made within local, regional, and national government, and within industry, commerce, and the military. Without knowledge of where, and with whom, power of decision-making is located, and awareness of the mechanisms by which decisions are reached, intervention is not possible. In other words, the kind of scientific and technological literacy that this curriculum proposal is designed to achieve is inextricably linked with education for political literacy. The likelihood that students will deploy their knowledge of political structures and mechanisms in significant sociopolitical action in adult life will be much greater if they are given opportunities to take action as part of the curriculum experience. Examples of such action include conducting surveys of dump sites, public footpaths, and environmentally sensitive areas, generating data for community groups such as birdwatchers and ramblers, making public statements and writing letters, organizing petitions and consumer boycotts of environmentally unsafe products, publishing newsletters, lobbying local government officials, working on environmental clean-up projects, creating nature trails, assuming responsibility for environmental enhancement of the school grounds, monitoring the school’s consumption of energy and material resources in order to formulate more appropriate practices, and so on. It is not enough for students to learn that science and technology are influenced by social, political, and economic forces. They need to learn how to participate, and they need to experience participation. It is not enough for students to be armchair critics! As Kyle (1996) put it: “Education must be transformed from the passive, technical, and apolitical orientation that is reflective of most students' school-based experiences to an active, critical, and politicized life-long endeavour that transcends the boundaries of classrooms and schools” (p. 1).

#### Science curriculum creates citizens who are technologically responsible, and environmentally sustainable.

Hodson, Ontario Institute for Studies in Education, University of Toronto, Canada Visiting Professor, University of Hong Kong, 2004

(Derek, “Going Beyond STS: Towards a Curriculum for Sociopolitical Action ,” The Science of Education Review, Volume Three Issue 1, 2004, accessed on 6/30/17, ATH)

It is a well-worn cliché to say that we live in a global village, and that what we do in our own backyard can impact quite significantly on people living elsewhere in the world. It is also the case that our actions now impact on the lives of future citizens. The ethics of previous generations have dealt almost exclusively with relations among people alive at the same time. In startling contrast, the impact of contemporary technology makes an urgent issue of relations with those as yet unborn. In recognizing this new reality, we would do well to heed the wisdom of the First Nations people of North America: “Treat the Earth well. It was not given to you by your parents; it was loaned to you by your children. We do not inherit the Earth from our ancestors, we borrow it from our children” (oral tradition). It is not too much of an exaggeration to say that the degree to which young citizens incorporate sustainable practices into their professional and personal lives will determine the quality of life for future generations. It is my contention that the science curriculum has a crucial role to play in teaching students how to exercise the enormous power of technology responsibly, carefully, and compassionately, and in the interests of all living creatures.

### Science solves democracy

#### Lack of scientific literacy discourages civic participation in decision making, and destroys democratic processes.

Süerdem, Professor of Business at Istanbul Bilgi University, and Çağlıyor, Halic University, 2016

According to American National Academy of Sciences [5], “scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity”. Lack of scientific literacy creates docility on the side of the public and discourages civic participation in decision making. According to Miller, [5] a science literate public is essential for the democratic process to function in today’s highly technological societies. Without at least a general understanding of the issues they are called on to decide, voters will not be able to make healthy choices. Hence, studying the relationships between civic scientific literacy and public understanding of science is important to understand public participation to political decisions. The aim of this study is to make an operational model for explaining how civic scientific literacy affects public understanding of science and these in turn influence participation to political decision making.

#### Society must enhance its scientifically literate to have substantive democratic practices

Árnason, Professor of Philosophy at the University of Iceland, 2011

(Vilhjálmur, “Database Research: Public and Private Interests,” Cambridge Quarterly of Healthcare Ethics, October 2011, Proquest, accessed on 6/30/17, ATH)

How can the search for ethical frameworks be enlightened by the vision of the "active, informed, reflective and responsive citizens25 It is crucial that this be seen in terms of shaping conditions that enhance scientific literacy and awareness of the social implications of biotechnology and genetic research. This is a task that needs to be undertaken at several levels of society. First, educational programs need to be developed aimed at increasing scientific literacy, social awareness, and critical thinking about science and technology. Second, the scientific media needs to be strengthened so that citizens are kept better informed about scientific projects and their social implications. Third, this vision requires transparency and professionalism in the work of supervisory agencies, which also need to be creative in finding ways to enable participants in population database projects to follow the research and, with continuous information, to exercise their consent and their right to opt out of particular research projects if they so choose. Finally, there is a need to create deliberative public forums that enable citizens to inform themselves about scientific projects, exercise their reflective capacity, adopt a public standpoint, and influence policymaking. I end by considering briefly two objections, liberal and practical, to the idea of scientific citizenship in the spirit of deliberative democratic theory. The liberal criticism of the deliberative vision of the citizen concerns the demands placed on the citizens in liberal democratic society. This objection need not doubt the intrinsic value of deliberation; rather, it would emphasize other values that are more important to protecting people's basic interests. If one would take the deliberative vision of citizenship to emphasize public participation over protection of basic interest, this objection would certainly apply. But public accountability is the basic requirement of the democratic legitimacy of a policy. This implies that the policy needs to be justified to everyone whom it affects and that the policy would be accepted in an informed and unrestrained public dialogue. More generally, it could be stated from the viewpoint of liberal neutrality that the citizens should enjoy their right to non-interference and should not be bothered with demands for collective deliberation on public policy.26 They should legitimately be able to enjoy the privacy of their personal life and have freedom from politics. The deliberative vision of the scientific citizen does not question the right to privacy and freedom from politics, but it emphasizes the fact that in a democratic society every citizen is partially responsible for public policy. It is a duty of democratic politicians to conduct politics in such a way that citizens are well informed and otherwise enabled to assume their responsibilities as free and equal citizens, which in turn should affect political decisions. It could still be said that many citizens are not interested in being informed and responsible, and their choices in that regard will be respected. Nevertheless, it is quite compatible with liberal politics to emphasize citizenship education that motivates citizens to think about common concerns and to develop reasoning skills, along with mutual respect, that are crucial for deliberative democratic practices.

#### The nature of scientific literacy fosters responsible citizenship

Holbrook, University of Tartu in Science Education, and Rannikmae, Estonian Chemist in Cognitive Learning and Scientific Literacy at the University of Tartu, 2007

(Jack and Mia, “The Nature of Science Education for Enhancing Scientific Literacy,” International Journal of Scientific Education, Volume 29 Issue 11, 1347-1348, September 3, 2007, accessed on 7/1/17, ATH)

A common rationale given for studying science subjects in school is the achievement of scientific literacy (American Association for the Advancement of Science [AAAS], 1989; Bybee, 1997; Brown, Reveles, & Kelly, 2005; OECD, 2003; Shwartz, Ben-Zvi, & Hofstein, 2005), although there are different interpretations of its meaning (DeBoer, 2000; Fensham, 2004; Hodson, 2002; Jenkins, 1990; Kolstø, 2001; Laugksch, 2000; Tippens, Nichols, & Bryan, 2000). This paper sets out to establish the nature of science education needed to prepare students for the kind of scientific literacy necessary for responsible citizenship. It proposes that abilities in a range of educational goals including socio-scientific decision-making and scientific problem-solving are more important for enhancing true scientific literacy (Shamos, 1995), or multi-dimensional scientific literacy (Bybee, 1997), than a thorough basic understanding of fundamental content knowledge (AAAS, 1993; National Research Council [NRC], 1996).

### STEM solves climate change

#### STEM key to climate change adaptation

Lutz et al, member of World Population Program and International Institute for Applied Systems Analysis, 2014

(Wolfgang, Science Magazine, “Universal education is key to enhanced climate adaptation”, 11/28/2017, <http://science.sciencemag.org/content/346/6213/1061>, accessed 06/28/2017, AS)

Over the coming years, enormous amounts of money will likely be spent on adaptation to climate change. The international community recently made pledges of up to $100 billion per year by 2020 for the Green Climate Fund. Judging from such climate finance to date, funding for large projects overwhelmingly goes to engineers to build seawalls, dams, or irrigation systems ( 1). But with specific projections of future changes in climate in specific locations still highly uncertain, such heavy concrete (in both meanings) and immobile investments that can lock countries into certain paths may not be the best way to go (2). Our new study suggests that it may be efficient and effective to give part of this fund to educators rather than engineers. Public investment in universal education in poor countries in the near future should be seen as a top priority for enhancing societies’ adaptive capacity vis-à-vis future climate change. Recent research suggests that general empowerment of populations through universal primary and secondary education is not only essential to poverty alleviation and economic growth but also to reducing vulnerability to natural disasters (3, 4). It is not unreasonable to assume that factors that helped reduce vulnerability to floods, tropical storms, and droughts over the past decades will help reduce future vulnerability to climate change. We present findings from the most comprehensive global-level assessment of the effects of education on disaster fatalities (measured as the logged number of deaths per million of population) from hydro-meteorological hazards that are likely to be intensified by climate change, e.g., floods, droughts, storms, and extreme temperatures. The data cover 167 countries for the period 1970 to 2010. Data on disasters come from the Emergency Events Database (EM-DAT), which provides the best available information on the number of disasters and reported fatalities from around the world (5). EDUCATE FEMALES, REDUCE FATALITIES. Because the literature on disaster vulnerability has conventionally emphasized economic growth while disregarding education, our statistical analysis focuses on the relative assessment of these two factors as measured by Gross Domestic Product (GDP) per capita and the proportion of women aged 20 to 39 with at least junior secondary education. The latter was shown to be a good indicator for recent improvements in human capital in other contexts (3). To account for differences in the frequency of natural hazards experienced and size of the countries affected, we include as controls the number of registered disasters per population, total arable land area, a dummy variable for being landlocked, the recent rate of population growth to capture stress on infrastructure, and 43 regional fixed effects for countries with comparable settings and climate zones. As documented in the supplementary materials (SM) (table S1 and sensitivity analysis in table S2 and fig. S1), several alternative model specifications combined with different estimation techniques resulted in very consistent findings: When estimating the relative effects of income and education in the same models, GDP per capita turns out to be insignificant, whereas female education is highly significant across all models with the expected negative sign. Hence, this empirical analysis of national-level time series clearly indicates that female education is indeed strongly associated with a reduction in disaster fatalities. Assuming that this robust association between education and lower mortality risk from natural disasters will continue in the future, we present alternative scenarios for future disaster-related fatalities as a function of alternative future education and population trends. When studying the effects of improvements in school enrollment on the human capital stock of the adult population, it is essential to account for significant inertia in the process of human capital formation. Because primary and junior secondary education tend to happen almost exclusively during childhood, it will take several decades until an expansion of education among children translates into higher human capital for men and women around age 50. This process of human capital formation along cohort lines can be appropriately modeled using the tools of multidimensional demography (6). This approach has recently been applied to produce a new set of SSP (Shared Socioeconomic Pathways) scenarios for the international integrated assessment and vulnerability, risk, and adaptation research communities replacing the older Special Report on Emissions Scenarios which contained only total population size and GDP as socioeconomic variables (7). The SSPs were defined to address simultaneously the socioeconomic challenges to climate change mitigation and adaptation (8). Besides many other economic and technological variables, alternative population scenarios by age, sex, and seven levels of educational attainment for all countries form the “human core” of the full SSPs ( 9). SSP1 illustrates the case of rapid social development in all parts of the world associated with rapidly expanding education (see the first chart). SSP2 is the middle-of-the-road scenario where current development trends continue while SSP3 anticipates a fragmented world with stalled socioeconomic development. The figure also illustrates the great inertia of progress in improving educational attainment where, by 2035, the differences between the scenarios are only evident for the younger cohorts. The results of combining the estimated coefficients (table S1) with two contrasting SSP scenarios (SSP1 and SSP3) for the rest of the century are shown in the second chart. We did this by taking the time-varying population and education variables from the respective SSPs. Different assumptions were made for the frequency of disasters representing possible greater future hazards. The solid lines in the second chart show the hypothetical case of constant hazard (i.e., no climate change). Under SSP1, this results in a significant decline of disaster deaths because of underlying progress in educational expansion. If we assume stalled development, which also implies higher fertility and thus higher population size, we observe almost no change under SSP3. The dashed lines assume an increase in the number of hydro-meteorological extreme events of on average 10% per decade (Climate Change +10%). Although there is still a slight reduction in future disaster deaths for SSP1, we observe a strong increase according to SSP3. The more extreme assumption of the hazard increasing on average by 20% per decade (Climate Change +20%; dotted line) leads to an increase in future disaster deaths in the longer run for all SSPs, although to different degrees. COGNITIVE CAPACITY, SOCIAL SPILLOVER. Our macrolevel finding that education reduces disaster-related mortality is consistent with evidence from recent empirical studies for different parts of the world and at different levels of analysis (from individual-, household-, and community-level to global-level data). These studies demonstrate that education contributes to vulnerability reduction and adaptive capacity enhancement in the predisaster phase and during disaster events and the disaster aftermath [for review, see ( 2)]. Before a disaster, disaster mitigation efforts like living in low-risk areas or undertaking disaster preparedness measures, such as stockpiling emergency supplies, are found to be greater among more highly educated individuals and households ( 10). Similarly, loss of life, injury, morbidity, and physical damage from natural disasters were reported to be lower in communities and countries with a higher proportion of populations with at least a junior secondary education ( 11). The better educated were also found to cope better with both income loss and the psychological impacts of natural disasters ( 12). Most of these studies explicitly compare the effects of education to those of household income with education consistently emerging as more important. Given such systematically strong associations and a sound causal narrative described below, there is firm ground to assume functional causality of the effects of education on reducing vulnerability. This implies that a continuation of this association in the future can be reasonably assumed. One important mechanism through which education influences human well-being is neurocognitive development. Learning basic literacy, numeracy, and abstraction skills enhances cognitive capacities through raising the efficiency of individuals’ cognitive processes and logical reasoning ( 13). Accordingly, because preventive action is initiated by stressors, such as perception of risk, followed by assessments of one’s ability to respond to the threat, the more educated tend to have greater risk awareness because of better understanding of the consequences of their actions, e.g., as found in the case of smoking and cancer prevention ( 14). In addition to these individual-level effects, there are also spillover effects of education at the community level as is evident for the effect of female education on lowering infant mortality ( 15). Opportunities of social interaction with more-educated members may speed up the diffusion of information and knowledge, or access to institutions that favor disaster risk reduction. Of course, in our study the association between educational level and disaster vulnerability has only been estimated on the basis of the past 40 years and can change in the longer-term future because of all kinds of uncertainties. Instead of assuming different percentage changes in the hazard as we did, more differentiated global climate models could be applied. But our calculations show a clear picture of the strong effects of empowerment through education on reducing disaster vulnerability and enhancing adaptive capacity to climate change, which is unlikely to change when using more sophisticated models. Accordingly, given uncertainty about the precise manifestations of climate change in specific areas, it seems beneficial to increase general flexibility and enhance human and social capital in order to empower populations to better and more flexibly cope with climate change in a way best for their long-term benefit.

### Sci dip impact – disease

#### Through STEM education and science diplomacy, global epidemics and issues such as climate change can be managed

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We also reason that, through international exchange and science diplomacy, the training of a whole new generation of STEM innovators and researchers can be successfully achieved. A major challenge will be to harness the innovative talent that exists globally in STEM areas, which can lead to the discovery of cures for disease, improvements in food and water supplies, improvements to our climate, and production of sufficient sustainable energy. The use of science and health agreements by our global partners in the service of foreign policy interests confirms a positive role that these interests can have in bringing STEM experts together to advance a global health agenda in many areas, including management of climate change and the combatting of global epidemics, such as MERS, SARS, AIDS, avian influenza, and Ebola. Finally, the globalization of science is now recognized as an important goal for the future of the advancement of STEM areas. The US has benefitted from collaboration with UNESCO, the OECD, the InterAcademy Council, and the International Council for Science in shaping science policy.11 Still, policymakers in the US must assess what globalization implies. It is imperative to expand STEM diplomacy in the US to drive global competition and scientific advances, notwithstanding any hesitation due to concerns involving economic competition or the brain drain phenomenon that the US and other countries have experienced. STEM experts are essential to the advancement of global interests and the management of global challenges, while also building robust international collaborations. Our science diplomats must be skillful in developing these global relationships to effectively address global challenges. Undoubtedly, continued training and support in STEM education will only heighten their abilities to address societal needs in the future.

### Sci dip impact – Warming

#### Increasing science diplomacy programs is needed to solve climate change

Hollander ’15 (A student who’s university published her paper so people could get a larger idea of the topic at hand)(Edwina Hollander, E-International Relations Students, “How does Diplomacy Cope with Challenges Facing Diplomcay More Broadly?”, August 30, 2015, http://www.e-ir.info/2015/08/30/how-does-science-diplomacy-cope-with-challenges-facing-diplomacy-more-broadly/, June 30, 2017, EEM)

At this point in time the world is facing common threats like at no other period in human history. Globalisation, in terms of instantaneous communication and rapid transportation, means the issues faced in one area are no longer constrained by political boundaries.[30] Global problems including climate change, food and energy security, and pandemics, require a transnational response that is fundamentally reliant on science and technology to resolve them.[31] Yet to bring states together to address these transnational issues, science knowledge needs to be clear and delivered from within a framework which states can operate and respond. These global problems are complex and science and technology expertise is often missing from ministries of foreign affairs and development agencies. Furthermore, Daryl Copeland argues “science and technology issues are largely alien to, and almost invisible within, most international policy institutions”,[32] this creates a further impediment to sound understanding of science and technology decision-making policy directives. Consequently, modern diplomacy is seeing the rise of the ‘technocrat’ at multilateral meetings where specialist knowledge is required, yet where such knowledge is often beyond the level of detail held by the average career diplomat.[33] A diplomat is only as good as their information and connection with the world around them, and, moreover, there is a distinct “scarcity of science and technology-capable diplomats around the world”.[34] Subsequently, delegations participating in multilateral meetings are ill-equipped to deal with the complexities of science and technology issues at the multilateral level. In addition, there is a lack of high-level scientists skilled in political or diplomatic areas. This can be explained by the difficulties faced by researchers in taking time out of their competitive careers, where promotion is heavily linked to active research projects and the number of annual scientific publications.[35] Global political undertaking is required to advance diplomacy for science. The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer[36] provides a symbolic representation of the impact of science as a diplomatic instrument for multilateral dialogue to protect the global environment. Since its inception 197 Parties have ratified the Montreal Protocol and as a result of the collective international effort to phase out the use ozone-depleting substances, their use has been reduced by 98 per cent.[37]Nevertheless, in the process of advancing other science causes, evidenced-based lobbying can be derailed because in multilateral fora there is often more at stake than scientific accuracy. This scenario has been encountered in the climate change negotiations where “national interests tend to trump broader objectives”[38] and a vocal minority with powerful commercial influences have hindered progress.[39]Despite promising beginnings of the Kyoto Protocol[40] in proposing legally binding greenhouse gas emission reduction targets and international emissions trading schemes, the Kyoto Protocol has failed to deliver on many levels. Due to the protracted nature and the variegated processes undertaken during its preliminary negotiations, the Protocol was unable to achieve consensus on the key set of objectives with an agreed means by which they would be achieved.[41] The scientific basis was subsumed by domestic interests and instead, unable to agree, states heavily compromised on the proposed binding emission targets.

#### Increasing diversity in STEM allows STEM educated people to create technology to alleviate the impacts of climate change

Przystac ‘15 (senior and founder of the Roosevelt @ U Mass Amherst chapter and studied ecosystem science at Mount Holyoke College and civil engineering at the University of Massachusetts-Amherst.) (Carley Przystac, Roosevelt institute reimagine the rules, “Diversity in STEM fields is key to Stopping Climate Change,” October 2, 2015, <http://rooseveltinstitute.org/diversity-stem-fields-key-stopping-climate-change/>, June 30, 2017, EEM)

So far, we are [not doing particularly well](http://nces.ed.gov/pubs2014/2014001rev.pdf" \t "_blank) at achieving greater representation in these fields. An American Community Survey report issued in 2013 found that only 6 percent of our workforce were employed in a STEM occupation. Of those, only 26 percent were women (even though women as a whole make up half of the overall workforce) and 70.8 percent identified as non-Hispanic whites. This disparity seems to result, at least in part, from unequal education: The United States Department of Education reports that “women, underrepresented minorities, first generation college students, and students from low-income backgrounds leave STEM fields at higher rates than their counterparts.” Confronting this issue of inequality at the professional level must start with confronting inequalities in our educational system. Mentorship in STEM, as in any professional occupation, is lacking. The primary responsibility for mentoring programs has not been given to any one body, and frequently starts too late in a professional’s development to have an effect on the attrition in STEM in primary, secondary, and post-secondary education. It is in the best interests of colleges, universities, and companies to leverage their considerable expertise toward this effort, as doing so will ultimately provide them with more qualified and numerous students and professionals. In order to increase opportunity in STEM for current students, the way we teach these subjects must change. If STEM students come from a diverse background, instructors teaching these students cannot approach teaching with a one-size-fits-all approach. Research has shown that traditional lecture-and-textbook approaches do not cater to women and minorities, as these groups are more likely to show interest in people than in things, and showing these ideas in isolation rather than in context disengages underrepresented groups in STEM. This was known as far back as 1990, but the educational system is slow to change. In the same way that addressing climate change is urgent, increasing the talent pool of STEM professionals in the educational pipeline must be looked upon with the same necessity. Until the people designing technologies to help alleviate the impact of climate change represent the populations affected by climate change, the technology will ultimately come up short of its full potential. STEM research and development will benefit immensely when the experiences of those who are doing the work are as diverse as the populations they aim to help. COP21 is working to establish the urgency of the fight to mitigate climate change, but in order to reduce global climate impacts, we first need to look at the educational system producing the minds that are working to do just that.

#### STEM curriculum encourages students to take action to help the environment

Stringer ’16 (Education Journalsit)(Kate Stringer, yes! Magazine, “We can’t solve Climate Change Without Teaching it – Why More Classes Are Heading Outside”, February 22, 2016, <http://www.yesmagazine.org/planet/we-cant-solve-climate-change-without-teaching-it-why-more-classes-are-heading-outside-20160222>, June 30, 2017, EEM)

Environmentally-themed schools have grown in popularity since the early 1990s, fueled by increasing climate-change awareness, a push for smaller, STEM-based schools, and a desire to connect an urban population of students to nature, said Brigitte Griswold, director of youth programs at [The Nature Conservancy](http://www.nature.org/about-us/careers/leaf/index.htm). While climate change awareness has improved over the past two decades, U.S. middle- and high-school classrooms spend an average of only one to two hours per school year covering it, according to a survey of science teachers published in the February 2016 issue of [*Science*](http://science.sciencemag.org/content/351/6274/664.full). And misinformation abounds: Thirty percent of teachers say climate change is likely caused by natural events; twelve percent don’t emphasize a human cause. That’s why it’s so important to have schools that incorporate environmental literacy across the curriculum, Griswold said. Every subject area is tied in some way to the environment. “If we don’t have an environmentally literate generation of young people trained, who will install the solar panels, and retrofit buildings?” Griswold said. “The environment is something everyone could be involved in and should be involved in.” Place-based learning isn’t solely for the elite. Half of Common Ground’s student body qualifies for free or reduced-price lunch, and two-thirds are black or Hispanic. “What’s really important is that (students) have the tools they need to speak up for what they know is important,” said Liz Cox, Common Ground’s director. “That they have the fundamental understanding of what it means to live in a sustainable way.” One of the attractions of an environment-based curriculum is that students find their work has real-world outcomes. They’re no longer doing work just for the sake of doing it. Mercer and her classmates, for example, collected data on water quality, which the school presented to the Environmental Protection Agency’s New England Environmental Justice Council. She and her peers also put up signs near sewers adjacent to the river to warn community members against polluting the waterway. Their projects blossomed. Mercer has found herself planting trees around Connecticut with the Urban Resources Initiative, walking in a New York City 2014 climate march, and cleaning up metal and glass strewn across Jamaica Bay after Hurricane Sandy.

### Sci dip impact – hegemony

#### There is a direct correlation between U.S. global leadership in STEM, econ development, and U.S. international relations

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The US has begun to place greater emphasis on global STEM education. Diplomats, STEM experts, and US national leaders understand the direct correlation between US global leadership in STEM research, economic development, and US international relations. Undoubtedly, STEM research in the US can lead our world into a new era of prosperity. Notwithstanding its largest percentage of premier academic institutions, the US ranks poorly compared to its global partners in STEM, placing twenty-fifth in math and seventeenth in science out of thirty-one countries profiled by the Organization for Economic Cooperation and Development (OECD). And although the US produces the most STEM undergraduates among OECD countries (348,484 in 2008), it ranks twenty-seventh in the proportion of STEM degrees compared to all undergraduate degrees (15 percent compared to the 21-percent OECD average in 2008). In response to this trend, the US government has elected to fund the development, recruitment, and retention of 100,000 STEM teachers over the next ten years. This includes the training of an additional 1,000,000 students in this field. The funding also appropriately includes resources to be targeted at underrepresented minorities and women. In addition, non-profit organizations such as Change the Equation8 and state-based programs like New York's STEM Education Collaborative9 are working to improve and sustain the national STEM effort.

#### Science Diplomacy Key to American Strength

Hormats, AAAS Center for Science Diplomacy Writer, 2012

(Robert D., Science and Diplomacy, Vol 1, No. 1, “Science Diplomacy and Twenty-first Century Statecraft,” March 2012, <http://www.sciencediplomacy.org/files/science_diplomacy_and_twenty-first_century_statecraft_science__diplomacy.pdf>, accessed 7/1/2017, BH)

SCIENCE diplomacy is a central component of America’s twenty-first century statecraft agenda. The United States must increasingly recognize the vital role science and technology can play in addressing major challenges, such as making our economy more competitive, tackling global health issues, and dealing with climate change. American leadership in global technological advances and scientific research, and the dynamism of our companies and universities in these areas, is a major source of our economic, foreign policy, and national security strength. Additionally, it is a hallmark of the success of the American system. While some seek to delegitimize scientific ideas, we believe the United States should celebrate science and see it—as was the case since the time of Benjamin Franklin—as an opportunity to advance the prosperity, health, and overall well-being of Americans and the global community.

#### Science Diplomacy can build and strengthen US international relationships.

Hormats, AAAS Center for Science Diplomacy Writer, 2012

(Robert D., Science and Diplomacy, Vol 1, No. 1, “Science Diplomacy and Twenty-first Century Statecraft,” March 2012, <http://www.sciencediplomacy.org/files/science_diplomacy_and_twenty-first_century_statecraft_science__diplomacy.pdf>, accessed 7/1/2017, BH)

While the scientific partnerships that the United States builds with other nations, and international ties among universities and research labs, are a means to address shared challenges, they also contribute to broadening and strengthening our diplomatic relationships. Scientific partnerships are based on disciplines and values that transcend politics, languages, borders, and cultures. Processes that define the scientific community—such as merit review, critical thinking, diversity of thought, and transparency—are fundamental values from which the global community can reap benefits.

History provides many examples of how scientific cooperation can bolster diplomatic ties and cultural exchange. American scientists collaborated with Russian and Chinese counterparts for decades, even as other aspects of our relationship proved more challenging. Similarly, the science and technology behind the agricultural “Green Revolution” of the 1960s and ‘70s was the product of American, Mexican, and Indian researchers working toward a common goal. Today, the United States has formal science and technology agreements with over fifty countries. We are committed to finding new ways to work with other countries in science and technology, to conduct mutually beneficial joint research activities, and to advance the interests of the U.S. science and technology community.

### Sci dip impact – Disease

#### Science diplomacy driven by STEM education directly helps solve the world’s global issues

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Science and technological advances are driven, in part, by the necessity to solve national and international problems. Ergo, to remain at the vanguard of science, the US must effectively use STEM in collaboration with other countries to make the world more secure, healthier, and more competitive. The ongoing Ebola crisis, in which the US is assisting West African nations to contain and medically manage the increasing number of infected individuals, is an example of global problems that demand STEM solutions. Science diplomacy is effectively contributing to the most recent initiatives to hasten the development of effective and affordable Ebola vaccines. In addition, STEM scientists are developing advanced ocean mapping technology to chart US continental shelf regions and maritime boundaries, assisting in the reduction of nuclear arms, clearing land mines and unexploded ordinance, and developing security systems that defend against computer hackers.2 To build on these and other successes, and to remain at the vanguard of discovery, the next generation of scientists and innovative science diplomats solutions must to use what technology have long to develop been intractable international problems: developing and operationalizing alternative energy sources, managing sustainable food sources, and identifying mechanisms for the improvement of the quality of healthcare through biotechnology for the US and developing countries alike.

### Sci dip impact – IT

#### Science diplomacy manages global issues such as climate change and brings awareness to the need to develop IT communications

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Indeed, many scientific leaders from Israel and Arab countries have come together to develop strategies and issue policy statements which have called for greater investments in STEM. An example of this occurred where ministers of higher education and science assembled in Riyadh, Saudi Arabia in March 2014 calling for the improvement of science education and research capacity in the Middle East, with the goal of investing 3% of their gross domestic product (GDP) for the expansion of R&D; it was proposed that 30% of this expansion would come from the private sector who are interested in technological breakthroughs. We have written in the past about developing links between investigative science and policy utilizing science diplomacy as a useful tool to advance Middle Eastern knowledge-based economies (3-6). One major reason for “soft power” approach is that it can be used as a valuable mechanism to develop foreign policy in this region of the world, specifically for the purpose of encouraging governmental support of STEM research and education. Between 2013 and 2016, Qatar, Oman, Jordan, Saudi Arabia and Israel all realized this potential; they hosted regional conferences to determine whether science diplomacy can indeed bring positive awareness for the need to develop IT communications, manage climate changes, develop research tools and training opportunities for men and women so that one could build research capacity in their countries (6). An important concept raised at these conferences was the necessity to develop the infrastructure to develop cutting-edge research opportunities, particularly with new talent.

### Sci dip impact – laundry list

#### Science Diplomacy is Required to Tackle Global Problems

Flink and Schreiterer, Writers for Science and Public Policy, 2010

(Tim Flink and Ulrich Schreiterer, Science and Public Policy, “Science diplomacy at the intersection of S&T policies and foreign affairs: toward a typology of national approaches,” November, <https://oup.silverchair-cdn.com/oup/backfile/Content_public/Journal/spp/37/9/10.3152/030234210X12778118264530/2/37-9-665.pdf?Expires=1499019797&Signature=HFfmVkUclSyHxO-~6IpJbrsv8TeJ~iB7ToytxFJDdeKh47I536~ZNFJfWnu8~xqKs3wBF4eFC0Utwm4RZdLIti83VertOO7vO-N7~cTFiM783nIbiDVZBre1tV6A9tSGoFDof9~x-B9egplKbjiyfBD3mvSxc4RySsEI4kQTRSqz7xU~-OdcAnCve9h1dvfZyLg0VzArrhscgnS11dxPwGhqCSncsQF8~a90smkyHY3ttjWVaIX~2iHbtdLJSPfQoX4yAHZdAp6xJLMO-y-LCmPT-hRmYffYAX1ZX16H-bA~Ylt3i09WnjRIcdcTj1w9gy6kMCenEEbOCu9~ArXE8g__&Key-Pair-Id=APKAIUCZBIA4LVPAVW3Q>, 7/1/2017, BH)

The more a nation’s prosperity and economic success hinge on its ability to tap into global resources and to attract talent, capital, support and admiration, the better it is advised to look for strategies to use its R&D assets most effectively to secure competitive advantages. At the same time, global phenomena such as climate change, infectious diseases, famines, migration, nuclear non-proliferation or terrorism call for international collaboration in S&T to tackle, or at least to ease, the many multi-faceted problems they raise or entail. The controversial Intergovernmental Panel on Climate Change is an important example for this new kind of global approach and science policy, the less prominent Global Science Forum of the OECD just another

### Sci dip impact – fopo

#### Student Exchange Programs are Key to Science Diplomacy Solving Problems

Stine, Specialist in Science and Technology Policy, 2009

(Deborah D., Congressional Research Service Reports, “Science, Technology, and American Diplomacy: Background and Issues for Congress,” 1/1/2009, <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1055&context=crsdocs>, 7/1/2017, BH)

DOS sets the overall policy direction for U.S. international S&T diplomacy, and works with other federal agencies, as needed. In its May 2007 strategic plan, DOS and USAID identify the following key S&T diplomatic strategies: encourage science and technology cooperation to advance knowledge in areas related to water management; promote sharing of knowledge in the international scientific community that will enhance the efficiency and hasten the fruition of U.S. research efforts, and promote international scientific collaboration; strengthen major international collaborations on cutting-edge energy technology research and development in carbon sequestration, biofuels, clean coal power generation, as well as hydrogen, methane, and wind power; apply research including promotion of technological improvements to foster more sustainable natural resource use, conservation of biodiversity, and resilience to climate change impacts; support scientific and technological applications, including biotechnology, that harness new technology to raise agricultural productivity and provide a more stable, nutritious, and affordable food supply; and enhance outreach to key communities in the private sector. DOS uses a variety of tools to implement this strategy, such as formal bilateral S&T cooperation agreements that facilitate international collaboration by federal agencies; promotion and support of S&T entrepreneurs and innovators; scientist and student exchanges; workshops, conferences,

#### Science Diplomacy Plays a Large Role in Foreign Policy

Albro, Vice President of Public Diplomacy Council in Washington, 2014  
(Interview given by Azadeh Eftekhari, Interviewee Robert Albro, Iranian Diplomacy, “Science Diplomacy Can Pave the Way Between Iran and US,” 1/25/2014, <http://www.irdiplomacy.com/en/page/1927842/Science+Diplomacy+can+pave+the+way+between+Iran+and+US.html>, 7/1/2017, BH)

Science diplomacy is not internationally institutionalized enough for us to refer to a particular well-defined place for science diplomacy, as part of international diplomacy and international relations more broadly. Science diplomacy, however, continues to play a role in international affairs. It also appears to be an increasingly important dimension of the work of science, as an extension of the tremendous increase in international scientific cooperation over the previous several decades. National foreign policy strategies typically now include an explicit science diplomacy dimension. In the US the White House, Department of State, and US Agency for International Development all have science and technology advisory offices, each of which includes a global outreach component and a variety of programs for international science and technology cooperation, such as the Science Envoys program established in 2009.

The US is not alone in having formally incorporated science diplomacy into its foreign policy objectives. In recent years, Brazil, for example, established its Scientific Mobility program. This program is intended to send up to 100,000 Brazilian science students to study abroad in world class universities in key fields of science, technology, engineering and mathematics (STEM). Science diplomacy, in short, is an area of growing importance in foreign affairs globally.

#### Science Diplomacy addresses global problems

Albro, Vice President of Public Diplomacy Council in Washington, 2014

(Interview given by Azadeh Eftekhari, Interviewee Robert Albro, Iranian Diplomacy, “Science Diplomacy Can Pave the Way Between Iran and US,” 1/25/2014, <http://www.irdiplomacy.com/en/page/1927842/Science+Diplomacy+can+pave+the+way+between+Iran+and+US.html>, 7/1/2017, BH)

 At the same time, we should also underscore that science diplomacy is not restricted to activities between governments. It is also a growing feature of the collaborative nature of science globally, and so, a dimension of non-governmental cooperation among, for example, institutions of higher education. US-based universities now have more of a global footprint while opening up novel opportunities for international engagement using new technologies such as massive open online courses (MOOCS). In addition, scientists are increasingly dedicated to addressing challenging and large-scale problems that are global in scope, such as climate change, pandemics, industrial pollution, global fisheries, and many other questions, which cross geopolitical boundaries and require international cooperation among scientists and governments, or which are too expensive for individual laboratories to pursue alone.

#### Science Diplomacy Can Create Relations Between Estranged Nations

Albro, Vice President of Public Diplomacy Council in Washington, 2014

(Interview given by Azadeh Eftekhari, Interviewee Robert Albro, Iranian Diplomacy, “Science Diplomacy Can Pave the Way Between Iran and US,” 1/25/2014, <http://www.irdiplomacy.com/en/page/1927842/Science+Diplomacy+can+pave+the+way+between+Iran+and+US.html>, 7/1/2017, BH)

 Conventionally, science diplomacy is understood to be of value in a geopolitical environment of estrangement between nation-states, where formal diplomatic relations are lacking and where the pursuit of direct political relationships is difficult or impossible, often for reasons of domestic politics in one or both countries. In such cases, as with the US and USSR during the Cold War – where physicists regularly exchanged information, attended the same conferences, and even collaborated in their work – science diplomacy functions as a variety of third-track diplomacy. This facilitates the maintenance of communication among nations during periods of the lack of formal relations or hostility.

Science, in all of its diversity, can be an effective basis for collaboration across otherwise hard-to-cross political boundaries because the methods, discourse, ethics, and results of science are not specific to a particular people or nation, are typically non-political, and shared in common by scientists everywhere. Given the scientific value of transparency and of the free circulation of information, regardless of location, scientists often share common assumptions, goals, problems, and so, communicational frames that politicians or more traditional diplomats do not.

The recent successful search for the Higgs-Boson particle at CERN, which involved scientists of diverse national backgrounds, was a global effort. The successful cooperation among scientists focused on global problems that require international cooperation can lead to greater political cooperation around politically more intractable issues, such as climate change. The collaborative and international work of scientists relating to persistent transboundary global problems typically produces the initial conceptual framework for multilateral policy making focused on the same problem, and so, leads to shared political problem-solving.

### Sci dip impact – Iran relations

#### Science Diplomacy Key to Developing Relationship with Iran

Albro, Vice President of Public Diplomacy Council in Washington, 2014

(Interview given by Azadeh Eftekhari, Interviewee Robert Albro, Iranian Diplomacy, “Science Diplomacy Can Pave the Way Between Iran and US,” 1/25/2014, <http://www.irdiplomacy.com/en/page/1927842/Science+Diplomacy+can+pave+the+way+between+Iran+and+US.html>, 7/1/2017, BH)

Both the US Department of State and the Iranian government, as well as many scientists in the two countries, currently coincide in the view that science-based engagement is a key basis for addressing global problems and improving mutual understanding. Co-authorship in scientific journals involving US and Iranian scientists has steadily increased since the early 2000s. Since 1979 there have been a series of US-Iranian collaborations in the medical and health sciences. Since the turn of the 21st century, the National Academy of Sciences (NAS) in the US, a non-governmental organization, has maintained a program intended to promote engagement between US and Iranian scholars and scientists around such issues as earthquake science and food-borne diseases, among others. Joint planning meetings, workshops, individual exchanges, and pilot programs, have involved more than five hundred scientists from over eighty institutions in the US and Iran.

Neuroscience, community health, and bioethics are other areas that have seen significant and ongoing collaboration between Iranian and US scientists in recent years.

American bioethicists and biomedical researchers have spoken at conferences in Iran, Iranian universities, and research institutes, while Iranian counterparts have visited and lectured at US universities and research institutions. This has helped to make bioethics a topic for scientific exchange between the two countries. Researchers in the US and Iran face the same problems of bioethics, from confronting pandemics, to stem cell research, access to basic healthcare, addressing high-risk behaviors, and other questions. Jointly addressing these issues promotes dialogue, also facilitated by common international policy frameworks, reflecting shared values about the sanctity of life, responsibility toward vulnerable populations, and imperative to do no harm.

The established precedent of cooperation and collaboration between the US and Iran in bioethics and other scientific fields, together with the established history of successful science diplomacy between the US and USSR during the Cold War around nuclear arms control, serve as powerful examples of ongoing lines of scientific communication, shared values, and global commitments, which can promote more beneficial bilateral political outcomes, going forward. Since 2013, cooperation between the International Atomic Energy Agency and the government of Iran, in the form of last year’s joint Cooperation Framework and other shared efforts, have helped establish necessary trust, scientific agreement about facts on the ground, and so, legitimacy around talks between the US, Iran and the European Union, which has recently paving the way for historically important diplomatic breakthroughs with regard to Iran’s nuclear development and toward the lifting of international economic sanctions upon Iran.

### Sci dip impact – perception

#### Science diplomacy is uniquely key to tackling major issues and boosting relations – even the perception of co-op solves

Espy, Harvard Biological Sciences of Public Health at Harvard PhD, 2013

(Nicole, PhD in Biological Sciences of Public Health at Harvard, Harvard University Graduate School of Arts and Sciences, 2-18-13, http://sitn.hms.harvard.edu/flash/2013/science-and-diplomacy/, accessed 7/1/17, RCU).

Beyond the contentious subjects of nuclear proliferation and climate change, science can be a tool to improve diplomatic relations between conflicting nations. The former Dean of the Kennedy School of Government at Harvard University Dr. Joseph Nye, Jr., noted that “soft power,” such as international cultural and intellectual collaborations between international groups, helps maintain a positive global attitude between participating nations and can result in favorable political alliances. Scientific collaborations are a powerful example of soft power, since science is internationally respected as an impartial endeavor.

The United States is using science as soft power in its diplomatic relations between Yemen, North Korea, and others. Yemen currently suffers from multiple social and environmental issues, including a large influx of African refugees, displaced Yemenis due to internal conflict, and a disappearing water supply. Each person in Yemen is estimated to have access to only 136 cubic meters of freshwater per person, well below the “water poverty line” set by the United Nations Development Program at 1000 cubic meters per person. This large gap can only be overcome with improvements in water technology that are innovative and sustainable. Toward this end, American and Yemeni scientists, engineers and students met last summer in Jordan, another water poor country, for a conference hosted by the Middle East Scientific Institute for Security to discuss strategies for better water management and to establish collaborations. While limited in impact, this conference was an indirect way for the US to practically demonstrate its support for the people of Yemen and to shift favor away from Al-Qaeda in the Arabian Peninsula, an affiliate of the international Al-Qaeda terrorist network. Thus, meetings like this, in conjunction with political support, military support and development aid, are a part of the US’s efforts to improve diplomatic ties with Yemen, as well as combat the spreading influence of extremist groups.

As was the case for the conception of CERN, the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME) is the result of interest among Middle Eastern nuclear physicists to have a local laboratory dedicated to the nuclear science. The construction of SESAME in Jordan will bring scientists in the region much closer to facilities similar to those found at institutions like CERN. While SESAME necessitated diplomacy for scientific advancement, the scientific leadership involved in establishing SESAME set the stage for the unlikely diplomatic relations between Iran, Palestine, and Israel, among others. This practical collaboration for the pursuit of science has the unique potential to ease the hostilities between these countries. It also serves as an example of how scientists can make an impact beyond their respective fields.

Traditionally, science training does not include instruction on how to engage with the public or with politicians. But in our increasingly globalized world, environmental and technological issues are shared problems. These problems require scientists to share their knowledge with the public, politicians, and colleagues in their own countries and others around the world. It requires science itself to be a more international endeavor. Used properly, science and diplomacy can complement each other and help tackle the many problems facing our world today.

### Democracy impacts

#### Democracy key to check autocracy and authoritarianism

Jakobsen et. al., Associate Professor, Norwegian University of Science and Technology, 2016

(Jo, Tor G. Jakobsen, Professor, Norwegian University of Science and Technology, Eirin Rande Ekevold, Research Assistant, Norwegian University of Science and Technology, “Democratic peace and the norms of the public: a multilevel analysis of the relationship between regime type and citizens’ bellicosity, 1981–2008,” Review of International Studies, Vol. 42, Issue 5, 988-989, March 31, 2016, accessed on 7/1/17, ATH)

But why is it that the existence of ‘democratic-pacifistic’ norms fails to produce a monadic democratic peace as well? The answer might lie in differences in the types of wars fought by democracies and non-democracies, respectively. The logic of the normative argument, as it is, only applies in a clear-cut way in certain areas. Most obviously, it pertains to serious interstate crises or conflicts where the security dilemma is modified due to both (or all) parties to the dispute being democracies. When a democracy is embroiled in a dispute with an autocracy, on the other hand, the former will likely act in a distrustful manner. Failure to do so might imply a renunciation of the crisis-bargaining available initiative vis-à-vis a purportedly less constrained adversary. This is something that a state can ill afford – as Kant himself surely acknowledged.79 The right of democracies to fight defensive wars – ‘to protect themselves … from external attacks’ – was certainly also recognized by Kant.80 There is one additional category of wars, though, that in some respects is harder to judge. In the post-imperialist world, at least, democracies only very rarely, if ever, consider conducting ‘pure’ wars of conquest. On the other hand, and although democracies ‘might intervene in a different pattern than militaristic authoritarian ones’, 81 the dividing line between conquest and liberal-interventionist war is not always clear-cut, at least not when the latter result in (temporary) occupation, such as was the case in Afghanistan and Iraq. These wars essentially also involve the ‘externalization’ of liberal, democratic, and indeed also ‘pacifistic’ values – even if in a somewhat peculiar way. The justification of such endeavors is clearly constructed on the basis of the logic of liberal theory in general, and sometimes democratic peace theory in particular: One prominent effect of helping other people rid themselves of autocrats is, ostensibly, the creation of a more peaceful world. Thus, the logic here indicates that the occurrence of such wars does not necessarily contradict the empirical results herein, as they – in the minds of the interventionists – are wars whose objectives are liberal and therefore benevolent. Studies of US public opinion, for example, have found such wars to enjoy substantial support among the democratic public,82 which also affects the proclivity of political leaders to undertake them.

#### Democracy good—prevents security dilemmas, war, and crisis escalation

Jakobsen et. al., Associate Professor, Norwegian University of Science and Technology, 2016

(Jo, Tor G. Jakobsen, Professor, Norwegian University of Science and Technology, Eirin Rande Ekevold, Research Assistant, Norwegian University of Science and Technology, “Democratic peace and the norms of the public: a multilevel analysis of the relationship between regime type and citizens’ bellicosity, 1981–2008,” Review of International Studies, Vol. 42, Issue 5, 988-989, March 31, 2016, accessed on 7/1/17, ATH)

Thirdly, our results work to bolster normative democratic peace arguments: The empirical evidence suggests that individual attitudes towards the use of armed force are significantly shaped by the nature of the regime under which one lives. Of course, in the statistical models we cannot investigate if respondents’ values on the dependent variable vary as a function of the regime type of any (hypothetical) adversary. This means, in turn, that our results cannot directly be deemed as supportive of the dyadic democratic peace thesis. Still, seen in light of the gist of existing empirical research, which is quite confident in the empirical existence of a dyadic democratic peace, our study does lend indirect support of some substance to the normative dimension of the dyadic thesis: Citizens of democratic regimes are thoroughly more pacifistic than non-democratic citizens. To the extent that these norms and values are externalised into the realm of foreign policy, as the normative democratic peace literature in our view convincingly contends, a critical foundation for mutual trust exists in democratic dyads. This should markedly contribute to taming security dilemmas, spiral mechanisms and the escalation potential in interstate conflicts and crises. Hence, a norm-based dyadic democratic peace results.

### Math literacy good

#### Limitations in mathematical ability are strongly correlated to subprime mortgage defaults.

Gerardi, et al 10

[Kristopher, financial economist and adviser in the research department of the Federal Reserve Bank of Atlanta, “Financial Literacy and Subprime Mortgage Delinquency: Evidence from a Survey Matched to Administrative Data”, April 2010, accessed 7-1-17, NW]

This paper investigates whether subprime borrowers with limited financial literacy are more likely to be delinquent on their mortgage and more likely to default. We conducted an extensive survey to measure subprime borrowers’ financial literacy and cognitive ability in the summer of 2008 and matched the individual-level measures to micro-level datasets that contain extensive information on mortgage characteristics and payment histories. Our estimation results show a significant and quantitatively large association between one aspect of financial literacy, numerical ability, and mortgage delinquency. In addition, we find that foreclosure starts are two-thirds lower in the highest numerical ability group compared to the lowest group. The correlation is robust to several measures of delinquency and to the inclusion of a wide set of socio-economic and demographic control variables. The correlation appears to be specific to numerical ability and is not driven by general cognitive skills or economic literacy. Our results therefore show that limitations in numerical ability are common and that there is a strong and quantitatively important link to subprime mortgage defaults. The results suggest that the correlation between mortgage delinquency and financial literacy is not due to financially illiterate borrowers taking on too much debt, or choosing excessively risky mortgages. We are able to control for many details of the mortgage contracts, but find that the correlation is not sensitive to their inclusion in the econometric models. This suggests that limited numerical ability might lead to other mistakes over the course of time, like too much spending, too little savings, or inappropriate reaction to income and/or consumption shocks. Such an interpretation is consistent with results using the same measure of numerical ability for savings (Banks and Oldfield, 2007), and related measures (Stango and Zinman, 2008; Lusardi and Mitchell, 2009; Lusardi and Tufano, 2008). This result also suggests that subprime mortgage borrowers with limited numerical ability were no more likely than others to have been steered into unfavorable contract terms, although there is an important caveat: We surveyed individuals between 1 and 2 years after their mortgages had been originated, and many subprime mortgage defaults (about 60 percent, see, e.g. Foote et al., 2009) happen within two years of origination. Thus, our results do not completely rule out the possibility that limitations in financial literacy led to unfavorable mortgage terms or contracts that contribute to unfavorable mortgage outcomes. We believe that our results also have several implications for future research and applications. First, the results show that a normally unobservable characteristic/ability can explain part of the heterogeneity in default behavior. This finding provides insights to lending firms on designing contract terms and default reduction strategies. Individuals who have difficulties dealing with numbers seem to be riskier, controlling for usual indicators like FICO scores. In order to better assess the risk of its customers, financial institutions may therefore have an interest in applying tests of numerical ability to screen loan applicants. Second, one could ask whether the role of financial literacy was particularly important in this environment of rapidly falling house prices. Even among academic economists, the views sharply diverged. Many economists thought that the rise in house prices reflected fundamentals (e.g., Himmelberg et al., 2005), while others saw it as a giant bubble (e.g., Shiller, 2005). Thus, many individuals may have assumed that house prices would keep rising at the previous high rates into the foreseeable future, and thus, may have relied more heavily on the accumulation of future equity in their homes to refinance into a larger mortgage, or to add a second lien to extract the equity. As the prospects for refinancing darkened, individuals with high financial literacy may have found it easier to adjust their consumption and savings decisions in order to continue making their mortgage payments. Exploring this hypothesis more fully requires data from an episode in which house prices were rising, and our data does not allow us to examine this in more detail. Finally, our results suggest as a policy implication that more intensive financial education could substantially improve financial decisions later in life, and, in fact, have a profound impact on financial markets as suggested by the evidence in Agarwal et al. (2010a) and Bernheim and Garrett (2003). But it is important to remember that while our data show a strong and robust correlation that is highly specific and robust to a wide set of controls, it is not a setting in which financial literacy has been explicitly randomized in some way. The next logical, but ambitious step, is to randomize financial education and then track the financial decisions of these individuals over time.

### Science – pseudo-framework cards

#### Prioritize science education, an educated populous is key to eliminate problems at the top.

Hodson, Ontario Institute for Studies in Education, University of Toronto, Canada Visiting Professor, University of Hong Kong, 2004

(Derek, “Going Beyond STS: Towards a Curriculum for Sociopolitical Action ,” The Science of Education Review, Volume Three Issue 1, 2004, accessed on 6/30/17, ATH)

The gist of my argument is that science and technology education has the responsibility of showing students the complex but intimate relationships among the technological products we consume, the processes that produce them, the values that underpin them, and the biosphere that sustains us. Within an issues-based curriculum oriented towards sociopolitical action, it is not acceptable to regard environmental problems as an inevitable consequence of technological development or to imply that science itself can solve the problems by simple technical means. Projecting such messages depoliticizes the issues, thereby removing them from the “realm of possibility” within which ordinary people see themselves as capable of intervention. As a consequence, dealing with environmental problems is left to experts and officials, and ordinary citizens are disempowered. Education for sociopolitical action entails recognizing that the environment is not just a “given,” but a social construct. It is a social construct in the sense that we act upon and change the natural environment, and so construct and reconstruct it through our social actions. It is a social construct in the sense that we perceive it in a way that reflects the prevailing sociocultural framework. In consequence, environmental problems are not problems “out there” in our surroundings, but problems “in here” (in our heads), in the way we choose to make sense of the world. They are pre-eminently social problems-problems of people, their lifestyles, and their relations with the natural world.

#### Environmental advocacy from STEM education contributes to real world policy advocacy

Meyer et al., President of the Ecological Society of America, 2010

(Judy L., Peter C Frumhoff, Director of Science and Policy at the Union of Concerned Scientists, Steven P Hamburg, Brown University Associate Professor of Environmental Studies, Carlos de la Rosa, Director of La Selva Biological Station, “Above the din but in the fray: environmental scientists as effective advocates,” Frontiers in Ecology and the Environment, Volume 8 Issue 6, August 1, 2010, accessed on 6/30/17, ATH)

As members of society, environmental scientists have a responsibility to bring their expertise to the decisionmaking process; working with advocacy organizations is an effective way to do this. Scientists can contribute not only data and information, but also robust methodologies that can influence the approach taken toward environmental issues. Not only will this result in more effective decision making, but the interaction between the scientist and the advocacy organization can directly benefit both. However, in order to increase interactions between advocacy organizations and scientists, it is critical that these linkages are valued and that belief in a hierarchy of accomplishments among academic, government, and advocacy-based scientists is rejected. Many of today’s science students are seeking careers in advocacy, and many academic scientists volunteer considerable time to advising decision makers and advocacy groups; it is incumbent on the more senior members of the environmental science community to encourage both. The more desirable and recognized such career and volunteer efforts become, the greater the role science will play in environmental policy making. Recognition of the importance of advocacy in the value system of academia is still lacking in many institutions, and many advocacy organizations fail to acknowledge the importance of continued research and publishing by their staff scientists. Academic environmental scientists could play a more substantial role in developing sound environmental policies if the criteria for success in academic institutions and for those scientists based in advocacy organizations recognized the challenges in making science relevant to policy (Panel 4). A concerted effort is needed to establish relevant criteria and have them widely adopted (see also Whitmer et al. 2010). The Ecological Society of America, the Society for Conservation Biology, and other scientific organizations can play a key role in supporting the widespread adoption of these criteria and best practices for engaging in and supporting science-based advocacy.

#### The role of the ballot is to endorse advocacy that uses scientific research to support a policy or set of policy mechanisms

Nelson, Professor of Environmental Philosophy at Oregon State U, and Vucetich, Professor of Conservation Ethics at Michigan Technological University, 2009

(Michael and John, “On Advocacy by Environmental Scientists: What, Whether, Why, and How,” Conservation Biology, Volume 23 Issue 5, May 18, 2009, ATH)

Much of the advocacy literature presumes too much too quickly and conflates three fundamentally separate questions: (1) “Should scientists, as a matter of principle, advocate on policy-related matters?” (2) “If scientists should be advocates, what general qualities should characterize their advocacy?” (3) “How, more specifically, should scientists manifest their advocacy?” Most of the literature treats the last question without giving due consideration to the first two. Here we made only two assumptions about the nature of advocacy. First, it entails more than merely conducting research and communicating results through primarily scientific venues—even if the nature of the research is inspired by or relevant to a policy matter. Second, advocacy entails promoting, developing, or assessing policy positions. We also considered the assessment of policy a form of advocacy because policy assessment routinely entails important yet obfuscated promotion or refutation of a policy, even when the assessor is unaware of such affects (see “Nature of Science Arguments”). In this sense our definition of advocacy is similar to Lackey’s (2007), which suggests advocacy is the “active, covert, or inadvertent support of a particular policy or class of policies.” Prompted by this notion of advocacy we catalogued, categorized, and critiqued arguments used for and against the appropriateness of advocacy by environmental scientists.

#### Science and math literacy are key to attaining recognitions of citizenship for marginalized communities

Gaines, W.E.B. Du Bois Professor of African Studies and History at Cornell University, 2010

(Kevin, “Of Teachable Moments and Specters of Race,” American Quarterly, June 2010, Volume 62 Number 2, 207-209, accessed on 6/28/17, Project Muse, ATH)

Along with building an archive and bearing witness to links between past and present injustices, many American studies scholars have also forged partnerships with those engaged in transforming communities and practices of citizenship by promoting education and multiple forms of literacy. I want to conclude with an example of a project that seeks to revitalize citizenship through education, with math literacy as the focal point. Robert Moses argues that economic access is the most urgent social issue for poor people and [End Page 208] people of color. Today, economic opportunity and full citizenship depend on math and science literacy. Indeed, Moses believes that the absence of math literacy in urban and rural communities is as urgent a problem as the lack of African American registered voters was in Mississippi in 1961. The Algebra Project, founded by Moses, applies the techniques of community organizing that transformed the South during the 1960s to the task of improving math literacy for black, Latino, and poor white youth.

The problem of math illiteracy is particularly urgent for blacks and other minorities, with prisons looming as the fastest-growing public sector industry in the country. For Moses, the question remains the same as it was in 1964: "How do the people at the bottom get into the mix? In the 1960s, in Mississippi, it was the sharecroppers. In our time, across the country, it is Black, Latino, and poor white students who are trapped at the bottom with prisons as their plantations."55

As scholars, we can perform important work in defending public education and fostering myriad forms of literacy. Anything less than a societal commitment to universal access to quality public education constitutes a betrayal of our children. The stakes could not be higher, as we look to more effective means of engaging public audiences in the United States and abroad in the ongoing creation and dissemination of critical archives, and in the cultivation of long memory against chronic amnesia. If enough of us respond to this crisis as a teachable moment within and beyond our institutions, we can usher in a rebirth of citizenship, public education, and democracy. [End Page 209].

# \* \* HEGEMONY \* \*

### STEM – Competitiveness

#### STEM Gives The US An Edge In Global Competitiveness

Evans Ex. Dir. of the National Science Teachers Association, and Milgrom-Elcott, Executive director of the STEM teacher training initiative 100Kin1, which trains and supports STEM education teachers, ‘17

(David, *The Hill*, “STEM education will carry our children in tomorrow’s economy,” 4 April 2017, http://thehill.com/blogs/pundits-blog/education/327195-stem-education-will-carry-our-children-in-tomorrows-economy, 1 July 2017, RV).

Now it’s the entire world competing for the same jobs, the same resources, the same opportunities. It’s no longer about passing algebra; it’s about thriving in an increasingly worldwide workforce.

American students should be able to compete with kids from anywhere in the world, because when they graduate from high school, technical school, or college, that's who they'll be measured against.

In this global economy, one of the most effective ways to set our children up for success is to ensure they receive excellent STEM (science, technology, engineering, and math) education.

As you may have heard, there are a lot of jobs to be found in STEM fields: indeed, ten of the top 14 fastest-growing industries require STEM training. But STEM is more than a specific set of classes or subjects.

STEM education teaches kids how to think critically and solve problems: valuable skills they’ll need to succeed in school, work, and life. Teenagers taking algebra need to understand why it matters and how they might use it in real life.

Whatever today’s kids want to be able to do tomorrow, they will need serious STEM skills – and the ability to use what they’ve learned when solving new problems or tackling new dilemmas. That will be true whether they become a mechanic called in to fix something they’ve never seen before, or a medical professional faced with an outbreak of a new disease.

Fortunately, we have a powerful opportunity to strengthen STEM education for all American students through the Every Student Succeeds Act (ESSA).

ESSA, passed with strong bipartisan support, provides states with the flexibility to set new policy and funding priorities, and as part of the ESSA framework, states must develop their own education plans. The key to help develop and nurture a new generation of thinkers and creators depends on these state plans supporting and promoting STEM education.

As leaders of two national efforts focused on recruiting, training and supporting STEM teachers, as well as fostering excellence in STEM education, we hear firsthand from our partners and allies across the country about the exciting innovations to champion STEM education in the classroom: including supporting teachers to incorporate STEM labs into their classrooms, create digital learning communities to connect their students with practicing scientists or engineers, or implement new courses in computer science and engineering.

We need these kinds of initiatives in every state. We must continue to encourage and foster expanded support and opportunities for STEM education.

We are working alongside nearly 20 additional 100Kin10 partner organizations to ensure that all students receive outstanding STEM educations. We’re calling it Every Student Succeeds with STEM, and it offers resources and tools to learn more about ESSA and how to promote STEM learning to your state leaders. Whether you're a parent, a teacher, or a citizen who wants to make sure America will be leading the way on discovering new cures and creating new jobs, we've made it easy for you to help. If you live in a state that’s already offering robust support for STEM initiatives, let your state officials know to keep up the good work.

But if your state needs to be doing more – the time to advocate for STEM education is now: whether that means contacting your governor or chief state school officer, spreading the word on social media, or submitting a comment on your state’s draft plan. In addition to working with your state on its ESSA plan, tell your representatives in Congress to fully fund ESSA to be sure there are resources to implement it.

Education should be about helping our kids acquire the skills they’ll need to live successful, productive, and satisfying lives. In a rapidly changing world, where it’s difficult to predict what challenges and technologies lie ahead, it is more important than ever that kids learn to think carefully, critically, and creatively.

We must do everything we can to prepare our children to meet this uncertain future. Securing robust STEM support in every ESSA state plan is an important path forward -- because advocating for high quality STEM education is crucial to safeguarding the future of every child.

David Evans, Ex. Dir. of the National Science Teachers Association. Talia Milgrom-Elcott, executive director of the STEM teacher training initiative 100Kin10, which trains and supports STEM education teachers.

#### STEM education reform is key to US economic competiveness

Baker et al., Distinguished Research Professor at University of California, Los Angeles, 2016 (Eva L., Department of Education, “STEM 2026: A Vision for Innovation in STEM Education, Updated 1-18-17, Pg. 1-2, APW)

A strong STEM education—one that results in the skills and mindsets just described and opens the door for lifelong learning—starts as early as preschool, is culturally responsive, employs problem- and inquiry-based approaches, and engages students in hands-on activities that offer opportunities to interact with STEM professionals. The development of and adherence to these types of STEM teaching and learning practices is not widespread, however, and opportunity gaps persist throughout the education system. The inequities in STEM education along racial and ethnic, linguistic, cultural, socioeconomic, gender, disability, and geographic lines are especially troubling because of the powerful role a foundational STEM education can play and because the gaps are so pronounced in STEM. According to the U.S. Department of Education Office for Civil Rights’ Issue Brief Civil Rights Data Collection: Data Snapshot: College and Career Readiness (2014), the STEM fields “are the gateway to America’s continued economic competitiveness and national security, and the price of admission to higher education and higher standards of living for the country’s historically underrepresented populations” (p. 2). Recent analyses indicate that during the next five years, major American companies will need to add a total of nearly 1.6 million employees to their workforce: 945,000 who possess basic STEM literacy and 635,000 who OFFICE OF Innovation and Improvement 2 demonstrate advanced STEM knowledge (Business Roundtable & Change the Equation, 2014).5 Other data suggest that at least 20 percent of U.S. jobs require a high level of knowledge in any one STEM field (Rothwell, 2013).6 Even outside of the traditional STEM job sector, there is a need for STEM competencies and skills. Data show that the set of core cognitive knowledge, skills, and abilities that are associated with a STEM education are in demand in nearly all job sectors and occupations (Carnevale, Smith, & Melton, 2011; Rothwell, 2013).

### STEM – Manufacturing

#### STEM Education Key To Current Manufacturing Jobs

The National Association of Manufacturers, Largest manufacturing association in the United States, ‘12

(The National Association of Manufacturers, *The National Association of Manufacturers*, “NAM Offers Support For STEM Jobs Act,” 20 September 2017, https://www.manufacturing.net/news/2012/09/nam-offers-support-stem-jobs-act, 1 July 2017, RV).

“Modern manufacturing is based on technology and innovation. As a result, manufacturing is critically dependent on a workforce that is trained in the fields of science, technology, engineering and math (STEM). By increasing the number of employment opportunities available for individuals who have proven their knowledge and experience in these fields, we provide manufacturers another tool to strengthen their workforce and grow their business.

As our global economy grows more competitive we must make every effort to ensure that, in the absence of qualified homegrown candidates, foreign-born students educated in the United States have the opportunity to apply their talents here rather than taking them abroad. More work must be done to strengthen our STEM education system, but this is an important step in ensuring that we have the talent and knowledge to close the skills gap and meet the employment needs of manufacturers in the United States.”

### STEM – Economy

#### **STEM professionals vital for economic leadership**

Sahim, Research Scientist at Harmony Public Schools, formerly a Research Scientist at Aggie STEM Center at Texas A&M University, 2016 (Alpaslan, The Fountain, “STEM Education and Why It is Important for Countries’ Global Leadership”, August 2016, <http://www.fountainmagazine.com/Issue/detail/stem-education-and-why-it-is-important-for-countries-global-leadership>, accessed July 1 2017, KMV)

STEM’s importance grows from the fact that STEM knowledge is diffused to almost each and every part of our lives. If we just look at our environment, we can see how we experience things that are STEM-related. At this point, if a country wants to produce innovative economic leadership, it will depend upon producing STEM professionals (engineers, mathematicians, physicists, etc) who develop inventions and innovations in all areas of the economy. In addition, the 21st century workforce requires an almost entirely new set of skills due to the rapid changes in technology and the internet; we have to prepare our young population for the challenges they are going to face. The 21st century has brought many changes to our lives, from manufacturing to broader dissemination of information and technology. Today’s students know that the future holds jobs that require more advanced skills (Roblin, 2012; National Research Council, 2011) because many traditional jobs have been outsourced or replaced with high-tech tools. Therefore, students must also be prepared for jobs that do not yet exist (Dede, 2010). A lack of a skilled or, a STEM-illiterate, generation is a threat to each and every economy that worries about their future. The Science Pioneers website gives many good examples of how science, technology, engineering, and mathematics are diffused into things happening around us every day. The website defines science as our natural world. We ride a car, fly a plane, or sail a ship, and each has its own system and set of sciences. We also live in the digital age where all types of technology enter our lives via desktops or laptops, iPads or smartphones, and countless other information sources. We witness the construction of colossal structures, as well as engineers’ amazing solutions to today’s challenges of a growing population and global warming. We don’t need to search very hard to see the contributions of engineers to our daily lives. All we have to do is look at the world around us, including the houses we live in and the cars we drive. When it comes to recognizing the use of mathematics, evidence is everywhere. Math is used for such minor tasks as going to a grocery store, bank, or shopping center, or for budgeting or investing. Mathematical calculations are part of our daily routines. Almost every other field (STEM and non-STEM) depends on mathematics. I remember an example one of the STEM teachers gave me. He explained why mathematics is not fully appreciated. He used an analogy of a tray, which represents mathematics. When you serve other subjects – including physics, chemistry, biology, technology, and even reading – on the tray, people pay attention to the things on the tray, but not the tray. But without the tray, you cannot serve anything. In sum, STEM education is a must in today’s economy; it’s very important, because “it pervades every aspect of our lives” (Science Pioneers, p.1). It is better to explain this section with an example. The United States will produce more than 1.8 million STEM jobs by 2018. In fact, it is expected that STEM-related jobs will grow at a faster rate than other fields - 17 percent versus 9.8 percent (Bertram, 2014). Unfortunately, it is estimated that 1.2 million of these STEM jobs will go unfilled. Why? Because the current US workforce does not possess the skills to fill them (Bertram, 2014). Moreover, the World Economic Forum ranks the United States 52nd in the world when it comes to the quality of mathematics and science education, and 5th in overall global competitiveness or innovativeness. Moreover, the United States comes in 27th among developed nations in generating college graduates in science or engineering. Not surprisingly, many graduate students studying in US graduate schools are mostly non-American citizens, including over 2/3 of the engineers who receive Ph.D.’s from United States universities. What’s more, only one third of the annual 1.8 million bachelor graduates in the US choose STEM majors. One very important quote from the US Department of Labor (cited in Vilorio, 2014) summarizes why STEM education is important for the US economy: “The STEM fields and those who work in them are critical engines of innovation and growth: according to one recent estimate, while only about five percent of the US workforce is employed in STEM fields, the STEM workforce accounts for more than fifty percent of the nation’s sustained economic growth.” Therefore, STEM education has a critical role in countries like the US. The importance of STEM education is not limited to only the United States: when you look at the research literature, you will see that many other European and non-European countries have started investing millions of dollars to improve their STEM education and increase their STEM-literate college students (Archer, DeWitt, & Wong, 2013; Ayar, 2015).

### STEM – Innovation

#### STEM knowledge makes people more financially successful, helps fill the high demand for STEM jobs

Economic & Statistics Administration 2017 (U.S. Department of Commerce, “STEM Jobs, 2017 Update,” March 30 2017, <http://www.esa.doc.gov/reports/stem-jobs-2017-update>, Accessed June 30 2017 by KMV)

#### Science, technology, engineering and mathematics (STEM) workers help drive our nation's innovation and competitiveness by generating new ideas and new companies.1 For example, workers who study or are employed in these fields are more likely to apply for, receive, and commercialize patents.2 STEM knowledge also has other benefits; while often very specialized, it can be transferred to a wide variety of careers, particularly management occupations, while increased technology in the workplace means that, to handle non-repetitive tasks, workers need the critical thinking and technical skills that come with STEM training.3 A wealth of data is produced by the U.S. Census Bureau and the Bureau of Labor Statistics on many aspects of the STEM economy. Using data from these agencies, particularly the Census Bureau's Current Population Survey (CPS) and American Community Survey (ACS), allows us to look closely at the trends in STEM and perform a detailed analysis of wages and employment that goes beyond most published studies on STEM. This report, the first in a series of upcoming reports from OCE on the STEM economy, is an update of findings from our previous report, "[STEM: Good Jobs Now and for the Future.](http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf)" Future reports will update previous research by this office on sex, race, and ethnicity in STEM jobs, as well as present new findings about the geography of STEM jobs and the skills needed to participate in this vital sector of the economy. Key findings for this update, which are consistent with previous research, including research done by the Office of the Chief Economist (OCE) are that: In 2015, there were 9.0 million STEM workers in the United States. About 6.1 percent of all workers are in STEM occupations, up from 5.5 percent just five years earlier. Employment in STEM occupations grew much faster than employment in non-STEM occupations over the last decade (24.4 percent versus 4.0 percent, respectively), and STEM occupations are projected to grow by 8.9 percent from 2014 to 2024, compared to 6.4 percent growth for non- STEM occupations. STEM workers command higher wages, earning 29 percent more than their non-STEM counterparts in 2015. This pay premium has increased since our previous report, which found a STEM wage advantage of 26 percent in 2010. Nearly three-quarters of STEM workers have at least a college degree, compared to just over one-third of non-STEM workers. STEM degree holders enjoy higher earnings, regardless of whether they work in STEM or non- STEM occupations. A STEM degree holder can expect an earnings premium of 12 percent over non-STEM degree holders, holding all other factors constant.

#### STEM Education is necessary for Science and Technology based innovation

Atkinson, founder and president of the Information Technology and Innovation Foundation, and Mayo, founder of Mayo Enterprises, LLC, a consultancy in the areas of innovation, workforce, technology and the future of learning. Her recent work has included projects for NASA’s Office of the Administrator, 2010 [Robert and Merrilea, “Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education” Information Technology & Innovation Foundation, December 10, p. 21-22, https://www.itif.org/files/2010-refueling-innovation-economy.pdf, Accessed 6/27/17, SKS]

Science- and technology-based innovation is impossible without a workforce educated in science, technology, engineering and math. As a result, it behooves the United States to support strong science, technology, engineering, and mathematics (STEM) education, especially as our competitors recognize the links between STEM education, greater research, and increased innovation. As the OECD observes, “Education systems play a broad role in supporting innovation because knowledge-based societies rely on a highly-qualified and flexible labor-force in all sectors of the economy and society. Innovation requires the capacity to learn continually and upgrade skills.”67 Since innovation and productivity are supported by a highly educated workforce, higher education attainment has become an important component of economic success, particularly in higher wage nations that can compete less effectively in lower skilled, routinized work.68 As we discuss in Chapter 3, some may argue that we don’t really have a STEM worker shortage. With some companies moving some R&D and technical jobs offshore, we don’t really need to be focused on producing STEM jobs, so some claim, or we can always rely on immigrants with STEM degrees, as we do now. But this ignores three key facts. First, as discussed in Chapter 3, the number of STEM jobs is projected to grow over the next decade faster than other jobs. Second, we may not be able to rely on high-skill foreign STEM talent too much longer, as other sending nations, like China and India, successfully grow their tech economies and universities. Finally, if the United States is ever to turn its economy around, including eliminating the massive trade deficit, we will have to do it largely through science and technology-based industries. If we were to eliminate the trade deficit by expanding exports, many of these exports would likely be in technology based sectors. We would need to employ large numbers of additional STEM workers. Just as we would be unable to expand our industry if we lacked the natural resource materials to build the factories (e.g., cement), or energy to power the plants, we cannot expand our technology economy without the needed human resources, in this case high-quality STEM graduates.

### Competitiveness – ripple effect

#### AFF has a ripple effect across industry

U.S. DEPARTMENT OF COMMERCE, January 2012, “The Competitiveness and Innovative Capacity of the United States,” http://www.esa.doc.gov/sites/default/files/thecompetitivenessandinnovativecapacityoftheunitedstates.pdf

Research and development, education, and infrastructure are discussed sepa‐ rately in the chapters that follow, but they are not separate and unique entities. As some commentators have noted, the elements of competitiveness and innovation are less like silos and more like a network or ecosystem. Changes in one part of the network—say education—**ripple** through the system satisfying demands for researchers, creating demands for infrastructure, and feeding back into the schools via the creation of demand for new and different skills. U.S. industries, like those discussed in the manufacturing chapter, sit in a critical juncture in this network—creating demand for labor with specific skills and participating integrally in research and in the creation and build out of new infrastructure (see figure 2.2). Thus, although this report addresses innovation and competitiveness topics sequentially in separate chapters, their interconnect‐ edness is a sub‐text that the reader should keep in mind.

### Competitiveness – Fed key

#### Federal funding is key- allows the U.S. to be economically competitive and increases heg

Plank, Director of Stem Education, 2017

(Larry, Larry Plank, “Plank Testimony In Front of the Senate”, March 15th, Director for K-12 STEM Education, Hillsborough County Public Schools, Executive Director for the National Science Leadership Association and Director for the Tampa Bay STEM Network., pgs 1-6, LNM)

PRIMARY MESSAGE: Federal investment is needed to assist and encourage support for STEM education in PreK-16, ultimately preparing Americans for the workforce. Remarks Submitted by Larry Plank, Director for K-12 STEM Education, Hillsborough County Public Schools, Executive Director for the National Science Leadership Association and Director for the Tampa Bay STEM Network. Chairman Blunt, Ranking Member Murray and members of the Committee, it is my pleasure and honor to be here today to speak with you about the importance that the federal government plays in STEM education. As the Director for K-12 STEM Education in Hillsborough County Public Schools, I am responsible for not only supporting the academic endeavors of our community’s children, but also responsible for teacher professional development and the appropriate theming of our magnet schools and career and technology education academies so that they are best connected to the workforce needs of the greater Tampa Bay region. Facing a global economy growing ever more technologically-based, a national need for STEMliterate citizens has arisen. As a national leader in education, Hillsborough County Public Schools is well positioned to answer this call through our comprehensive STEM education program. Hillsborough County Public Schools is the eighth largest school district in the nation. With over 250 school sites and over 213,000 students, our district is a microcosm of the nation, from core urban areas in inner-city Tampa, to the suburbs of Brandon and Tampa Palms, to the rural areas of Plant City—all with unique challenges. We pride ourselves upon preparing and inspiring the next generation of STEM-literate citizens who will directly contribute to the STEM fields through the workforce or post-secondary education. While many STEM initiatives prepare only some students for success in STEM fields, it is important to us and our community that all students have equitable experiences and access to STEM opportunities. My role in Hillsborough has been to ensure that every student has an opportunity to enjoy science, technology, engineering, and mathematics in a highly supportive setting that encourages and fosters their own creativity, innovation and perseverance. In an effort to build a successful STEM program for our region, we’ve identified four elements of the work, all supported in part by federal funding streams. In some cases these funds are in the form of Title dollars, in others competitive grants through the Department of Education or Federal Agencies such as NASA and NOAA. The braiding of funds has allowed us to efficiently and effectively support STEM education and workforce development in our region. These elements support our work, which includes 1) improving instructional practices in mathematics, science and STEM-related course at all grade levels to increase student achievement, 2) connecting student learning in the classroom to careers for the 21st century in an effort for students to experience their future, 3) building relationships in the community that positively impact student achievement in and appreciation for STEM, and 4) supporting STEM learning and achievement across multiple settings and environments that afford students the opportunity to apply what they have learned. Essential Element 1: Curriculum Innovations that Support 21st Century Skills and STEM Learning Curriculum innovations consist of changes to the standard curriculum, associated instructional practices and district protocol that promote STEM programs and understanding and support learning in STEM subjects. At the center of this effort lies professional learning for teachers– from professional learning experiences to on the job support through academic coaching and modeling—all to support innovative practice and content standards that define the integrative STEM approach to curriculum. Example of Success: Department of Education Math/Science Partnership Project: AMP STEM The Accelerating Maximum Potential in STEM (Mathematics and Science Partnership) was funded by the US and Florida Departments of Education to provide professional development to K-12 STEM teachers and support integrative STEM practices in K-8 classrooms. Our award amount is $4,500,000 for 3 years, and through this grant project we will provide nearly 50,000 hours of professional development and create, pilot and publish over 48 integrative, STEMcentric lessons for elementary and middle grades to be shared with the state of Florida. In addition, the grant also assists us in preparing teachers for certification examinations in hard to certify areas, such as 6-12 Mathematics, 6-12 Chemistry and 6-12 Physics. Example of Success: Title I Funding to Create Equitable Experiences for Students Hillsborough also utilizes Title I funds to create equitable learning experiences in our Title I schools. Over 63% of our students qualify for free and reduced lunch, and the district has a majority of schools that receive Title I funding. While these dollars support a wide range of services for our schools, in the STEM arena we utilize the funds to support academic coaches in mathematics, science and STEM as well as additional training for our teachers. In science and STEM laboratories and classrooms, we have purchased state of the art learning tools and technologies, and in mathematics classrooms virtual and hands-on manipulatives to support rigorous content and practice standards. Example of Success: Tampa Bay Master Teacher Fellows Program The Tampa Bay Master Teacher Fellows program is a competitive grant funded in part by the National Science Foundation to support twenty teacher-leaders in grades 6-12 who serve as district liaisons for new teacher induction, inservice teacher professional development, preservice teacher education and curriculum design and revision. The award amount is $1,300,000 over 5 years. Essential Element 2: Establishing Career Pathways that Support Employment in STEM Fields According to the STEM Education Coalition – which is chaired by the National Science Teachers Association – the average wage for all STEM occupations is nearly double the average for all occupations. However, the importance of preparing children with basic STEM skills is about more than economics. In today’s economy every student needs to have a strong foundation in the STEM subjects in order to land and succeed in virtually any job – from the shop floor to the research lab to the boardroom. And every citizen needs STEM skills to participate knowledgeably in our democracy where so many opportunities and challenges come from advances in science and technology. While the nation struggles with a high level of unemployment, thousands of positions that require skills related to STEM are unfilled, costing the US economy billions of dollars. The same can be said for greater Tampa Bay. In response, our district has continued to finely tune traditional programs in Career and Technical Education (CTE) to address the needs of the nation and serve the community of students to whom we are responsible. Example of Success: Magnet Schools supported by Magnet Schools of America and Grant Opportunities Hillsborough County Public Schools has a high number of magnet choice opportunities for students, ranging from the performing arts to biomedical science to aerospace and engineering. Magnet schools can be found in all grade levels: elementary, middle and high. Competitive grant dollars have been utilized to create a template for each school site, after which the district has maintained the programs. These seed funds are utilized to write curriculum, create school content, support teacher professional development and the unique tools for learning that a school may need to meet a magnet mission. A list of HCPS STEM schools is included in the supporting documents. Example of Success: Perkins Funding While the level of funding under Perkins has diminished our district continues to use this funding stream to establish programs of study that foster growth and understanding of relevant STEM content. We do this by incorporating instructional models from mainstream curriculum, such as inquiry-based experiences and engineering/design challenges and strengthening connections to local industry with technology-based workforce agreements, and finally by adopting best practices through Career Academy models. Perkins funding supports the professional development of teachers, field experiences, and tools of the trade in high-tech STEM learning environments. Essential Element 3: Fostering Community Relationships that Support STEM Learning Many school districts are concerned with making connections to the home to ensure parental support for students in the educational process. Research suggests that practices which garner parental support result in student learning gains and success throughout the K-12 system. However, establishing parental connections with STEM-related programs is more difficult than in other areas due to parents’ inadequacies in STEM understanding or familiarity. In addition to parents, supports from academic, business and community (the ABCs of STEM) partners are more essential to STEM programs since public schools rely upon these institutions for innovations within the STEM fields, financial supports and academic supports. Research from the National Academies suggests the community-based ecosystem approach to STEM education has merit and should be further explored. Recently, organizations such as the Teaching Institute for Excellence in STEM and the National Science Foundation have supported such ecosystems through grant opportunities. The NSF INCUDES and STEM-C solicitations both include language regarding the building of community support from multiple sectors in their request for proposals. Example of Success: Tampa Bay STEM Network Tampa Bay STEM Network was born in 2016 and is funded in part by the STEM Funders Network, Samueli Foundation and Teaching Institute for Excellence in STEM to develop a supportive network of collaborating partners in STEM education in the Tampa Bay region. Locally over 25 academic, business and community partners have committed to this call. Essential Element 4: Value-Added and Non-traditional Programs that Support STEM Learning Research suggests that much of what students learn in STEM disciplines, especially science, occurs through discovery and exposure to content outside of the typical classroom. This learning can occur through self-guided exploration, experiences at informal science institutions, as well as through a variety of media. In addition, states and districts must utilize value-added programs, such as after school extended learning programs, Saturday school, competitions, fairs and other community events to bring content to life for students. The STEM disciplines present an opportunity for nontraditional and value-added measures, yet many school systems fail to make these connections. Example of Success: 100Kin10’s Early Childhood STEM Learning Project In 2013, 100Kin10 announced $2 million in funding for a competitive opportunity for partners to propose “moonshot” ideas that will help support the creation of active STEM learning environments in grades P-3 in schools across the country. Focused upon teacher effectiveness and encouraging experimentation, this opportunity is intended launch great solutions to the root causes of this overarching challenge in STEM education. There is much more to be done, however, so please consider our “ask”. When Congress reauthorized the Every Student Succeeds Act, they eliminated the Math Science Partnership program and instead opted to consolidate this program, and other competitive grant programs, into a single, formula-funded, flexible block grant, now known as Title IVA, Student Support and Academic Enhancement Grants (SSAE). I applaud the fact that the new federal law now gives district leaders more flexibility in choosing programs that will best fit the specific needs of our schools. But as Hillsborough and thousands of districts nationwide prepare to implement the new federal education law, we must be able to rely on the federal funding levels that Congress authorized in ESSA if we want to see this law succeed. I am asking that you, members of the Senate Appropriations Committee, support full funding of the ESSA Title IV Student Support and Academic Enhancement Grants at the authorized level of $1.65 billion. I would also hope that your Committee will also make clear that this program will continue as authorized by Congress as you resolve the current Continuing Resolution for this fiscal year. Districts could choose where best to spend their SSAE grant dollars in order to help all students develop the skills essential for learning readiness and academic success. Title IV SSAE funds would allow high need districts to promote hands on STEM learning, develop and provide more computer science courses, create STEM specialty schools, and integrate informal and formal STEM programs. SSAE will also fund safe and healthy student activities, including student mental health services; allow students to have more access to accelerated learning courses; provide for more courses in physical education, art, music, foreign languages, and college and career counseling; and support the effective use of technology through professional development, and access to technology and digital materials. I am concerned, and I know many of you have heard from your constituents, that diminished funding for the Title IVA SSAE grant would force many school districts to choose between badly needed programs that can positively impact students. Tough funding decisions must be made in this budget, but under funding ESSA Title IVA is in direct opposition to Congress's intent to provide greater flexibility for districts and schools. In addition to supporting Title IV, the committee should also consider the highest possible level of funding for ESSA Title II Supporting Effective Instruction State grants. This program provides support for teacher quality improvement initiatives, including professional development and teacher leadership, and provides states with flexibility in addressing STEM-specific challenges in this area. We would also like to see the highest possible funding level provided for Title IV Part B (21st CCLC). New language in ESSA allows 21st CCLC to fund high-quality STEM programming in afterschool and summer learning programs. I would also like to encourage you to work with you colleagues to support the highest possible funding level for the National Science Foundation’s Education and Human Resources (EHR) Directorate. This funding supports discovery and innovation at the frontiers of STEM learning and teaching, supports the testing, assessment, study and evaluation of highly innovative models and approaches to learning, and fosters linkages between STEM education research and practice that improve the effectiveness of programs across the federal government and at the state level. Funding for NOAA education programs should also be continued. NOAA is mandated to support and coordinate educational activities to enhance public awareness and understanding of oceanrelated issues. NOAA education activities are authorized under the America COMPETES Act, which obligates NOAA to carry out science, technology, engineering, and math (STEM) activities to improve interest and literacy in STEM subjects. The Bay-Watershed Education and Training (B-WET) and competitive education grants (also called Environmental Literacy Grants or ELG) should be funded in the total amount of $20 million in the Fiscal Year 2018 appropriations bill. Funding B-WET at $12 million would enable NOAA to resume operation of all seven of the regional B-WET programs which impact a total of 27 states and the District of Columbia. Funding the ELG program at $8 million would return it to a robust level of grant-making and national impact. In closing, I would simply state that if we are to keep up with our global competitors, we had better step up our commitment to improving STEM education and increasing opportunities to access innovative STEM education programs both in and out-of-school. Excellence in STEM should be embraced as a bedrock element in conquering the challenges of today and tomorrow, including modernizing our infrastructure, improving health care, defending the homeland, and fostering future industries. I feel strongly that action on STEM education policy should match the rhetoric on its importance. The bipartisan Every Student Succeeds Act would provide schools with the flexible resources they need to support wide range of activities like science, technology, engineering, and math competitions, hands-on learning, and bringing high-quality STEM courses – including computer science – to high-need schools. The Subcommittee funding level last year was far below the level authorized under ESSA and we would like to see this funding level increased. I look forward to your questions.

#### Federal investment in Education allows for a laundry list of advantages

Epstein, Senior Education Policy Analyst at American Progress, ’11 [Diana, “Investing in Education Powers U.S. Competitiveness”, Center for American Progress, September 6, Accessed July 1, 17. https://www.americanprogress.org/issues/education/reports/2011/09/06/10376/investing-in-education-powers-u-s-competitiveness/, SKS]

Ensuring all students reach high standards of achievement It is critically important that we close achievement gaps between groups of students defined by race/ethnicity and family income. As our population continues to become more diverse and as income inequality continues to increase, the federal government plays an essential role in funding schools so all children have the resources they need to achieve high standards. These types of achievement gaps run counter to America’s commitment to an equal and just society. Economic returns There are large economic returns to increasing our country’s high school and college graduation rates. Approximately 1.3 million students dropped out of the class of 2010; if half of those students had graduated from high school, the class of 2010 alone would earn $7.6 billion more per year and generate an additional $5.6 billion in increased spending and $2 billion in increased investing per year. Economic returns would be even higher if the dropout rate were cut further. Looking back to the beginning of the education pipeline, research shows that investing in early childhood has huge payoffs. Studies of the highly regarded Perry Preschool and Chicago Parent-Child Centers estimated a positive 9-to-1 benefit-cost ratio for Perry and 8-to-1 for CPC, with Perry’s annual return on investment estimated to be 4 percent for participants and 12 percent for society. The United States is one of only a handful of advanced countries that does not provide universal early childhood education—there are currently 5 million children ages 3 to 5 who are not attending preschool or kindergarten. Even if universal access is not possible in this budget climate, continued federal spending in this area is a prudent investment in terms of both long-term economic outcomes and future student achievement. Jobs The American Recovery and Reinvestment Act, otherwise known as the stimulus, saved between 250,000 and 350,000 jobs in education. Now those ARRA funds are drying up and states and local governments are cutting education budgets right and left. Cutting education further would mean eliminating more educator jobs, whereas investing in education could translate directly to job preservation and employment growth. Furthermore, the additional spending and investment gained by producing more high school graduates would lead to more job creation. Cutting the class of 2010’s dropout rate in half would have added up to 54,000 new jobs to the economy. Savings elsewhere Taxpayers are spared up to $13 for every $1 invested in quality early education, according to estimates. A key goal of early childhood education is to ensure children enter the K-12 system with the pre-literacy skills and vocabulary necessary to learn to read. Children who fail to learn to read by the third grade are far more likely than their peers to wind up receiving special education and related services. Investment in early child- hood education reduces spending on K-12 special education as fewer children need to be classified as learning disabled. Continuing to invest federal resources in K-12 and early childhood education produces cost savings in other areas as well, including savings in higher education due to a decrease in the resources that must be spent on remediation. Higher graduation rates and generally greater skill levels among graduates may help reduce the rate of incarceration and lower participation in poverty-related programs, both of which result in future cost savings. Path to the middle class A recent article in The Atlantic Monthly by Don Peck discussed the decline of the middle class in America and how it might be restored. The richest 1 percent of Americans command an increasingly huge share of national income and wealth, while median incomes have declined. The Great Recession exacerbated this trend due to job losses concentrated in traditionally middle-class sectors compared to either high-level white-collar or low-skill blue-collar sectors. As the article points out, many of the manufacturing jobs the United States lost in recent years were available to workers without advanced education, but many of the middle-class jobs of the future will require at least some education beyond high school. Fields such as health care will grow, and many of these jobs require some level of postsecondary training though not necessarily a college degree. In addition to educating workers for these expanding fields, the United States will also need to create high-skill jobs requiring high levels of education in order to produce the continuing innovation that is necessary for economic growth. Improving our education system and increasing educational attainment is clearly one of the most important paths to restoring a strong and vibrant middle class. What happens if Johnny can’t read? Understanding the importance of education is not an abstract idea—everyone went to school at some point in their lives, and most people know of at least one child currently in school. To understand the difference between a good education and a poor one, let’s look at a hypothetical 3-year-old child named Johnny. Johnny doesn’t have access to high-quality early childhood education so he enters kindergarten behind his peers. He goes to a high-poverty school that is under-resourced and lacks a stable cadre of highly effective teachers. Johnny falls further and further behind and is unable to read by third grade, a critical benchmark for future success. By high school, Johnny is chronically absent, far below proficient in reading and math, and eventually drops out. He can’t get a job without a high school diploma and is far more likely to become incarcerated, which will cost taxpayers an average operating cost of about $24,000 per year on top of $65,000 in capital costs. But Johnny didn’t have to end up on this path. If he had been enrolled in a high-quality early childhood program, he would have started school on track. Attending a school where he had a series of highly effective teachers would have increased his achievement by leaps and bounds. Simply graduating high school would make him more likely to be employed. With a diploma, he would earn about $9,000 per year more or $300,000 (33 percent) over a 40-year working career. Adult Johnny pays taxes and buys goods, increasing demand and contributing to job creation and economic growth. Rather than drain resources from taxpayers, he invests in his community. Johnny realizes that he would have greater opportunities with some postsecondary training, so he goes to the local community college and earns a technical certificate and then later an associate’s degree. He is now qualified for a higher-paying job—$10,000 more per year than if he had only a high school diploma.31 With these increased earnings, he puts more money back into the economy, further stimulating demand and leading to even more job creation and economic growth. And what if Johnny had gone to college and earned a bachelor’s degree? His lifetime earnings would be 74 percent more than if he had stopped at a high school diploma, 31 percent more than if he had earned only an associate’s degree. One child, two dramatically different paths. Now imagine that child is like the 100 other children in your local school, the 1,000 in your town, the 1 million in your state, or the 50 million in the United States. Pretty soon the power of education becomes clear—as do the consequences if we fail to provide all children with the quality education they need to succeed. How we spend money matters Of course, investing in education isn’t going to increase student achievement by itself. It matters how we spend that money, and now more than ever we have to ensure money is spent fairly, efficiently, and effectively. Here are a couple of key principles to follow. Spend scarce federal money where it is most needed We need to increase student achievement overall, but we also need to do a much better job of closing achievement gaps in order to ensure all children are prepared for higher education and securing future employment. To this end, federal education funds should go to students with extra needs, including low-income students, students with disabilities, and English language learners. Money should be used to close vast disparities in educational achievement between low-income and minority students and their more affluent peers. Resources—including effective teachers—should be distributed equitably among schools within a district and among districts within a state. And, though states are struggling as well, we should use federal taxpayer dollars to encourage states to direct the resources they do have to school districts with many low-income students. Education funding should be efficient and effective, emphasizing returns on investment Results should drive funding decisions so ineffective programs are eliminated, outdated programs are updated, and overlapping programs are consolidated into new funding streams. We should require districts to report real expenditures at the school level, rigorously evaluate state and local results on that spending, and make future funding decisions accordingly. More effort should be devoted to evaluating the returns on education spending achieved by states and local school districts, providing crucial data for smart budgeting.35 Finally, we should explore innovative funding strategies that reward performance, such as pay-for-success contracts and social impact bonds. Conclusion Education is the key to future American competitiveness and a strong economy, and we must continue to invest in education in order to put our economy on the path to sustained growth and rebuild the middle class. The payoffs to investing now will not be fully realized for decades, but every moment lost is another child not prepared for kindergarten, another high school dropout, another low-skilled worker who cannot secure employment. Investment in education is a social and economic imperative, and efficient and effective federal education spending must be protected in this fall’s super committee negotiations.

### Competitiveness – Technology key

#### Technological hegemony relies on STEM education

Gleiser, Ph.D., 2016 (Marcelo, *npr.org*, “The Key to America’s Future? Science,” 11/16/16, <http://www.npr.org/sections/13.7/2016/11/16/502270280/the-key-to-americas-future-science>, accessed 06/27/2017, JME).

Growing up in a reasonably affluent family in Brazil, I have no doubt that my life changed forever when, as a 10-year-old, I watched the moon landing on live TV. How amazing was that? To see a human walking on the moon from the comfort of my uncle's bedroom in Rio? I was born two years after the Soviets launched Sputnik, an event that surely changed history as we know it, adding a new dimension to the Cold War. How many people looked up to the skies in awe, seeing that small, fast-moving dot of light, a man-made machine not much bigger than a beach ball inscribing its path away from Earth for the first time in history? National pride was hurt, and from a mix of fear of the Soviets controlling space and an intensely focused effort, the American space program took off to define the parameters of the space race. Now, a mere half a century later, we have launched machines to all planets of our solar system, exploring worlds that defy even the most creative of imaginations. Most Americans hardly understand the impact American science has worldwide. I don't mean just the technologies that everyone else on the globe (that can afford them) consumes or copies, or the might of its military. I mean the inspiration, in the minds of children, especially. People around the world watch the awesome movies, the TV shows, the NASA launches; they read the sci-fi books, the Marvel comics, the biographies of great scientists and inventors. How many Americans realize that one of the greatest, if not the greatest, legacies of this country are its amazing universities, incubators of some of the most creative ideas in the past 100 years? Ideas that have changed the world, that have shaped the way we live, that have saved (and taken) countless lives, that pave the way for what the future will be like. Manned missions to Mars, the privatization of the space race, self-driving cars, the explosion of social media platforms, renewable energy sources, the endless pursuit for new cures and vaccines, smart robots, ultrafast computers — these are the technologies that will define the 21st century, and they all depend crucially on science and scientific research. According to a report from the [U.S. Patent and Trademark Office](https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_all.htm), from Jan. 1997 to Dec. 2015 the office granted 3,030,080 patents to U.S. entities, while the rest of the world combined was granted 2,709,771. Of these, 1,069,394 were given to Japanese entities. This trend is shifting now worldwide, with [China taking a lead](http://www.wipo.int/pressroom/en/articles/2015/article_0016.html) in the number of patent filings. There are many metrics to measure the impact of science in a country, and patents are only one. However, the trend is worrisome, as it shows a potential slowing down of American science. Patents relate to the creation and potential implementation of new ideas, some of which may be transformative. America's might is crucially dependent on its scientific base. This has been the history of this country, a country that developed the electric light, the airplane, the assembly line, the computer, the Apollo program, Microsoft, Apple, Google, Tesla. A huge amount of technologies we use every day — amounting to about 30 percent of the national GDP — [depend on quantum physics](http://www.forbes.com/sites/chadorzel/2015/08/13/what-has-quantum-mechanics-ever-done-for-us/#4e9627976759) in one way or another. Basic research that changed the world in unexpected ways. America is now at a crossroads, as a new government promises to redefine its political and economic direction. If campaign statements are taken seriously, a Trump government may have a very negative impact in the American scientific establishment, in particular in fundamental, or basic, research. (Historically, Republican governments are strong in defense funding.) For America to remain a dominant player in the world for the remainder of this century, it should not revert to a past where its strength was based on the extraction and refinement of oil and gas, and on industries sustained by coal-burning plants. This is an old model of progress, one that will not lead to the long-term growth of the American economy. Once the cup is empty, and it will become empty, you either get thirsty or find something else to drink. Despite loud climate change deniers, people are increasingly aware of the need for alternative renewable energy sources. Even for those who for some reason or another challenge that global warming is caused by humans, cleaner air to breathe is never a bad thing. I imagine coal miners would agree with that. If change is needed, it is in the redirecting of the old model and on the retraining of workers that now depend so crucially on it. What will happen to the 3.5 million truck drivers in the U.S. when [self-driving trucks](http://www.npr.org/sections/13.7/2016/10/08/496828596/would-you-trust-a-self-driving-car) take over the interstates? We need a national Marshall plan to reeducate workers on the technologies of the present and the future. We need to unify America around the need for science and STEM education as the only guarantee for prosperity. Only education can keep America great. There is a new race out there, the race for digital technology dominance. Whoever leads it will define the parameters of the global economy for the next decades. More oil and coal burning will only choke our children and kill our forests. A new reality is calling, and we need to respond to its call together.

#### Technology and Science Development is Key to US Global Primacy

Segal, Maurice R. Greenberg Senior Fellow in China Studies at the Council on Foreign Relations, 2004 (Adam, YaleGlobal Online, “*Is America Losing Its Edge?,”* November 17, 2004, http://yaleglobal.yale.edu/content/america-losing-its-edge, July 1, 2017, IL)

The United States' global primacy depends in large part on its ability to develop new technologies and industries faster than anyone else. For the last five decades, U.S. scientific innovation and technological entrepreneurship have ensured the country's economic prosperity and military power. It was Americans who invented and commercialized the semiconductor, the personal computer, and the Internet; other countries merely followed the U.S. lead.

Today, however, this technological edge-so long taken for granted-may be slipping, and the most serious challenge is coming from Asia. Through competitive tax policies, increased investment in research and development (R&D), and preferential policies for science and technology (S&T) personnel, Asian governments are improving the quality of their science and ensuring the exploitation of future innovations. The percentage of patents issued to and science journal articles published by scientists in China, Singapore, South Korea, and Taiwan is rising. Indian companies are quickly becoming the second-largest producers of application services in the world, developing, supplying, and managing database and other types of software for clients around the world. South Korea has rapidly eaten away at the U.S. advantage in the manufacture of computer chips and telecommunications software. And even China has made impressive gains in advanced technologies such as lasers, biotechnology, and advanced materials used in semiconductors, aerospace, and many other types of manufacturing.

Although the United States' technical dominance remains solid, the globalization of research and development is exerting considerable pressures on the American system. Indeed, as the United States is learning, globalization cuts both ways: it is both a potent catalyst of U.S. technological innovation and a significant threat to it. The United States will never be able to prevent rivals from developing new technologies; it can remain dominant only by continuing to innovate faster than everyone else. But this won't be easy; to keep its privileged position in the world, the United States must get better at fostering technological entrepreneurship at home.

PENNYWISE

At the moment, it would be premature to declare a crisis in the United States' scientific or technological competitiveness. The United States is still the envy of the world for reasons ranging from its ability to fund basic scientific research to the speed with which its companies commercialize new breakthroughs.

This year, total U.S. expenditures on R&D are expected to top $290 billion-more than twice the total for Japan, the next biggest spender. In 2002, the U.S. R&D total exceeded that of Canada, France, Germany, Italy, Japan, and the United Kingdom combined (although the United States trailed Finland, Iceland, Japan, South Korea, and Sweden in the ratio of R&D to GDP). And although scholars from other parts of the world may write relatively more science and engineering papers than Americans do, U.S. research continues to be cited the most.

The United States also leads the major global technology markets, holding commanding market shares in aerospace, scientific instruments, computers and office machinery, and communications instruments. U.S. information and communications technology producers lead almost every sector. And for the last two decades, U.S. firms have been the top providers of high-technology services, accounting for about one-third of the world's total.

These strengths, however, should not obscure the existence of new threats to the long-term health of science and innovation in the United States. A record $422 billion budget deficit, for example, may undermine future government support for R&D. Recent shifts in federal spending will leave basic research-that driven by scientific curiosity rather than specific commercial applications-underfunded, depriving the economy of the building blocks of future innovation. Although federal expenditures on R&D are expected to reach $132 billion in fiscal year 2005 and $137.5 billion in 2009, new spending will be concentrated in the fields of defense, homeland security, and the space program. Funding for all other R&D programs, meanwhile, will remain flat this year and decline in real terms over the next five years.

In July, Congress approved a record-breaking $70.3 billion for R&D for the Defense Department in 2005, a 7.1 percent increase from last year and more than the Pentagon had asked for (in fact, the department's top brass had asked to cut R&D spending). Such largesse makes it likely that the Pentagon will be able to continue innovation in the near term. Its longer-term prospects, however, are more worrying. According to five-year projections by the American Association for the Advancement of Science, the Defense Department will focus more and more on weapons development while neglecting basic and applied research.

Privately funded industrial R&D, meanwhile-which accounts for over 60 percent of the U.S. total-is also starting to slip as a result of the current economic slowdown. Private industry cut R&D spending by 1.7 percent in 2001, 4.5 percent in 2002, and 0.7 percent in 2003. This year, R&D spending is expected to increase-but by less than one percent, which is less than the inflation rate. Furthermore, with less than 10 percent of its R&D spending dedicated to basic research, industry will not be able to fill in the gaps created by the government's shift of funding to defense and homeland security-related research.

These funding decreases may be exacerbated by a coming labor shortage. The number of Americans pursuing advanced degrees in the sciences and engineering is declining, and university science and engineering programs are growing more dependent on foreign-born talent. Thirty-eight percent of the nation's scientists and engineers with doctorates were born outside the country. And of the Ph.D.'s in science and engineering awarded to foreign students in the United States from 1985 to 2000, more than half went to students from China, India, South Korea, and Taiwan.

Such dependence on foreign talent could become a critical weakness for the United States in the future, especially as foreign applications to U.S. science and engineering graduate programs decline. With booming economies and improving educational opportunities in their countries, staying at home is an increasingly attractive option for Chinese and Indian scientists. In addition, visa restrictions put in place after the terrorist attacks of September 11, 2001, have created new barriers for foreign students trying to enter the United States. Surveys conducted by the Association of American Universities, the American Council on Education, and other education groups have blamed repetitive security checks, inefficient visa-renewal processes, and a lack of transparency for significant drops in applications to U.S. graduate programs this year.

ENGINEERING BIOSYSTEMS

The real test for the United States' future will be whether it can maintain and improve its environment for innovation. For the last 30 years, U.S. companies have led in the invention of new products while Asian firms have played a secondary role, lowering the costs to manufacture U.S. inventions. But Asian firms have begun to challenge that division of labor and are no longer content simply to follow.

This shift has resulted in part from a change in the way U.S. companies work. During the 1980s and 1990s, U.S. technology producers started collaborating more with colleagues around the world. Private industry found that R&D had become too costly and risky for a single lab at a large company to undertake alone. Instead, cutting-edge companies began to cooperate with a wide network of other firms, universities, and industry-government consortia to develop new products. Such activity flourished in places such as Silicon Valley, the Route 128 corridor in Boston, and in Austin, Texas-hothouses of innovation where scientists, venture capitalists, and technology managers meet and share information. The result has been a shift in the locus of innovation from individual corporate labs to networks of technology firms, capital markets, and research universities.

Cheaper communications technologies have also allowed U.S. companies to operate more globally, dividing production into discrete functions, contracting out to producers in different countries, and transferring technological know-how to foreign partners. Contrary to conventional wisdom, not just labor-intensive manufacturing is being moved offshore; Microsoft, Intel, Bell Labs, Motorola, and other firms increasingly perform advanced research abroad.

The attraction of emerging technology clusters in places such as Shanghai, China, Bangalore, India, and Hsinchu, Taiwan, was at first based on their cheap labor supply. But as local technology companies have developed, new research institutes have been founded, and scientists and engineers from such countries have returned home after training and working in the United States, these hubs have started supporting innovation of their own. Craig Barrett of Intel has said that the Chinese are now "capable of doing any engineering, any software job, any managerial job that people in the United States are capable of." And Microsoft has reportedly contracted with the Indian companies Infosys and Satyam not only to do simple software coding, but also to provide highly skilled software architects.

No longer content to dominate labor-intensive manufacturing, Asian governments are also actively promoting technological innovation. Japan and South Korea each currently spend 3 percent of GDP on R&D (compared to 2.7 percent in the United States) and Beijing is trying to reach an R&D spending target of 1.5 percent of GDP in 2005 (up from 0.6 percent in 1996). Asian countries are also trying to take the lead in three areas that are likely to generate the next wave of innovation: biotechnology, nanotechnology, and information technology. Governments have increased their support for all three areas, and Asia now spends as much as the United States and Europe combined on nanotechnology. South Korea, China, and Japan have all established national offices to coordinate research and are spending significant private and public resources on new developments.

In addition to increasing science and R&D budgets, China, India, South Korea, and Taiwan are shifting from top-down, state-directed technology policies to more flexible, market-oriented approaches that foster innovation and entrepreneurship. Regional governments are using tax, education, and fiscal policies to create clusters of domestic start-ups. They are encouraging students, scientists, and technology managers to return from Silicon Valley to set up their own companies in Shanghai or Bangalore. And by offering tax holidays as well as priority access to water, land, and electricity, they are attracting high-tech companies from the United States, Europe, and Japan.

All of these changes in Asia highlight one of the paradoxical outcomes of globalization: geography has become both less and more important to innovation. Technology firms can now locate anywhere. Production that was once tied to a specific place can be picked up and moved to other parts of the world. But to remain competitive, technology companies need knowledge-and information-rich regions; firms are likely to be drawn to technology hubs that provide the concentration of ideas, talent, and capital needed for future innovation. Globalization has therefore not eliminated geography as a concern, but rather increased the leverage of those regions that can successfully assemble the components of innovation.

RAPID RESPONSE

Before rushing to address these challenges, Washington should understand the limits of the data used to describe S&T trends. Predictions of labor shortages in the sciences have been frequently wrong before, graduate school enrollment can change from year to year, and other data can counterbalance bad news. Although the number of Ph.D. students coming to the United States has dropped, for example, the proportion of those choosing to remain after their studies has increased substantially. Moreover, a bachelor's degree may now be more relevant to innovation than before, and the number of American students getting such degrees in science and engineering has increased over the last decade.

Policymakers should therefore be careful not to focus too much on any particular statistic. Dollars spent on R&D or research papers published are easy to measure, but innovation involves many other factors. The speed at which new technologies such as broadband are adopted and diffused, the flexibility of labor markets, and the ease with which new companies can enter and exit technology markets all affect the ability of innovators to flourish in a particular economy-yet such factors usually fall outside the parameters of traditional S&T policy.

The double-edged phenomenon of globalization, which can both strengthen U.S. technology companies and threaten the innovation system, makes the task of supporting innovation through policy much more difficult. Proximity to consumers gives firms a better sense of potential new markets and allows them to rapidly respond to changing customer demands. Yet a move overseas, although it might seem good for shareholders, could also destabilize the complex interactions between firms and universities that drive technological discovery in the United States. Removing any one element from a technology cluster can diminish its ability to generate new ideas. Send manufacturing jobs to Asia and you risk exporting important components of your innovation infrastructure.

The United States cannot and should not prevent the emergence of new technology clusters in Asia. Instead, it should prepare to develop and absorb new technologies as they emerge elsewhere. The ability to make good use of diverse ideas and systems remains one of the United States' most important comparative advantages, and U.S. companies must make sure that good ideas, no matter where they are developed, are brought to market in the United States first.

U.S. private industry may want to follow the example of the nation's armed forces. Washington's military dominance no longer depends on it denying others access to critical technologies. Many of the sensors that the U.S. military now uses to detect ships or aircraft beyond visual range or to provide targeting information are off-the-shelf items produced by companies around the world. Unable to prevent the spread of these technologies to potential enemies, the United States has maintained its military superiority by making sure it is better than any other country at using such tools, integrating sensor input, and creating sensor networks. In the commercial sphere, U.S. firms should similarly strive to maintain their advantage by adopting and integrating new technologies more rapidly than their competitors.

Maintaining such speed will require that U.S. companies have a presence in Asian markets to track, develop, and invest in the most promising new ideas. Washington must continue to pressure its trading partners-especially Beijing-to meet the terms of current trade agreements and allow such access. The United States must also promote voluntary and open technology standards. In March 2004, the Bush administration protested regulations requiring all wireless imports to China to contain data-encryption technology produced only by Chinese companies. Beijing has since withdrawn the regulations, but given China's interest in developing new technology standards, the United States should watch for future attempts of a similar nature.

At home, Washington should not strive to identify the next big thing. Rather, policymakers should ensure that the United States remains the most dynamic innovation system. Funding for science and education must be maintained. Although it might be tempting to shrink the budget deficit by reducing discretionary funding for the sciences, this would weaken one of the pillars of the country's future economic and technological health. Money for basic research, especially in the physical sciences and engineering, and support for the National Science Foundation should therefore be maintained at current levels or increased.

Of equal importance, policymakers must also reinforce the United States' entrepreneurial climate, its greatest asset. The building blocks of American innovation-flexible capital and labor markets, transparent government regulation, and a business environment that rewards risk-need to be strengthened. Making the R&D tax credit permanent and expanding it to include more types of collaborative research, for example, would help provide incentives for innovation in as many technological sectors as possible.

With innovative capacity rapidly spreading across the Pacific, the United States cannot simply assume that it will remain the epicenter of scientific research and technological innovation. Instead, it should meet the challenge from Asia head-on. The United States must actively engage with new centers of innovation and prepare itself to integrate rapidly and build on new ideas emerging in China, India, and South Korea. Above all, it must not assume that future innovation will occur automatically. Only through renewed attention to science funding, educational reform, the health of labor and capital markets, and the vitality of the business environment can the United States maintain its edge-and the most innovative economy in the world.

### Competitiveness – Innovation key

#### Innovation drives competition

Atkinson, founder and president of the Information Technology and Innovation Foundation, and Mayo, founder of Mayo Enterprises, LLC, a consultancy in the areas of innovation, workforce, technology and the future of learning. Her recent work has included projects for NASA’s Office of the Administrator, 2010 [Robert and Merrilea, “Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education” Information Technology & Innovation Foundation, December 10, p. 21, https://www.itif.org/files/2010-refueling-innovation-economy.pdf, Accessed 6/27/17, SKS]

Second, countries seek innovation to boost the competitiveness of their traded sectors in international markets, leading to increased exports and better terms of trade. The growth of international trade also makes it increasingly important for the United States to innovate. Low-wage nations can now more easily perform labor-intensive, difficult-to-automate work. Indeed, it has become difficult for the United States to compete in such industries as textiles and commodity metals. Notwithstanding the efforts of countries like China and India to compete in advanced technology industries, for the foreseeable future their competitive advantage should remain in more labor-intensive, less complex portions of the production process. By contrast, the United States’ primary source of competitive advantage should be in innovation- based activities that are less cost-sensitive. To illustrate, a software company can easily move routine programming jobs to India where wages are a fraction of U.S. levels. There is less economic incentive for moving advanced programming and computer science jobs there because innovation and quality are more important than cost in influencing the location of these jobs.

### Competitiveness – Int’l business signal

#### The prioritization of technical-related education avoids economic recession – the signal sent to foreign investors restores faith in the workforce

Moran, Director of International Business Diplomacy at Georgetown University, and Oldenski, 2013

(Theodore and Lindsay, “Foreign Direct Investment in the United States: Benefits, Suspicions, and Risks with Special Attention to FDI from China” *Peterson Institute of International Economics*, page 73-74, JME).

The preceding analysis shows that foreign multinational rms that invest in the United States are, alongside US-headquartered American multinationals, the most productive and highest-paying segment of the US economy. They conduct more research and development (R&D), provide more value added to US domestic inputs, and export more goods and services than other rms in the US economy. The superior technology and management techniques they employ spill over horizontally and vertically to improve the performances of local rms and workers. Their corporate social responsibility activities provide tangible bene ts to the communities where they locate their plants and research facilities. As the United States wants not only to expand employment but also create well-paying jobs that reverse the falling earnings that many US workers and middle class families have suffered in recent decades, it is more important than ever to enhance the United States as a destination for multi- national investors.

Multinational corporations (MNCs) target the United States for invest- ment overwhelmingly because the US economy gives them access to skilled and energetic workers. The US workforce today is willing to work more hours at (often) multiple jobs than ever before. But after more than a century of spec- tacular progress, in recent years the rate of US educational advance has sharply decelerated. From 1940 to 1980 the mean educational attainment of all US workers climbed by 0.86 years per decade, from 9.01 to 12.46 years, but from 1980 to 2005 the total increase was no more than one year—only 0.43 years per decade (Kirkegaard 2007, Goldin and Katz 2008, Baily and Slaughter 2008). This slowdown in education has taken place while improvements in secondary education have accelerated around the world. Other countries have not merely been catching up to the US workforce; they have been moving ahead.

Among 26 member states of the Organization for Economic Cooperation and Development (OECD) in 2006, 18 had high school graduation rates higher than that of the United States. At the same time there have been concerns about the quality of US education, with US students scoring below the median in comparative tests of educational achievement in science and mathematics. Maintaining the competitive quality of the US labor force is a dynamic process. As Jacob Kirkegaard points out, the retirement of the baby-boom generation in the United States represents the largest brain drain, or skill drain, that has ever taken place from any economy in history, and replacement indicators are not promising (Kirkegaard 2007). Measures to improve the education and skill level of the US workforce are therefore vital to making the United States an ongoing attractive site for international investment.

A particularly important component of improving the human capital resources within the US labor market is policy toward high-skilled immi- gration. Immigrants with college or higher degrees bring skills directly into the US labor pool, as well as innovative ideas for new goods and services and connections to business networks in their home countries. Approximately one-quarter of all US high-technology startups since the early 1990s have had at least one foreign-born cofounder, up from less than 10 percent in the 1970s (Kirkegaard 2007). But the US H-1B visa program places stringent caps on the in ow of engineers, scientists, architects, doctors, and managers from abroad. As a result, the most competitive companies in the United States— including US af liates of foreign multinationals—cannot get visas for the non-US high-skilled workers they want to hire. A snapshot from 2008 shows that about half of 163,000 companies in the United States wishing to hire a foreign high-skilled worker on H-1B visas were denied this opportunity by the annual quota of 85,000 available permits.1 For a more recent illustration, any US rm that wanted to hire a foreign-born high-skilled person in December 2011 had to wait until April 1, 2012, as that scal year’s quota had already been lled.2 Reforming US policy toward high-skilled immigration would make the US economy more competitive as a site for US and non-US investors alike. Strengthening the quality and size of the skilled labor force in the United States through both education and immigration policies will increase the appeal of the United States as a location for high-value production, attracting investment that will utilize this larger pool of indigenous and foreign-born workers while bene ting the overall US economy.

### Competitiveness – High school workers

#### Two internal links to K-12 STEM – greater college STEM enrollment and more skilled high-school workers

U.S. DEPARTMENT OF COMMERCE, January 2012, “The Competitiveness and Innovative Capacity of the United States,” http://www.esa.doc.gov/sites/default/files/thecompetitivenessandinnovativecapacityoftheunitedstates.pdf

Another barrier to attending college (and an explanation for the high rate of re‐ medial education in college) **is inadequate K–12 preparation**. The primary and secondary education system in the United States must prepare students who wish to go to college and specialize in a STEM field with the skills to do so. Simi‐ larly, those **students who choose to enter the workforce directly after high school** and not attend college must be equipped with the skills necessary to be trained for STEM jobs that do not require a college education. Yet pre‐college prepara‐ tion in the skills that will allow students to specialize in STEM coursework in col‐ lege or to enter STEM jobs right out of high school is lagging. The Program for International Student Assessment (PISA) test scores reveal that U.S. students con‐ sistently scored below the OECD average in math in 2003, 2006, and 2009 (the past three testing cycles). In science, while U.S. students scored lower than the OECD average in science literacy in 2006, the average score of U.S. students in 2009 was not measurably different from the 2009 OECD average (see figure 4.7). Further, U.S. students scored lower than the students in 12 OECD countries, and not significantly different from students in 12 other countries. These conclusions about the world ranking of U.S. students is supported by the results of the most recent National Assessment for Educational Progress study, which shows that al‐ though U.S. students have improved in math over the past 30 years, only 26 per‐ cent of 12th graders are “proficient” or better in math. In reading, 38 percent of students scored at the proficient level or higher in 2009. While overall math and reading scores for 12th graders have improved between 2005 and 2009 (the latest two reports available), there remain notable and persistent disparities by race, ethnicity and gender.22 The latest science scores may also give reason for pause as only 21 percent of 12th graders were found to be “proficient” or better.23 Overall these scores suggest that while we need to boost student achievement in all di‐ mensions, we are particularly poor right now in skills that prepare students for post‐secondary STEM education and training.

#### Boosting federal education spending creates waves of increased earnings starting that following year – continual economic growth every subsequent year

Hall, Director of the U.S. Congressional Budget Office, 2017  
Keith, Congressional Budget Office, 5/3/2017, “How CBO Analyzes the Economic Effects of Changes in Federal Subsidies for Education and Job Training,” <https://www.cbo.gov/publication/52361>, 7/1/2017

Lags would be shorter for Title I spending, which goes to schools with large shares of economically disadvantaged students. CBO expects that, on average, for an increase in Title I spending in a given year, beneficiaries of that spending would begin to enter the labor force about eight years after the spending occurred. For that year’s 12th graders, entry into the labor force could begin as soon as the following year. Students in lower grades would enter the labor force over the subsequent 13 years. The lags between federal subsidies for higher education and job-training programs and any subsequent increase in earnings would be much shorter than those lags for preschool and K–12 education—two years, on average, for higher education and one year for job training. CBO expects that, on average, students whose education was supported by larger federal subsidies would experience increased earnings throughout the rest of their working life. Those effects on earnings would rise in dollar terms over time as workers’ earnings grew with their experience on the job, in CBO’s estimation.

#### **Graduates with STEM degrees are more likely be employed as soon as they leave college, short T.F. for AFF impacts to take place**

Strauss, Journalist for Forbes Magazine, 2016 (Karsten, Forbes Magazine, “The Top Degrees for Getting Hired Right Out of College”, June 10 2016, <https://www.forbes.com/sites/karstenstrauss/2016/06/10/the-top-degrees-for-getting-hired-right-out-of-college-energy-industry-jobs-take-a-dive/#1f9fe2ad36d9>, accessed July 1 2017, KMV)

It turns out, unsurprisingly, that graduates with certain degrees are more successful finding a job right out of school than others. A study released this month by the National Association of Colleges and Employers (NACE), a Bethlehem, PA non-profit that links college career placement offices with employers, revealed which graduating bachelors degree students in the class of 2015 – by college major – were able to find employment within six months of graduation. We folded NACE’s results into an easy-to-read gallery. In putting together its study, NACE collected data on 373,807 undergrad students at various colleges throughout the country, with various majors, all graduating in 2015. It turns out that the field of study that led to the highest rate of employment within six months of graduation was computer sciences, with 72% of students majoring in the concentration finding a full-time job. Those computer science students also reported an average starting salary of just over $69,000 a year—the highest starting salary tracked in NACE’s study. That’s an 11.3% increase in salary over numbers reported last year, according to NACE. Number two on the list of majors that led to quick full-time employment was Business. NACE reported that 65.7% of the undergrad Business class of 2015 found work within six months, for an average salary of $51,452. Overall – when looking at 2015 graduates – one of the more notable trends uncovered in this year’s study was the increase to the starting salaries of new grads, says Ed Koc, director of research for NACE. “The average starting salary went up between 4% and 5%,” he said. “That’s significant because salaries have been pretty flat for a number of years. They haven’t really exceeded the inflation rate for any period of time.” Employment was positive across the board, said Koc, but there were highlights, including STEM majors, who had the best rates of finding work fast. But that area of study is new to the top of the list. Over the past several years – up through the class of 2014 – three majors tended to have the best rate of employment: petroleum Engineering, Geo-sciences and chemistry—all fields of study connected to the oil and gas industry. That has shifted.

### STEM – hegemony sustainability

#### US is losing global competitiveness due to a shortage of STEM education

McGlynn, Psychology Professor at Mercer Community College, 2009 (Angela, The Hispanic Outlook in Higher Education, “Needed: More – and More Diverse – STEM Students & STEM Teachers,” 10/05/2009,   
<http://proxy.foley.gonzaga.edu/login?url=https://search.proquest.com/docview/219309310?accountid=1557>, accessed 6/20/2017, JME).

Where does America stand in the global picture when measuring educational attainment and research productivity? As we acknowledge an increasingly competitive global environment, is the United States losing its advantage? Once we led the world in the fields of science, technology, engineering and mathematics (STEM) , pushing us into the role of superpower and ensuring a better quality of life for our people. Where are we now? According to the Business Higher Education Forum (BHEF), Securing America's Leadership in Science, Technology, Engineering, & Mathematics (2006), other countries have already caught up with or passed our nation on some key factors used to predict future economic growth. Specifically, we have lost ground in several ways: \* Fewer college degrees earned in STEM fields \* Fewer Nobel Prizes won \* Since Sept. 11, fewer of the world's most talented students and scholars are coming to America to work and study due to stricter immigration policies and the increased worldwide competition for top students. William H. Swanson, chairman and CEO of Raytheon Company, presented this picture in 2006: "As Tom Friedman \New York Times columnist] has written, the world is becoming 'flat.' The United States will need an adequate supply of engineers and scientists to prosper in this intensely competitive world that is just a 'mouse-click' away. One of the key challenges we face is to help young students to develop and sustain an interest in math so that they will pursue careers in engineering and related fields. Much is riding on how well we meet this challenge." William J. Baker, president of California Polytechnic State University, added: "The United States has been in a world leadership position for some time; however, we have now become complacent. We must move beyond this complacency and commit ourselves to a national collaborative effort to equip each and every one of our teachers and students with the skills needed to take over the vital leadership that is needed in science and technology-driven fields." Back in 2006, BHEF warned that our nation must strengthen its efforts and determination to create a world-class work force, particularly in the critical STEM disciplines. At that time, BHEF, joined in its initiative by corporate and academic groups, set the groundwork for doubling the number of STEM graduates produced by 2015. Its aim was to improve the quality of the nation's future work force and to strengthen the country's research and development infrastructure. The BHEF initiative, known as "Securing America's Leadership" (SAI), was aimed at strengthening the education pipeline that would lead students to STEM careers. Based on data showing that students are not well-prepared for STEM majors, that the teacher turnover in math and science is higher than in other fields, and that few STEM majors complete their degrees, often switching to other disciplines, the SAI Project focused on six areas of priority: 1) Science and Math Culture and Achievement - Increase student awareness, interest, and achievement in math and science. 2) STEM Pipeline - Attract and graduate more students in the STEM disciplines, particularly women and underrepresented minorities. 3) Institutional and Systemic Reform Advance learning methods and systemic reforms that facilitate greater student achievement in math, science, engineering and technology. 4) Teaching Work Force - Foster new methods of recruiting, training, supporting and collaborating with K- 12 teachers proficient in math and science. 5) STEM Policy - Advance policy and programs that enable U.S. higher education, private industry and government agencies to compete in the global search for the best STEM talent. 6) Advocacy and Action - Stimulate national dialogue and local, grass-roots initiatives through alliance building and collaboration among business, education and government. ACI: American Competitiveness Initiative The BHEF 2006 Issue Brief titled "The American Competitiveness Initiative: Addressing the STEM Teacher Shortage and Improving Student Academic Readiness" explores the overlapping issues of STEM teacher shortages and lack of student preparedness to enter teaching and research fields. The American Competitiveness Initiative (ACI) is aimed at addressing these crucial issues. The components of the ACI include an Adjunct Teacher Corps, Advanced PlacementInternational Baccalaureate (AP/IB) Incentive Program, the National Math Panel, Math Now for Elementary Students, and Math Now for Middle School Students. In terms of teacher shortages in STEM fields, the brief expounds on three facts: Fact 1. The United States faces a critical shortage of highly qualified mathematics and science teachers that will require an additional 283,000 teachers in secondary school settings by 2015. The shortage is most dramatic in low-income, urban school districts. In "Making a Case for Diversity in STEM Fields," authors Daryl. E. Chubin and Shirley. M. Malcom offer insight into the lack of diversity and the compelling reasons for diversifying the STEM fields both in academia and the work force. Chubin and Malcom say that the STEM fields look the least like America in both arenas. There are smaller proportions of women, African-Americans, Native Americans and Latinos. Even as the overall college student population has become more diverse, these groups are underrepresented among all STEM majors. Chubin and Malcom argue the case for diversity in education and the work force, showing how both students and society would benefit from a more diverse STEM field. As mentioned earlier, there is high teacher turnover in STEM disciplines. Add this to the swell of student enrollment and lower studentteacher ratios - this combination of factors contributes to the growing shortage problem.

#### China will bring the STEM

Atkinson, founder and president of the Information Technology and Innovation Foundation, and Mayo, founder of Mayo Enterprises, LLC, a consultancy in the areas of innovation, workforce, technology and the future of learning. Her recent work has included projects for NASA’s Office of the Administrator, 2010 [Robert and Merrilea, “Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education” Information Technology & Innovation Foundation, December 10, p. 12, https://www.itif.org/files/2010-refueling-innovation-economy.pdf, Accessed 6/27/17, SKS]

It is probably not possible to write a report about STEM today without mentioning China. With its single-minded focus on innovation and STEM education, China is rightly seen as a threat to the U.S. innovation economy. Numerous reports have warned that China is producing vast numbers of STEM college graduates who will be available to power their technology economy. However, as we discuss below, the reason for this is that the Chinese central government rations college slots. If you are a Chinese student and you want to get into and graduate from college, you have a much better chance of doing so if you major in STEM. In the United States, with our focus on individual liberty and choice, such a regimented approach would be rightly rejected. But while the Chinese approach is not appropriate for the United States (and perhaps not even for China), it does reject a fundamental insight that is lacking in the United States STEM debate. Chinese officials recognize that STEM is more important than other subjects because the overall societal contribution from a STEM graduate exceeds that of a social sciences or humanities major. Such a view is rejected in elite policy circles in Washington (which are populated largely by individuals with law degrees). On what basis is government to say that electrical engineering degrees are more important than French literature degrees or even law degrees? After all, since the average salary of lawyers is higher than that of scientists, the conventional neoclassical economics view would de ne lawyers as providing more value to society. To paraphrase neoclassical economist Michael Boskin (who famously said “potato chips, computer chips, what’s the difference?”), “Art History, Computer Science, what’s the difference?” In fact, three times as many high school students take the AP Art History test than the AP Computer Science AB test.

### STEM – K-12 specific

#### Specifically, K-12 education improvements solves long-term competitiveness

U.S. Department of Labor 2007 (U.S. Department of Labor, “The STEM Workforce Challenge: The Role of the Public Workforce System in a National Solution for a Competitive Science, Technology, Engineering, and Mathematics (STEM) Workforce,” April 2007, <https://www.doleta.gov/youth_services/pdf/STEM_Report_4%2007.pdf>, accessed 07/01/2017, JME.)

Science, Technology, Engineering, and Mathematics (STEM) fields have become increasingly central to U.S. economic competitiveness and growth. Long-term strategies to maintain and increase living standards and promote opportunity will require coordinated efforts among public, private, and not-for-profit entities to promote innovation and to prepare an adequate supply of qualified workers for employment in STEM fields. American pre-eminence in STEM will not be secured or extended without concerted effort and investment. Trends in K-12 and higher education science and math preparation, coupled with demographic and labor supply trends, point to a serious challenge: our nation needs to increase the supply and quality of “knowledge workers” whose specialized skills enable them to work productively within the STEM industries and occupations. It will not be sufficient to target baccalaureate and advanced degree holders in STEM fields. Our nation’s economic future depends upon improving the pipeline into the STEM fields for sub-baccalaureate students as well as BA and advanced degree holders, for youth moving toward employment and adults already in the workforce, for those already employed in STEM fields and those who would like to change careers to secure better employment and earnings. The seriousness of this challenge has penetrated public and opinion-makers’ consciousness—and government, industry, and education and training providers have begun to respond. NIH, NSF, and the Department of Education have been leading the federal effort. Industry associations, individual firms, foundations, and other organizations have identified and tried to fill gaps. State governments, too, are working to strengthen the STEM workforce pipeline. Much remains to be done, though, within government and across diverse sectors, to ensure that U.S. education, workforce, and economic systems rise to the STEM challenge. The U.S. Department of Labor is already an important partner in federal efforts to strengthen the science, technology, engineering and math (STEM) pipeline. The U.S. Department of Labor invests about $14 billion a year in the nation’s workforce system and in increasing the skills and education of our current workforce. In addition, the Department of Labor has begun investing regionally in ways that overcome typical fragmentation in planning and action among industry, government, non-governmental organizations, and education and training institutions. The Department of Labor has the potential to play an even more important role in addressing gaps in the nation’s approach to strengthening the STEM pipeline in three areas: 1) building the gateway to STEM careers; 2) enhancing the capacity of talent development institutions to produce more and better skilled STEM workers; and 3) catalyzing and supporting innovation, entrepreneurship, and economic growth. The leadership of the Employment and Training Administration is committed to—and stands ready to—contribute and collaborate to develop an overall national strategy around the STEM workforce pipeline and to improve coordination across federal agencies. The STEM Challenge to U.S. Competitiveness and Growth There is broad consensus that the long-term key to continued U.S. competitiveness in an increasingly global economic environment is the adequacy of supply and the quality of the workforce in the STEM fields. Scientific innovation has produced roughly half of all U.S. economic growth in the last 50 years (National Science Foundation 2004). The STEM fields and those who work in them are critical engines of innovation and growth: according to one recent estimate, while only about five percent of the U.S. workforce is employed in STEM fields, the STEM workforce accounts for more than fifty percent of the nation’s sustained economic growth (Babco 2004). Opinion leaders and the public broadly agree that education in math and science is critical to the nation’s future success. According to a recent Educational Testing Service survey, 61 percent of opinion leaders and 40 percent of the general public identify math, science and technology skills as the most important ingredients in the nation’s strategy to compete in the global economy (Zinth 2006). This engine of growth is increasingly precarious in today’s global economy. The Business Roundtable (2005) warns that, if current trends continue, more than 90 percent of all scientists and engineers in the world will live in Asia. The Business-Higher Education Forum (2005) concludes: “Increased global competition, lackluster performance in mathematics and science education, and a lack of national focus on renewing its science and technology infrastructure have created a new economic and technological vulnerability as serious as any military or terrorist threat.” The seminal National Academy of Sciences study, Rising Above the Gathering Storm (2006), argues that, absent a serious and rapid response, the U.S. will lose quality jobs to other nations, lowering our standard of living, reducing tax revenues, and weakening the domestic market for goods and services. Once this cycle accelerates, it will be difficult to regain lost preeminence in technologydriven innovation and its economic benefits.

### A2 Hard power is sustainable

#### US national security no longer relies solely on military might – education is key to maintaining a smart voter basis as well as bolstering national security by promoting domestic prosperity.

Ferreira, Science writer, 2016 (Becky, Motherboard, “We Should Think of American Education as a National Security Issue,” 11-18-16, https://motherboard.vice.com/en\_us/article/ezpqym/we-should-think-of-american-education-as-a-national-security-issue, 6-28-17, APW)

The health of the American public education system has consequences far beyond its borders. The election of Donald Trump to the White House left great segments of the US population elated, and others feeling deflated and terrified. It still isn't clear what he will do after he's inaugurated, although [certain policies and approaches](https://www.donaldjtrump.com/policies/" \t "_blank) are beginning to take shape. But as observers take stock of how a novice politician who's never held elected office snagged the highest one in the land, something has become abundantly clear—America is divided, and one of the starkest divisions is around education. People voted along lines that reflect levels of education. While Hillary Clinton led college graduates by nine points (52/43 percent), Trump led non-college graduates by eight (52/44 percent). According to Pew Research, this is [the widest gap](http://www.pewresearch.org/fact-tank/2016/11/09/behind-trumps-victory-divisions-by-race-gender-education/" \t "_blank) in support between college-educated and non-college educated voters recorded in exit polls since 1980. To hold Trump, or any president, accountable to the people they represent, the US needs an informed electorate. According to some experts, this is literally an issue of national security. More uniformly educated populations are better equipped to resolve chronic policy problems, bolster economic growth, and keep pace with rapidly shifting geopolitical dynamics, which contributes to stability at home. "I don't think people generally understand the implications for national well-being and national security that the education problem raises," said former secretary of state Condoleezza Rice during [an April 2012](http://news.stanford.edu/news/2013/april/rice-declining-schools-040513.html" \t "_blank) talk at the Stanford Center for Opportunity Policy in Education. "We can't afford to become a country of two populations." It happens to be American Education Week, an [annual National Education Association (NEA) event](http://www.nea.org/grants/19823.htm" \t "_blank) that dates back to 1921, so a nationwide discussion about the fracturing of American demographics along educational lines—and its macro effect on national security—is timely. Indeed, some experts have cast Trump himself as a danger to America's integrity and interests abroad, including [several leading Republican dignitaries](http://www.nytimes.com/interactive/2016/08/08/us/politics/national-security-letter-trump.html" \t "_blank). The president-elect has [casually advocated](https://www.washingtonpost.com/news/monkey-cage/wp/2016/04/06/should-more-countries-have-nuclear-weapons-donald-trump-thinks-so/" \t "_blank) for nuclear proliferation, denies [that climate change](https://www.washingtonpost.com/news/the-fix/wp/2016/09/27/a-brief-history-of-donald-trumps-denialist-position-on-climate-change/" \t "_blank) is a problem, and invited [Russian hackers to meddle](http://www.pbs.org/newshour/rundown/trump-encourages-russia-hack-clintons-deleted-emails/" \t "_blank) in the 2016 election, to name a few key concerns. World leaders eager to speak with Trump, including Japanese prime minister Shinzo Abe, are [already reporting confusion](http://www.reuters.com/article/us-usa-trump-idUSKBN13B1UR" \t "_blank) over meeting details. These developments further validate [accounts of disarray](http://www.nytimes.com/2016/11/16/us/politics/trump-transition.html" \t "_blank) within Trump's transition team, which does not bode well for US diplomatic relations. Less educated voters [preferred Trump](http://www.nytimes.com/interactive/2016/11/07/us/how-trump-can-win.html" \t "_blank) for numerous complex reasons, but one common theme was [his outsider status](http://www.usatoday.com/story/news/politics/elections/2016/11/09/election-analysis-hillary-clinton-donald-trump/93198882/" \t "_blank), which many in his base valued over Clinton's policy insider image. This suggests a desire for change—of any kind—was more important to many Trump supporters than policy experience or sensitive treatment of issues like nuclear weapons, climate change, and cyber espionage—issues that pose serious risks to America's safety and leadership. This is not to imply that all Trump supporters' educational background was a hard-and-fast predictor of their political leanings. On the contrary, exit polls reveal many layered subtleties to the larger Clinton/Trump narrative surrounding education, along with a much more stark dividing line by race, [which was likely the most influential factor](http://www.pewresearch.org/fact-tank/2016/11/09/behind-trumps-victory-divisions-by-race-gender-education/" \t "_blank) in the campaign. For instance, white college graduates favored Trump by 49/44 percent, while non-white voters without a college degree favored Clinton by a whopping 75/20 split, [according to the New York Times](http://www.nytimes.com/interactive/2016/11/08/us/politics/election-exit-polls.html?_r=0" \t "_blank). There were also a myriad of factors beyond race or education that played a role in bringing the real estate tycoon and reality star to the White House. Still, education levels were one of the most noticeable splits between Trump and Clinton supporters, broadly speaking. As Georgetown University professor Jason Brennan put it [in Foreign Policy](http://foreignpolicy.com/2016/11/10/the-dance-of-the-dunces-trump-clinton-election-republican-democrat/" \t "_blank) after Trump's win: "Never have educated voters so uniformly rejected a candidate. But never before have the lesser-educated so uniformly supported a candidate." Beyond the election of wild cards like Trump, there are other potential national security dangers that might be incubated by an ailing school system. The overlap between those two spheres was best articulated in the March 2012 report [US Education Reform and National Security](http://www.cfr.org/united-states/us-education-reform-national-security/p27618" \t "_blank), authored by an independent task force sponsored by the Council on Foreign Relations (CFR) and chaired by former secretary Rice and former head of New York City public schools Joel I. Klein. America's primary and secondary schools are "widely seen as failing," the report said, and this has exacerbated "the undeniable—though often unconsidered—link between K-12 public education and national security." Rice and Klein note that high-quality education promotes security by encouraging competitive industries, social stability, and technological innovations, all of which attracts talent from around the globe. Without that draw, [America stands to lose its edge](http://motherboard.vice.com/read/trump-election-science-tech) in the fields that will most influence the future and promote its domestic prosperity. Trump's views (not to mention his stated anti-immigration policies) [run the risk of discouraging](http://www.nytimes.com/2016/11/17/us/is-it-safe-foreign-students-consider-college-in-donald-trumps-us.html?hp&action=click&pgtype=Homepage&clickSource=story-heading&module=b-lede-package-region&region=top-news&WT.nav=top-news&_r=0" \t "_blank) bright individuals, particularly women and non-white minorities, from bringing their intellectual capital to the United States. Likewise, the report spotlights the waxing spectre of cyber espionage, which demands a technologically literate public to meet it, if American intellectual property is to be protected. Trump's [enigmatic relationship](http://www.newsweek.com/2016/09/09/vladimir-putin-donald-trump-493946.html" \t "_blank) with Russian President Vladimir Putin and his joking condonement of Russian cyber attacks on US citizens directly touches on these concerns. Some of US education's major institutional problems outlined in the CFR report included sprawling bureaucratic structures, vast regional and demographic disparities in academic achievement, limited incentives to attract qualified teachers, and a lack of focus on 21st century skills such as multilingualism, STEM literacy, and global awareness. Beyond K-12 public schools, crippling student loan debt incurred at US post-secondary institutions has dashed the ambitions of many American students. This is only a short list, of course—[plenty of ink](http://blogs.edweek.org/edweek/education_futures/2015/08/10_reasons_the_us_education_system_is_failing.html" \t "_blank) has been spilled about the US educational system's [prismatic range of challenges](http://www.nytimes.com/2009/06/08/opinion/08levy.html" \t "_blank), and there is much disagreement over the best way to close the gap. Rice and Klein suggest some macro tactics, including the launch of a "national security readiness audit" that assesses how equipped students are to safeguard the nation's interests. Although firm policies and plans on school reform have yet to materialize from Trump, the president-elect has previously riffed [about gutting](http://gizmodo.com/department-of-education-memo-includes-talking-points-ab-1788753871" \t "_blank) or [wholesale scrapping](http://www.npr.org/sections/ed/2016/09/25/494740056/donald-trumps-plan-for-americas-schools" \t "_blank) the Department of Education. That Trump's former Republican primary rival Ben Carson, [a creationist](http://www.nytimes.com/2015/11/23/us/politics/from-vaccines-to-creationism-ben-carsons-views-perplex-some.html" \t "_blank), was in contention for the [position of education secretary](http://www.nytimes.com/interactive/2016/us/politics/donald-trump-administration.html?_r=0" \t "_blank) should also set off alarm bells loud enough to reach Mars (Carson has since opted not to pursue a role in Trump's administration, citing in part his [lack of governmental experience](http://www.latimes.com/nation/politics/trailguide/la-na-trailguide-updates-ben-carson-won-t-be-joining-donald-1479231990-htmlstory.html" \t "_blank)). Recently, Trump's team updated its [education platform](https://www.donaldjtrump.com/policies/education" \t "_blank) with a more substantiated focus on helping students attend the school of their choice. He proposes $20 billion of existing federal funds for this measure, and supports vouchers for families hoping to attend particular private or public schools. It's a first step towards a broader policy, though some critics regard this move [as a slippery slope](https://www.washingtonpost.com/news/answer-sheet/wp/2016/11/14/will-donald-trump-destroy-u-s-public-education/" \t "_blank) toward privatization of US public education. The future of American education is uncertain, and by extension, so is the nation's security and standing in the world. Perhaps framing America's school troubles in this light might spark investment and reform to reverse some of the damage. After all, publicly funded social programs are often considered to be drains on the country's resources, where upholding the safety of our autonomy or the competitiveness of our industries is prioritized. As the 2012 task force concluded, "military might is no longer sufficient to guarantee security." "Rather, national security today is closely linked with human capital, and the human capital of a nation is as strong or as weak as its public schools."

#### Policymakers should focus on improving STEM education – Key to national security

Lips and McNeill, Senior Policy Analyst at Heritage Foundation and Senior Director of Govt. Relations at U.S. Travel Association

(Dan and Jena, *The Heritage Foundation*, “A New Approach to Improving Science, Technology, Engineering, and Math Education,” 4-15-09, <http://www.heritage.org/education/report/new-approach-improving-science-technology-engineering-and-math-education>, 6-27-17, APW)

Improving learning in STEM education should remain a priority for American policymakers. For stu­dents, succeeding in K-12 STEM classes will open the door to future opportunities in higher educa­tion, and in the workforce. Also, ensuring that the next generation of American workers has adequate skills and training in critical areas is vital to America's national security and economic competitiveness. If the United States lacks the tools to combat aggressors, America's future is at risk. Wars are won partly with superior technologies--and America's survival depends on its ability to maintain an advantage over its enemies. U.S. scientists and engineers work every day to develop new tools to protect Americans from terrorism, such as lasers and explosives-detection devices. Tackling pressing global problems--from energy security to vulnera­ble cyber infrastructure--will require the intellec­tual curiosity and creativity of STEM-educated individuals.

### A2 Krugman

#### Krugman is 100% wrong—the US is falling behind and globalization creates competition for innovation companies

Ezell, vice president of global innovation policy at ITIF, 2011

(Stephen, ITIF, “Krugman Flat Wrong that Competitiveness is a Myth,” 01/26/2017, <http://www.innovationfiles.org/krugman-flat-wrong-that-competitiveness-is-a-myth/>, accessed 07/01/2017, AS)

In a Sunday op-ed in the New York Times, “The Competition Myth,” Paul Krugman argues that “competitiveness” is a myth, a bad metaphor, a fundamentally misleading goal, and that it doesn’t make “any sense to view our current woes as stemming from a lack of competitiveness.” About this, Krugman is absolutely, dead-on, 100 percent wrong. For the reality is that the perilous state of the American economy has everything to do with faltering U.S. competitiveness—and more than that—much to do with the abject refusal of neoclassical economists like Krugman himself to recognize that competitiveness is an issue, that countries compete, and that U.S. economic policy should be directly designed to bolster the competitiveness of U.S. organizations and industries.

Krugman’s like the young boy who finds himself losing a race with his buddies and who stops and yells, “I’m not racing!” Better to simply pretend that you aren’t racing than to lose. For if you can convince yourself that you aren’t in a race, you sure sleep better at night than if you admitted you were in a competition and were losing…That is, until you wake up one morning having lost ten million manufacturing jobs, have 10% unemployment, and have a horrifically bad trade balance. Moreover, when you refuse to even believe that you’re in a race, it’s a sure sign that you’re going to lose, as evidenced by the fact that the United States ranks 40th of out of 40 countries and regions in improving its innovation competitiveness over the past decade, as ITIF’s Atlantic Century report found.

Krugman’s misguided perspective on competitiveness dates back to a 1994 Foreign Affairs article he wrote, “Competitiveness, A Dangerous Obsession,” in which he made the utterly astounding contention that, “The notion that nations compete is incorrect…countries are not to any important degree in competition with each other.” Like many U.S. elites, Krugman simply refuses to recognize that the U.S. is in global economic—and innovation—competition with other nations. This view remains readily apparent in the NYT article, where Krugman contends that “we’re in a mess because we had a financial crisis, not because American companies have lost their ability to compete with foreign rivals.” Krugman goes on, “But isn’t it at least somewhat useful to think of our nation as if it were America Inc., competing in the global marketplace? No.” So again, only companies compete with one another; and it’s not helpful to think of the U.S. as competing. Moreover, our companies are competing fine…so the problem must be a financial crisis (caused by a few malfeasant firms in the financial sector).

But the reality is that countries do compete and seek to win in the highest-value-added sectors of economic activity. In fact, Krugman dramatically underestimates the impact that countries’ strategies—whether fair and consistent with global rules or not—can have in shifting comparative advantage in critical technology-based sectors their way. There are two aspects to this competition worth discussing.

First, an increasingly globalized economy means that countries have become price takers—not price makers—on international markets. In other words, companies now shop the world for the best locations to situate their globally mobile innovation activity, such as where to locate R&D facilities or build new factories. These companies look for which countries offer the best pools of talent (skilled scientists and engineers and a highly educated, highly skilled populace); which have the most attractive tax laws in terms of low corporate tax rates and generous and stable R&D tax credits; which have the most robust physical and digital infrastructures, the latter especially in terms of fixed and mobile broadband, electric smart grids, or intelligent transportation systems; which have the best high-skill immigration policies; the deepest pools of capital; the best funding for R&D; the easiest place to start a business; etc.. Collectively, these attributes constitute a nation’s innovation ecosystem, and governments play a legitimate and crucial role in shaping their nation’s innovation ecosystem. In fact, it is these innovation ecosystems on which countries increasingly compete. As Greg Tassey, a Senior Economist at the Department of Commerce National Institute of Standards and Technology argues, “Competition among governments has become a critical factor in determining which economies win and which lose in the increasingly intense process of creative destruction.”

But Krugman refuses to see this because “only companies compete.” This raises a consequent challenge again explained by Tassey: “Another underlying problem is that U.S. firms are attempting to compete largely as independent entities against a growing number of national economies in Europe and Asia in which government, industry, and a broad infrastructure (technical, education, economic, and information) are evolving into increasingly effective technology-based ecosystems.” Or as Wayne Johnson, Hewlett Packard’s Director of Worldwide Strategic University Customer Relations, said at a 2008 conference, “We in the United States find ourselves in competition not only with individuals, companies, and private institutions, but also with governments and mixed government-private collaborations.” In other words, the United States has a collection of players (businesses) running around competing against other players (nations) that are well equipped, well coached, and running specific plays.

Second—while President Obama might claim, as he did on his Presidential radio address this past Saturday that, “We can out-compete any other nation on Earth,”—the stark reality is that we are being out-competed by our competitors. We accumulated a -$6.3 billion trade deficit in the prior decade; we run a $200 billion a year trade deficit in advanced technology goods; we lost 8.4 million jobs in the recession; we lost 32% of our manufacturing jobs in the past decade; contrary to official statistics, U.S. manufacturing productivity has actually not increased; and the U.S. share of global exports dropped from 17 to 11% over the pase decade. And from the second half of the 1990s to the first half of the 2000s, corporate foreign outward direct investment (the amount of money U.S. corporations invest in other nations) increased by $29.2 billion, or 20 percent, while foreign corporations’ inward direct investment to the United States decreased by $7.6 billion, or 4 percent.

So why are we seeing these poor economic results? It’s not just because we’ve had a financial crisis. The answer is that over the past 12 years, the United States has become a less attractive environment for innovation and investment as it used to be or as other countries now are. We have the 2nd highest corporate tax rates in the world; our R&D tax credit is now less generous than Brazil, China, and India, in fact, it’s 17th of 30 OECD countries and it’s not even stable; 30% of our citizens haven’t graduated high-school; our high-school students perform below average against OECD peers in mathematics (Chinese students in Shanghai topped the rankings) and just narrowly above average in science and reading; we rank just 29th out of 109 countries in the percentage of twenty-four-year-olds with a math or science degree; three-quarters of electrical engineering and two-thirds of industrial engineering doctorates are awarded to foreign students; our corporations spend over twice as much on patent and other litigation than they do on research; we have a backlog of a million unexamined patents. In other words, our innovation capacity is slipping.

Therefore, the answer is not to blindly throw more money at infrastructure, as Krugman suggests (weren’t we supposed to have already spent $862 billion on that, anyway?) but to: 1) recognize that countries can and do compete; 2) recognize that U.S. innovation capacity and competitiveness is slipping; and 3) design our economic policies around fostering the competitiveness and innovation capability of U.S. firms and industries. (For plenty of ideas on how to do that, see ITIF’s Innovation Policy Toolbox.)

# \* \* STEM 2ACs \* \*

### 2AC K – helpful ev

#### Education reforms can help solve structural violence

National Academy of Sciences, et. al, nonprofit society of distinguished scholars engaged in scientific and engineering research, 07

[Private, nonprofit society of distinguished scholars engaged in scientific and engineering research, “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future”, 4-8-2007, <https://www.nap.edu/read/11463/chapter/2#3>, accessed 7-1-2017, NW]

Some commentators also argue that in industrialized countries there is no correlation between school achievement and economic success but that educational reforms often are the least controversial way of planning social improvement. School changes are less threatening than are direct structural changes, which can involve confronting the whole organization of industry and government. Reforming education, it is claimed, is easier and less expensive than examining and correcting the societal problems that affect our schools directly—economic weaknesses, wealth and income inequality, an aging population, the prevalence of violence and drug abuse, and the restructuring of work.

### 2AC States CP

#### Fed action is a prerequisite to state solvency – local funds go to waste, that’s normal means.

Caroline **King 17**, Chief Policy And Strategy Officer, Washington STEM, 03-15-17, "Senate Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies Hearing”, <https://search.proquest.com/docview/1877772258?accountid=1557>, Accessed 6-26-17, AS

Strategic federal investments have helped jumpstart the creation of innovative new programs that accelerate the pace at which Washingtonians get trained for the good paying job available in our state.

Federal funds have encouraged leverage and coordination of funds among state, local, philanthropy, and business investors. Again, these investments accelerate the pace, impact, and return on dollars spent for all investors, and, most importantly, they increase opportunity for our students.

Federal funds increase access to STEM education for rural and underserved communities. Rural communities [who] often struggle to find private investment partners, particularly in economically depressed areas of our state. **Federal funds provide the spark needed to make state and local dollars go further**.

Federal funds work across all areas of education - from early learning to K-12 to post high school career training. The following examples demonstrate the unique and significant role federal funds play in educating and training Washington's future workforce.

#### Investors perceive coordination – their arguments about localization undercut sustainable support for the counterplan

Gonzalez, Specialist in Science and Technology Policy, 12

[Heather B., Specialist in Science and Technology Policy, Congressional Research Service, “An Analysis of STEM Education Funding at the NSF: Trends and Policy Discussion”, 12-12-2012, <https://pdfs.semanticscholar.org/d7b6/ce6b2ed7be025e19259fb91302cae62ee564.pdf>, accessed 7-1-17, NW]

Coordination and Strategy Some stakeholders maintain that duplication in the federal portfolio is limited. They tend to focus instead on a perceived lack of coordination among and within agencies. To address this concern, some analysts **call for an overarching STEM education strategy**. Until recently, the federal STEM education effort was primarily undertaken in a distributed fashion that responded to the specific needs of agencies and STEM constituencies. That is, in general, programs were not part of a defined government-wide system with clear roles played by individual federal agencies. Some view this distributed approach as particularly sensitive to the unique workforce needs or STEM education assets of federal science agencies; other observers suggest that an overarching strategy may improve the efficiency of federal STEM education investments.68 Both the Congress and the President have moved to develop a federal STEM education strategy. Section 101 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) directed the NSTC to develop and implement a five-year federal STEM education strategy. Although the NSTC had not published this strategy by mid-July 2012, it issued a status report in February 2012.69 That status report identifies two common federal STEM education agency goals—STEM workforce development and STEM literacy—as well as policy and administrative strategies designed to accomplish these goals. In particular, the status report identifies four priority policy areas for the federal effort: “effective K-12 teacher education, engagement, undergraduate STEM education, and serving groups traditionally underrepresented in STEM fields.”70 The status report notes that strong arguments can be made for other STEM education policy areas, but states that these four were chosen as the priority areas for enterprise-wide coordination (agencies may still maintain their own STEM education priorities as well) because they represent the convergence of “national needs, Presidential priorities, and federal assets.”

#### States don’t have the ability to fully fix the STEM education

Means, Director, Center for Technology in Learning, SRI International, 2011

(Barbara, Congressional Documents and Publications, “House Science, Space, and Technology Subcommittee on Research and Science Education Hearing: "What Makes for Successful K-12 STEM Education: A Closer Look at Effective STEM Education Approaches,” 10/11/2011, https://search.proquest.com/pqrl/docview/898260643/652B9B0BBDB44EF8PQ/2?accountid=1557, accessed 06/27/2017, JME).

I believe that the Successful K-12 STEM Education committee's articulation of K-12 education goals not just for universal STEM literacy but for preparing broader sections of our student population for advanced-degree STEM and STEM-related occupations as well is very important. A balanced K-12 STEM education agenda will work toward all three of these goals.

And meeting these goals will require research addressing not only math and science achievement but also students' interest in STEM, their persistence in STEM courses in high school and postsecondary study, and their participation in STEM-related activities outside of school and in the job market. As Dr. Gamoran noted, we need rigorous longitudinal studies to help us understand how to develop and nurture STEM interest, persistence, and learning among student groups that now shy away from these subjects.

I am going to focus the remainder of my remarks on the steps needed to put the kinds of insights that could come from such studies into practice on a broad scale. The big challenge is scaling up what appear to be successful programs in ways that produce positive results for most or all of our students.

Conventional thinking on the part of many federal and private philanthropic programs has been that once we've identified an effective educational product or approach, we should simply roll it out to as many schools and classrooms as possible. The implicit assumption is that these schools will experience the same positive outcomes for the approach observed originally. I am going to argue that this assumption is flawed and that efforts to implement innovative K-12 STEM education approaches on a large scale need to be combined with rigorous research on those approaches in multiple contexts.

Educational effectiveness is a function of what gets implemented, not simply the elements of an innovation's design or a government policy. n1 And aspects of context--by which I mean factors such as grade level, school size, accountability measures, students' characteristics, and parent and community resources--have profound effects on how educational programs are interpreted and implemented.

I will illustrate this argument with the case of STEM-focused high schools. Selective STEM high schools were designed to serve our brightest students, and test scores are a major factor in gaining entrance. The bold idea behind inclusive STEM schools is to offer the same intensive focus on STEM subjects to students who are not selected by examination--to develop STEM expertise rather than selecting for it. It is easy to understand that instructional approaches and materials that work well with Northern Virginia's highest-scoring students who gain entrance to Thomas Jefferson High School will need to be modified in order to be effective with students who are a year or more behind national norms in math achievement when they enter an inclusive STEM high school.

Before promoting inclusive STEM high schools as a policy, we should have well-designed research demonstrating that such schools increase the likelihood that their students will be interested in, and prepared for, STEM college majors and careers. In fact, with a grant from the National Science Foundation (NSF), I am starting to examine the feasibility of conducting such a study. But this kind of research by itself is not sufficient.

If today's inclusive STEM high schools are effective, we need to figure out how we can make them widely available. For example, Texas has been particularly active in promoting inclusive STEM high schools. The Texas design for inclusive STEM schools calls for providing students with personal attention, in part by limiting school size to 100 students per grade. Although there are scores of these schools in Texas, less than 1 percent of the state's 1.4 million high school students attend them. So solid evidence that these schools are effective would lead us to the next, more difficult question. How can we obtain similar results for all of our students? The approach that works with schools of 400 students would have to be modified for schools with 1,000 or 2,000 students, and we would not know whether it would still be effective.

The rationale for bringing a new, potentially effective educational approach to many students is obvious, but the need to support initial large-scale implementations with research is less easily understood. We tend to plan for replicating a successful education approach as if we could simply have an assembly line produce more widgets. But the components of an education approach interact with, and are shaped by, the elements of the context in which we try to implement them, as Dr. Allensworth's research illustrates. For this reason, we need to combine scaling with research on the approach as implemented under different conditions.

Over the last decade, we have invested in large-scale experimental studies to answer the question of whether certain prominent educational approaches on average produce a significant benefit. Such studies are valuable in building a knowledge base, but educators care about results for their students, not averages. And they want to know not just whether they can expect good results in their setting but how to implement the approach to maximize prospects for success.

Let me illustrate my point with an example that found its way into a New York Times article last weekend. n2 The National Evaluation of Educational Technology Interventions, of which I was a part, examined the effectiveness of 16 reading and mathematics software products implemented in grades 1, 4, 6 and high school. These particular software products were selected for this large-scale experiment because they could point to some evidence that they were effective. In the large-scale national study, however, on average, none of the products produced significantly better student achievement than was attained by students in classrooms assigned to the control condition. n3 On the other hand, for virtually every product, there were some schools in which the software-using classes out-performed the control classes, some schools where the control classes outperformed the software-using classes, and some schools where the two were equivalent. We can choose to treat such variation as random "noise," or we can focus on it as an object of study. I am among those advocating the latter stance. n4

In the case of the national experiment on educational software, for example, we learned that features such as the students' grade level, the school's technology infrastructure, and district policies around curriculum and assessment influenced the way in which software was implemented. For example, some elementary school teachers had a set of computers in their classrooms and could have some of their students using the software while others worked with the teacher or did silent reading. Such flexibility was rare in middle and high schools where it was more common to have the whole class use the software on selected days, often in a separate computer laboratory.

The physical environment makes a difference in how an educational approach is implemented. In an extreme example, a sixth-grade class tried to use math software on laptops passed out to students in a large auditorium. The teacher could not help students because they were tightly packed in rows, so students could not get instructor assistance if they were having difficulty with the software program.

This class also provided an illustration of the inter-connected roles of teacher judgment and district policies. The math software was designed to individualize instruction, with each student working on a learning objective until he or she had mastered it. The teacher had different ideas, based upon his interpretation of school district policy. The district had instituted benchmark tests in mathematics every six weeks along with associated pacing charts indicating what should be taught in each period. In this context, the teacher felt there was no time to teach to mastery even though many of his students were English language learners who struggled with math. The infinitely patient technology tutor might have been ideal for such students, but the teacher believed that the district's policies required him to "touch upon a topic and move on."

I do not want to leave the impression that the effects of local context are always negative. Modifications of an education approach to better fit with local circumstances or the needs and interests of a particular set of students and instructors may enhance effectiveness in that setting. We found a number of examples in our studies of GLOBE, an Internet-based Earth science education program in which students took weather, vegetation, soil, and water measures for a local study site and uploaded them to a worldwide database used by both scientists and educators. Students whose teachers elaborated on the practices in the Teachers Guide by adding data analysis activities performed better than students of other GLOBE teachers on an assessment of science inquiry. n5 We found also that classes of teachers who designed extensions of the GLOBE investigations focusing on questions about their local environment were more active in the program (contributed more data to the database) than did other classrooms. n6 We brought these practices to the attention of the GLOBE program staff who were then able to build training and support for such practices into their program.

SRI spent over 10 years conducting research in support of the GLOBE program, an unusually long-lived collaboration. At the start of this joint work, the GLOBE program staff assumed that they could promote effective STEM learning activities if they simply trained teachers in how to conduct the scientific data collection protocols. They expected teachers to know how to make the data collection activities instructionally meaningful. Early on, we were able to show program staff that many teachers struggled to relate GLOBE activities to their local science curriculum. While high school teachers brought greater knowledge of science content, many of them were inexperienced in conducting hands-on activities with small groups of students. The program needed to entirely revamp its teacher training approach to address the range of needs uncovered by the research.

To increase the odds that new K-12 STEM education approaches will have positive effects when implemented at a large scale, researchers should be brought in to work with educators. Researchers can contribute their expertise to implementation planning and to building in data collections that can serve as feedback for those in charge of the program. At the same time, by studying implementation in multiple contexts, researchers can advance our understanding of the necessary preconditions, critical elements, and both therapeutic and harmful adaptations of the approach.

In short, I am calling for a much closer relationship between STEM education research and K-12 STEM education practice. We need collaborative efforts aimed both at (1) scaling up approaches with prior evidence of effectiveness and (2) studying what happens in multiple settings while advising those responsible for implementing the education approaches.

Approaches to Implementation Research

In recent years the Carnegie Foundation for the Advancement of Teaching has been promoting what it calls "improvement research" incorporating design, educational engineering, and development (DEED) activity. n7 Applied to K-12 STEM education, DEED collaborations would involve scientists, researchers, and education practitioners in jointly defining a problem of practice and then developing, trying out, evaluating and revising education approaches. Repeated cycles of design, development, measurement and feedback are central to this approach.

Many of the same elements can be found in educational researchers' call for "implementation research" n8 or "design-based implementation research." n9 Defining elements of this approach are:

. a focus on important problems of educational practice as defined by practitioners and researchers,

. commitment to iterative, collaborative design,

. interest in developing a theory of program implementation through systematic inquiry, and

. concern with developing education systems' capacity for change.

Implementation research requires a kind of partnership between education research organizations and schools and districts that is rare at present, but there are several existence proofs involving mathematics or science education. n10 When the focus is STEM instructional materials, science institutions should be brought into the mix as well.

A key difference between the K-12 STEM education implementation research agenda I am advocating and many existing federal K-12 STEM education expenditures is the principle of striking a three-way balance between scientists, education researchers, and education practitioners. Federally funded K-12 STEM education R & D should reflect deep expertise in STEM, address problems that educators care about, and have the potential to produce generalizable insights regarding organizational change, learning, and instruction. Funded initiatives should be neither research for its own sake, nor federal underwriting of K-12 education as usual, nor feel-good programs of scientists visiting classrooms for show and tell. I am advocating long-term, sustained collaborations with the three types of partners (scientists, educators, and education researchers) having equal roles in setting the agenda.

In this country, public education is a state and local responsibility. So what role should the federal government have in K-12 STEM education? I believe that the federal government has two responsibilities in this realm. First, it can articulate our country's goals for K-12 STEM education and a vision of how to attain them. The Successful K-12 STEM Education report provides a starting point for articulating goals. Second, the federal government has a responsibility to support the infrastructure for improving STEM education and measuring that improvement. This infrastructure includes both concrete resources, such as assessment tools and data systems, and R & D activities, such as those I've described as implementation research. The bringing together of research and educational practice that I have described would require both intellectual and monetary investments. Individual states and districts lack the resources and the broad national vision for this undertaking.

#### USFG must centralize STEM education to be effective- delegating offices and splitting duties drains funds, doesn’t solve

**Kuenzi, Education Policy Specialist, 2008 (**Jeffrey J., *Congressional Research Service*, “Science, Technology, Engineering, and Mathematics (STEM) Education: Background, Federal Policy, and Legislative Action,” 3-21-08, RL33434, p 3, MM).

There is growing concern that the United States is not preparing a sufficient number of students, teachers, and practitioners in the areas of science, technology, engineering, and mathematics (STEM). A large majority of secondary school students fail to reach proficiency in math and science, and many are taught by teachers lacking adequate subject matter knowledge. When compared to other nations, the math and science achievement of U.S. pupils and the rate of STEM degree attainment appear inconsistent with a nation considered the world leader in scientific innovation. In a recent international assessment of 15-year-old students, the U.S. ranked 28th in math literacy and 24th in science literacy. Moreover, the U.S. ranks 20th among all nations in the proportion of 24-year-olds who earn degrees in natural science or engineering. A 2005 study by the Government Accountability Office found that 207 distinct federal STEM education programs were appropriated nearly $3 billion in FY2004. Nearly three-quarters of those funds and nearly half of the STEM programs were in two agencies: The National Institutes of Health and the National Science Foundation. Still, the study concluded that these programs are highly decentralized and require better coordination. Though uncovering many fewer individual programs, a 2007 inventory compiled by the American Competitiveness Council also put the federal STEM effort at $3 billion and concurred with many of the GAO findings regarding decentralization and coordination.

#### States squander resources on private investment – makes it difficult to fund education

Berger and Fisher, President of Mass Budget and Policy Center and Professor of Physics, ‘13

(Noah and Peter, Economic Policy Institute, “A Well Educated Workforce is Key to State Prosperity, August 22, <http://www.epi.org/publication/states-education-productivity-growth-foundations/>, 7-1-17, LNM)

And as public resources are squandered on unproductive state efforts to capture private investment at the expense of other states, it becomes more difficult to fund the kind of education system innovations needed to raise U.S. educational performance up to the levels of other advanced industrial societies. Furthermore, investments in public research universities are important to enhancing the nation’s rate of innovation as basic research is spun off in new private ventures, and to maintaining or recapturing our leadership role in new technologies. Inadequate investments in education weaken the ability of a state to develop, grow, and attract businesses that offer high-skilled, high-wage jobs.

### 2AC DOE CP

#### The Department of Education sucks—uncoordinated; abused political utility; and hurts minority, economically disadvantaged, and disabled students

Meredith and Paige; general counsel to Wisconsin Education Assn. Council, assistant professor of public policy at the University of Massachusetts-Dartmouth in law and education; 2017

(Bruce and Mark; LA Times; “For better schools, abolish the politicized Department of Education and give local districts more control;” 01/09/2017; <http://www.latimes.com/opinion/op-ed/la-oe-meredith-paige-abolish-education-department-20170106-story.html>; accessed 06/29/2017; AS)

R[epublicans](http://www.latimes.com/topic/politics-government/republican-party-ORGOV0000004-topic.html) opposed the Department of Education from its beginning and regularly threaten to abolish it now, arguing that educational policy should be reserved to the states. Two respected [Democrats](http://www.latimes.com/topic/politics-government/democratic-party-ORGOV0000005-topic.html) also objected to the department’s creation almost 40 years ago. New York Sen. Daniel Moynihan warned that it would become a partisan sword. New York Rep. Shirley Chisholm worried about divorcing education from other policy areas vital to student success, such as making sure they had decent housing and enough to eat. History has proved the critics right. It’s time for the department to be dismantled. It has done some good, especially in pointing out education inequity. But more often it has served political, not educational, interests. In fact, the Department of Education was created by President Carter in part as a gift to the National Education Assn., for the union’s early support of his candidacy. Politics was the department’s original sin, and that reality has gotten only worse. Although President Reagan opposed the department’s existence, he recognized its political utility. His secretary of Education, William J. Bennett, used the influence of the office as a weapon in the culture wars by promoting “traditional” curriculums. Betsy DeVos, President-elect Trump’s choice for secretary, is likely to continue its politicization. She has a track record of advancing school vouchers and charter schools. It seems probable that she will advocate for a privatization agenda, no matter the views of local communities. This politicization of education is most clearly evident in the 2001 No Child Left Behind Act and the department’s enforcement of its provisions. This measure — a signature part of President George W. Bush’s legacy, with an assist from Sen. Edward Kennedy — required the restructuring and potentially the closing of an entire school if all its students in specific subgroups (for example, minority, economically disadvantaged, or special ed students) did not achieve proficiency on reading and math tests. It rejected the idea that poverty, students’ home lives or other factors outside the schoolhouse might contribute to low achievement. Such suggestions were just “excuses” for bad teaching. Of course, effective teachers, good reading and math skills, and periodic student assessments are important. But the No Child Left Behind Act had obvious failings. Universal proficiency was simply an impossible, utopian mandate. And it was a fiction that students’ life circumstances had no effect on their learning. Rather than admit the impossibility of proficiency for all students, the Education Department took a hard line. Secretary Rod Paige declared that his “oath of office” required him to “enforce the law.” A few months after No Child Left Behind passed, he named 8,600 schools that failed to meet the law’s requirements. Unless they improved, the department would sanction them. In the face of these threats, districts slashed budgets in nontested subjects, like art and music, and students sat for exam after exam in math and reading. The department’s approach changed only marginally under [President Obama](http://www.latimes.com/topic/politics-government/government/barack-obama-PEPLT007408-topic.html). Initially, Obama’s secretary, [Arne Duncan](http://www.latimes.com/topic/education/arne-duncan-PEPLT000007547-topic.html), continued the department’s relentless enforcement of the law’s punitive provisions. But as local educators’ complaints intensified and student achievement stalled, Duncan finally admitted in 2011 — 10 years after its passage — that No Child Left Behind was a “slow motion train-wreck” and granted waivers to states to avoid the law’s full force. However, policies such as the incentive grants in the Race to the Top program still emphasized education outcomes measured by tests, the pillar of NCLB. When Congress reauthorized No Child Left Behind in 2015, the law was renamed but the focus remained on testing. To be fair, the Department of Education didn’t initiate or write the legislation. But it did bring the full weight of the federal government against states and local school boards. No Child Left Behind erroneously presumed that Congress and the department — not local education agencies — understood how best to address schooling for high-needs learners. It’s the locals, however, who have real advantages in helping such students. School boards in towns and cities are less ideological and more pragmatic than politicians in Washington. They see students in personal and concrete terms. They have to work with classroom teachers, local administrators and community leaders as partners. Because they are less wedded to a political dogma, they respond more quickly when a policy isn’t working for kids. Washington has a role to play in education. The federal government alone is positioned to prevent “local control” from becoming a pretext for discrimination. It also must maintain funding to schools and colleges. But a separate executive branch department isn’t necessary to those functions. The essential tasks can be shifted to Health and Human Services and the Justice Department. After 40 years of top-down, politically tinged intrusion, it’s possible to imagine a more collaborative, less rigid relationship between our schools and the national government. Abolishing the Education Department is a good place to start.

### 2AC Ban DOE CP

#### Abolishing the Department of Education is a significant symbolic win for Trump—boosts credibility and large monetary gains

Holt, policy analyst with the Education Policy program at New America, 2017

(Alexander, *New America*, “How Trump Could Abolish the Department of Education,” 02/15/2017, <https://www.newamerica.org/education-policy/edcentral/how-trump-could-abolish-department-education/>, accessed 06/29/2017, AS)

By dollars, the biggest thing the department does is oversee the $1.3 trillion outstanding portfolio of federal student loans and distribute $30 billion worth of Pell grants every year. Those programs could be moved to the Department of Treasury, something a number of experts have proposed. That’s because the Department of Education, whose leaders and most of its staff have mainly been K-12 focused, don’t have a lot of interest or expertise in the financing and economics of higher education. That was proven most recently when the Government Accountability Office revealed that the department had [misestimated](https://www.newamerica.org/education-policy/edcentral/department-educations-budget-estimates-cannot-be-trusted/) the cost of a loan repayment program by tens of billions of dollar due to incompetence. And don’t forget the only number Betsy DeVos cited about federal student loans was [false](https://www.newamerica.org/education-policy/edcentral/why-does-betsy-devos-think-federal-student-loan-debt-has-grown-1000-percent/). Given that Treasury doesn’t know much about higher education, the shift could create new problems. But student loans and Pell grants have been a bad enough fit in the Department of Education that even if moving the program proved costly, many would still support it.  On the K-12 side, the two largest federal programs are Title I, allocating $16 billion for schools that serve concentrations of disadvantaged students, and IDEA, sending $13 billion dollars to help students with disabilities. These billions are dispersed and monitored according to arcane formulas that few outside the Department of Education really understand. Theoretically, they could be passed to the Department of Health and Human Services, which used to administer Title I before the Department of Education was founded. But that would create bureaucratic headaches not just for the agency, but for states just as they are adjusting to new rules from the Every Student Succeeds Act. Given that Republicans want to make Title I easier for states, it’s hard to believe they would quickly get behind this idea. However, any bill to abolish the department would give Congress an opportunity to get creative with Title I and IDEA, even if it would mean Massie might have to add a few more thousand sentences to his bill. Republicans have long wanted to either morph these programs into state block grants or make the center of the funding formula the student rather than the school. Both ideas have drawbacks: making money follow the student would replace one complicated formula with another, and block grants run the risk of being redirected to more politically powerful (and richer) school districts. One possible solution would be to turn both into HHS-administered block grants, and give the Department of Justice power to monitor patterns in school spending and take action against states if they suspect that federal funding is being diverted. The block grant approach would make it harder for the federal government to use Title I as a hammer to craft state policy, which would be a welcome development for Republicans (and states). The $5 billion in vocational education could be administered through the Department of Labor. That agency is theoretically more focused on the challenges of workforce development in the 21stcentury, and could make for a better fit for those funds than the K-12-focused Department of Education. Issues would still remain, of course. For instance, much of workforce development funding actually happens through the Pell Grant program, which would now be administered through Treasury. If that complication is a problem, Republicans could propose to move the vocational funding into the Pell Grant program, using that new money to allow students to access the program for the summer months, something that would be particularly useful for adult learners looking to gain new skills.  The Office for Civil Rights has become the most controversial part of Department of Education in the last eight years. The office monitors K-12 schools and colleges for discrimination based on sex, race, national origin, disability, and age, and the Obama administration recently expanded that to sexual and gender identity as well. The department initiates investigations into schools that, for instance, have not done enough to ensure a safe environment for these minorities and can impose financial penalties and withhold federal funding. While few would argue against this role, conservatives allege that the Obama administration has used OCR as a tool to advance a culture war agenda, for instance, mandating schools to allow students to use bathrooms that conform to their gender identity. Many advocates are now concerned that Congress and Trump could defund and [defang](https://www.newamerica.org/education-policy/edcentral/how-trump-will-try-end-political-correctness/) this office. But regardless of its ultimate fate in terms of funding, this office could be moved to the Department of Justice’s existing Civil Rights Division without significant cost or benefit. That agency enforces many of the same statutes as the one in the Department of Education. As for everything else, a handful of smaller programs (varying in size from less than a million dollars to a couple billion) could be consolidated, moved around, or eliminated. As just one example, various federal pet-projects in K-12 could be consolidated to round out the academic enrichment block grant. That’s how Trump could do it, but will it happen? Most presidents toy with the idea of consolidating parts of the federal bureaucracy, but eventually abandon the idea because the political cost is too high for agencies the president can simply ignore or marginalize. For example, President Obama’s team drew up a plan to [merge](http://www.politico.com/magazine/story/2013/11/locked-in-the-cabinet-099374?o=2) the Department of Energy, Interior, and the Environmental Protection Agency, but the idea went nowhere. Furthermore, recent changes to federal bureaucracy haven’t gone great—the Department of Homeland Security, which was created in the wake of the September 11 attacks, consistently ranks at the top of the Government Accountability’s “High Risk List” of fraud, waste, and abuse. Thus, most Republican presidents would quickly abandon the idea as a worthless political slog. And if the surprisingly contentious confirmation fight over Betsy DeVos has shown anything, it’s that Democrats can mobilize around perceived threats to public education. Given that DeVos needed Vice President Mike Pence’s tie-breaking vote to become secretary, it’s extremely unlikely Trump could get the Senate to pass the much more controversial idea to eliminate the Department of Education (which would probably require 60 votes). So it is highly unlikely that the Department of Education will go away. But that doesn’t mean Trump won’t propose it. Donald Trump is not a typical president. He places a high value on symbolism, from his businesses’ branding to the [physical traits of his cabinet picks](https://www.washingtonpost.com/politics/donald-trump-is-holding-a-government-casting-call-hes-seeking-the-look/2016/12/21/703ae8a4-c795-11e6-bf4b-2c064d32a4bf_story.html?utm_term=.96fcd5479132). For someone like Trump, a real push to eliminate the Department of Education while not actually eliminating programs could be a win-win, where he can claim to have slayed the bureaucratic beast while continuing populist policies. For a president concerned about the effect of a man’s mustache on national security policy, the symbolism of closing the Department of Education may be just the place to focus his efforts.

### 2AC Disad – cuts thumper

#### Their link is not unique – other education cuts are coming now.

Klein, Co-Founder & CEO of Go Public Schools, community organizer and political advocate, founded what is now the Oakland Public Education Fund, a non-profit organization that has helped hard-pressed schools ’17.

(Jonathan, *Go Public Schoosl*, “The President’s Budget Would Leave Vulnerable Students in Our Communities Behind,” 31 May 2017, https://gopublicschools.org/2017/05/the-presidents-budget-would-leave-vulnerable-students-in-our-communities-behind/, 30 June 2017, RV).

The President’s budget would make massive cuts to critical educational initiatives. The budget would reduce education funding by $9.2 billion, including supports for teachers, after-school programs for low-income students, and Special Olympics education programs. The local communities that we serve stand to lose millions of dollars annually.

Impact on California’s Schools

President Trump has proposed the largest cut to public education since the Reagan Administration. The proposed cuts would be a setback for students in California, which has the largest number of students living in poverty and the highest percentage of English Learners of any state. As part of his proposed budget, the President would eliminate about $400 million in grants to California schools that are currently used to enhance educator effectiveness, hire more teachers, fund after-school programs, improve school climate, and increase academic outcomes through technology. These changes would effectively end approximately 10 percent of the K-12 school funding that the state receives from the federal government. These cuts are proposed in the face of California’s rising pension costs and a worsening teacher shortage.

In addition, President Trump has proposed re-purposing a program that previously provided millions of dollars for college readiness, STEM, and teacher training programs across California to further his school voucher initiative. Recent studies have found that participation in voucher programs produced negative results for students across the United States, from Louisiana to Ohio to Washington D.C.

Impact on Local School Districts

Fresno, Oakland, and West Contra Costa Unified School Districts all receive significant funding from the Supporting Effective Instruction State Grants and 21st Century Community Learning Centers. The grants range from about $1.9 million for West Contra Costa to $9.4 million for Oakland. In addition, Alameda and Fresno Counties receive large 21st Century Community Learning Center Grants.

Every child — independent of their background — deserves equitable access to a high quality education that prepares them to succeed in school, work, and life. Today, far too many students lack access to a high quality education. The Administration’s cuts to key educational initiatives and supports further jeopardizes the future success of our students. We can and must do better for our students. Investing in the future of our children should be our nation’s top priority.

### 2AC Politics – popularity link turn

#### The public supports a strong education system

Epstein, Senior Education Policy Analyst at American Progress, ’11 [Diana, “Investing in Education Powers U.S. Competitiveness”, Center for American Progress, September 6, Accessed July 1, 17. https://www.americanprogress.org/issues/education/reports/2011/09/06/10376/investing-in-education-powers-u-s-competitiveness/, SKS]

The American people understand the critical importance of investing in education. The public has clearly expressed in nine different public opinion polls since January that it does not support cuts in education. In a January USA Today/Gallup poll, two-thirds of Americans opposed cuts in education—more than opposed cuts to any other area including Social Security, Medicare, and national defense. Similarly, when asked whether it was more important to reduce the deficit or prevent cuts in education, respondents to a January CNN poll chose to preserve education by a margin of 75 percent to 25 percent. In fact, lack of funding and financial support was cited as the biggest problem facing local schools, according to a new poll of the public’s attitudes toward public schools.

People appear to be less supportive of increasing education spending, however, if it means they would have to pay more taxes. When asked about the level of government funding for public schools in their district, about 90 percent of respondents to a 2011 Education Next poll felt that funding should either increase or stay the same. Only 28 percent, though, felt that local taxes should increase to fund their district schools while 35 percent felt that local taxes should increase to fund schools across the nation.

The American people are right to want to protect education funding. The United States suffers from persistent achievement gaps between groups of students defined by race/ ethnicity or family income. For example, on the National Assessment of Educational Progress exam, black students scored 27 points below white students in fourth-grade reading and Hispanic students scored 26 points below white students in eighth-grade mathematics. Racial/ethnic and income achievement gaps run counter to America’s commitment to an equal and just society, and lower levels of achievement are also associated with poorer health, lower earnings, and higher levels of incarceration.

Federal education programs provide more equitable resources for students who need it most—without federal support, many hard-fought gains would erode for children living in poverty.

International tests demonstrate that U.S. students have fallen behind many of their international peers. The Program for International Student Assessment, or PISA, assesses reading, math, and science literacy among 15-year-olds in the 34 member nations of the Organisation for Economic Co-operation and Development, or OECD, and 31 other countries and education systems. On the 2009 PISA exam in mathematics, the average score for U.S. students was below the OECD average, and 17 OECD countries had higher average scores than the United States. On the 2009 science exam, the U.S. average score was similar to the OECD average, and 12 OECD countries had higher average scores than the United States. The U.S. students scored at the OECD average in reading, though six other OECD countries scored higher than the United States.

To achieve desired levels of economic growth and live up to our founding ideals, the United States must increase the overall level of achievement of students in the K-12 education system and close both international achievement gaps and the persistent achievement gaps between groups of American children defined by ethnicity or family income.

### 2AC Politics – bipart link turn

#### Link turn—STEM has united Democrats and Republicans towards improved education and competitiveness

Atkinson, President of the Information Technology and Innovation Foundation, 2013

(Robert, *The Hill*, “A short and long-term solution to America’s STEM crisis,” 03/11/2013, <http://thehill.com/blogs/congress-blog/technology/287435-a-short-and-long-term-solution-to-americas-stem-crisis>, AS)

Today, jobs in STEM fields – Science, Technology, Engineering and Math, go unfilled for lack of qualified workers, even in the current economy. A key reason is American students are choosing fields other than STEM. In 2008, more than three times as many high school students took the art history advanced placement test as did the computer science test. In addition, from 2000 to 2007 non-STEM bachelor’s degrees grew 50 percent faster than STEM bachelor’s degrees. Yet, the nation’s STEM workforce has grown more than 50 percent faster than the number of STEM degree recipients.

Even more disconcerting, the Bureau of Labor Statistics states the U.S. economy is expected to add at least 1.2 million computing jobs from 2010-2020. At the current pace, U.S. universities won’t produce even half the number of U.S. computer science graduates needed to fill those positions. The gap is made up by foreign-born workers who come to the U.S., some of them getting STEM degrees and staying on with a green card, and some on H-1B visas, for those with a special skill.

But we may not be able to rely on high-skill foreign STEM talent for too much longer. Anna Lee Saxenian of the University of California, Berkeley has shown that as Taiwan’s economy and universities developed, Taiwanese STEM students getting degrees in the United States were much more likely to return home to Taiwan. As nations like India and China go through the same development process, it is likely that fewer of their top students will come to the United States for STEM degrees or employment. The Chinese government is certainly aware of this and, through its “Thousand Talents” program is making a major push to develop new research universities and to accommodate the demand for millions of new scientists and engineers by high-tech companies in China.  
  
The U.S. needs a “Thousand Talents” program of its own if we hope to keep up with our global competitors. While it’s become fashionable among some on the left to bash the H-1B program as favoring foreign workers over unemployed Americans, there is a global race for innovation advantage and the talent that drives it, and the United States is losing. The ITIF report, The Atlantic Century II, benchmarked 44 nations and regions on 16 core indicators of innovation-based capacity. When assessing the rate of improvement on these 16 indicators from 2000–2009, the United States ranked second to last, ahead of only Italy. In other words, 42 nations or regions made faster progress than the United States did in bolstering their innovation competitiveness.   
  
One of the main reasons we are losing this innovation race is due to the significant mismatch in the skills U.S. employers seek and those that many unemployed U.S. workers have to offer. To fix this, America needs a short- and long-term strategy. In the short-term we need to liberalize high-skill immigration policies, making it easier for the best and brightest STEM workers to come and stay in America. For the long-term we need to reform high school and college education to remedy the chronic shortage of STEM graduates.  
  
This is exactly the thinking behind a new bipartisan measure in the Senate, the Immigration Innovation Act of 2013, (known as “I-Squared”), which has done something few other initiatives have done in Washington: unite Democrats and Republicans to work for a common goal. Among other things, the bill creates a dedicated funding stream to help strengthen the U.S. STEM education pipeline. Businesses that hire workers on H-1B visas will pay a fee to the Promoting American Ingenuity Account, whose funds will be used to train teachers and expand the availability of STEM funding for students. The increased funding will help increase not only the number, but the diversity of workers trained in high-skill fields. Today, African-Americans and Latinos make up 28 percent of the population, but only 7 percent of the STEM workforce.   
  
America must focus on regaining the lead in the race for global innovation advantage, which will spur the U.S. economy and create millions of good jobs. One key ingredient in that quest is to expand STEM talent. The I-Squared Act is an important step in the right direction.

### 2AC Federalism, etc – Trump destroys SOP

#### Trump destroys every aspect of the separation of powers—we need to build our own wall to define the spheres of the executive, legislative, and judicial powers

Blackman, Associate Professor of law at South Texas College of Law Houston, 2016

(Josh, *National Review*, “Donald Trump’s Constitution of One,” 05/12/2016, <http://www.nationalreview.com/article/435296/donald-trumps-constitution-end-separation-powers>, accessed 07/04/2017, AMS)

On January 20, 2017, Chief Justice John Roberts will administer the oath of office to the 45th president: “I do solemnly swear that I will faithfully execute the Office of President of the United States, and will to the best of my ability, preserve, protect and defend the Constitution of the United States.” Donald Trump is utterly unqualified to keep this solemn pledge to our most fundamental law. We know this because in winning the nomination, Trump has already promised that he will knowingly break the law and violate the Constitution. Free speech? He will “open up the libel laws” to allow public officials to sue the media, and use the Federal Communications Commission to fine critics. Private property? To Trump, eminent domain is a “wonderful thing” and is not actually “taking property” because the owner can move “two blocks away.” Faithfully executing the law? His harebrained scheme to make Mexico pay for the border wall ignores the clear text of a statute and unilaterally prohibits foreign commerce. Serving as commander in chief? Trump has already pledged that he would violate international treaties and domestic law. The military “won’t refuse” his illegal orders. “Believe me,” he promised. Protecting our national security? Trump has lauded FDR’s internment of Japanese Americans, one of the darkest hours in the history of our Republic. And what about the Supreme Court? Assuming he keeps his promise to appoint conservative jurists — and that this promise is not merely a negotiating tactic — Trump’s approach would likely mirror that of George W. Bush: appoint justices who will defer to bold assertions of federal power. Judicial minimalist, thy name is John Roberts. These are the unconstitutional things Trump has told us he will do. I shudder to think of the trump cards the boardwalk emperor is holding close to his vest. For Trump, courts are merely a venue to silence critics, seize property, and evade creditors through bankruptcy protections. At every juncture, Trump uses and abuses the legal process to aggrandize his own personal power, bragging that “on four occasions I have taken advantage of the [bankruptcy] laws of the country.” Taking advantage of the laws aptly summarizes his approach to the law. Perhaps this makes him a shrewd businessman, but this ethos — and his promises to continue such egregious behavior — renders him ineligible to “preserve, protect and defend the Constitution of the United States.” Donald Trump shows absolutely no awareness of the importance of the freedom of speech — especially as a means to shine a light on dark public figures. Throughout his career, he has repeatedly turned to the law to silence dissent. In 2006, Trump filed a $5 billion libel suit against author Timothy O’Brien who wrote that he wasn’t a billionaire. In 2012 he secured a $5 million defamation judgment against a Miss USA contestant who claimed the Miss USA pageant was “rigged.” (Sound familiar?) Even when he didn’t actually follow through with litigation, Trump has often threatened to sue critics — which has the effect of chilling speech. In 2013, an online petition was organized to persuade Macy’s to drop his clothing line. His lawyers threatened the organizer of the campaign, whom Trump called a “loser,” with a $25 million lawsuit claiming the petition “far exceeds anything protected by the Constitution.” During the campaign, Ted Cruz aired a commercial including a clip from a 1999 episode of Meet the Press, where Trump said he was pro-choice. Trump’s response? His lawyers sent a cease-and-desist letter to Cruz, threatening to sue him for “intentionally disseminating libelous statements.” His attorney warned, we “will look forward to doing it.” Cruz, a former Supreme Court law clerk and advocate laughed off the suit and said, “any first year law student can tell you, in a defamation case, truth is an absolute defense.” After Cruz threatened to personally depose Trump, the threat dissipated. It’s not surprising that Trump has promised to “open up the libel laws” to allow public figures to sue newspapers. It’s not surprising that Trump has promised to “open up the libel laws” to allow public figures to sue newspapers that write “purposely negative and horrible articles about him.” Luckily, the Constitution stands as a barrier to his ability to silence critics. Fox News Sunday host Chris Wallace challenged Trump on this flatly unconstitutional standard, telling him “the Supreme Court ruled on this . . . so you’re going to have to win them [and] the Constitution.” Trump’s reply? “Well, in England, I can tell you it’s very much different and very much easier.” Trump seems entirely unaware that England lacks a First Amendment. He also seems unaware that libel laws are exclusively state laws, and the federal government would have no power to “open [them] up,” short of passing a federal seditious libel law. (The Adams administration did not have a good experience with the Alien & Sedition Act of 1798.) But more fundamentally, Trump’s response to criticism is to attempt to silence his critics. As the national strongman, he gets to determine what the grounds for debate are. But a Trump administration wouldn’t need to alter laws to chill speech. After a September 2015 debate, where Carly Fiorina rebuked Donald Trump’s misogynistic attacks, National Review’s Rich Lowry rebuked him on Fox News: “Let’s be honest: Carly cut his balls off with the precision of a surgeon — and he knows it.” Moments later, the choleric Trump tweeted “Incompetent @RichLowry lost it tonight on @FoxNews. He should not be allowed on TV and the FCC should fine him!” Instead of sending frivolous cease-and-desist letters, the Trump administration could simply fine anyone who speaks ill of his policies — which I am sure will be hailed as terrific in the polls. Or, a U.S. attorney appointed by Trump can give special attention to media entities that are critical of the government. Or, a Trump IRS can look extra closely at the tax returns of groups that are disfavored. The panoptic powers of the federal government are pervasive. Beyond libel laws, the serial-tweeter even said he would censor the Internet in the name of national security. In a speech in December, Trump urged shutting down parts of the Internet to stop ISIS — as if the Internet can be sectioned off like rooms in a casino. “We have to go see Bill Gates” and “people that really understand what’s happening,” Trump said, and “talk to them about, maybe in certain areas, closing that Internet up in some way.” What about the Constitution? In a mocking tone, Trump scorned, “Somebody will say, ‘Oh freedom of speech, freedom of speech.’ These are foolish people. We have a lot of foolish people.” Present company included. In addition to using the courts as a tool to squelch speech, the real-estate mogul has cheerfully exploited the state’s power of eminent domain to aggrandize his personal wealth. During an October 2015 debate, Trump was asked about eminent domain. His answer: “So eminent domain, when it comes to jobs, roads, the public good, I think it’s a wonderful thing, I’ll be honest with you. And remember, you’re not taking property, you know, the way you asked the question, the way other people — you’re paying a fortune for that property. Those people can move two blocks away into a much nicer house.” The very purpose of eminent domain powers is for taking a person’s private property! The Fifth Amendment expressly provides, “nor shall private property be taken for public use, without just compensation.” Further, victims of eminent-domain abuse seldom get fair-market value, let alone a “fortune.” That doesn’t even begin to compensate a property owner who values his home above market prices. And Mr. Trump has personal history with this populist abuse: He attempted to use eminent domain to take the home of an elderly widow in Atlantic City in order to construct a parking lot for one of his casinos. For Trump, ample parking for limousines contribute to the “public good.” The New Jersey court ruled against him, finding that the “primary interest served here is a private” purpose — that is, benefiting Trump — “rather than a public one and as such the actions cannot be justified under the law.” The pattern is consistent — he uses power and the courts to promote his bottom line. The Constitution imposes a duty on the president to “take care that the laws be faithfully executed.” Unfortunately, President Obama has routinely delayed, suspended, and modified the laws in violation of this fundamental principle of the separation of powers. President Trump would up the ante. On Meet the Press, Trump was asked whether he would rely on executive action in the manner of President Obama. “I won’t refuse it. I’m going to do a lot of things,” Trump replied. “I mean, [President Obama] led the way, to be honest with you,” he added. But rest assured, Trump noted, “I’m going to use [executive actions] much better and they’re going to serve a much better purpose than he’s done.” The Constitution does not vest the unitary executive with this authority for good reason. Trump’s constitutionalism would, like his hair, comb over any limitations. For a preview of how Trump will simply disregard the law when it is inconvenient, consider his signature proposal to make Mexico pay for the border wall. How would he do this? His legal team released a memo to the Washington Post detailing this audacious executive action. First, he would propose a regulation that would prohibit people in the United States without lawful presence from transferring money abroad. Second, President Trump would demand a “one time payment of $5-10 billion” from Mexico to ensure that wire payments continue to flow south of the border. Third, we build the wall. I will put aside for a moment the catastrophic implications this extortion racket would have on our diplomatic relations. More pressingly for our purposes, such a move would be flatly contrary to domestic and constitutional law. The crux of Trump’s proposal revolves around Section 236 of the Patriot Act, which requires financial institutions to verify the identity of customers who “open[] an account.” Regulations issued by the Bush administration made clear that this provision does not apply to financial institutions where customers do not open accounts, such as “wire transfer” services. This is a sensible reading of the statute. In his legal memo, Trump announced the he would ignore the clear text of the statute, and apply the provision to “money transfer companies, like Western Union.” Even though these institutions do not require a person to open an account, which is what the statute requires. Like President Obama before him, a President Trump would simply ignore statutes that get in the way of his terrific goals. Further, the statute makes absolutely no reference to excluding foreigners from U.S. financial institutions, unless they are on a “suspected terrorist” watch list. Under the Bush administration’s regulations, an alien only needs to provide a foreign “passport number and country of issuance.” Trump would change that too. Now, an alien who wants to send money abroad must “provide[] a document establishing his lawful presence in the United States.” This executive action would not be limited to aliens sending money to Mexico, but would also prohibit investments by foreigners where funds are transferred abroad. As a result, foreign nationals will no longer be able to open accounts and invest in American banks. There is absolutely nothing in the tenor of the act — passed in the wake of 9/11 — that would remotely suggest that the president has the authority to limit investments with financial institutions to U.S. persons. Billions of dollars already in American bank accounts held by foreign nationals could no longer be withdrawn. The money will effectively be seized, and impounded within our borders by the federal government, without any due process of law or statutory authority. More foundationally, Congress’s power over the regulation of foreign commerce would be ignored. The most troubling aspect of this harebrained scheme — an apt phrase for anything from the mind of Donald J. Trump — is that his lawyers have already blessed this proposal. No doubt a Trump Justice Department would be staffed with attorneys who would continue the trend of rubber-stamping implausible assertions of power. This is the sort of illegal executive action that President Obama has made routine, with respect to the implementation of Obamacare. President Trump would continue down this dangerous path. Under Article II of the Constitution, the civilian president is also the “Commander in Chief” of the armed forces. This is a solemn duty that Trump has already shown a complete lack of regard for. During a debate, he announced that in the fight against ISIS, the military would kill not only the terrorists, but also “take out their families.” However, as Senator Rand Paul (R., Ky.) pointed out, “if you are going to kill the families of terrorists, realize that there’s something called the Geneva Convention we’re going to have to pull out of. It would defy every norm that is America.” He’s right. Common Article 3 of the Geneva Conventions — which the United States Senate ratified, and is part of our “supreme law of the land” — mandates that people who are taking no active part in the hostilities “shall in all circumstances be treated humanely.” That means you can’t kill innocent family members. Perhaps Trump’s handlers didn’t coach him on this in advance — although frankly, it shocks the conscience that a presidential candidate could even propose this. But even more importantly, the military could not, and would not comply with such illegal bloodshed. CIA Director Michael Hayden stated that if President Trump “were to order that once in government, the American armed forces would refuse to act.” Hayden added that he “would be incredibly concerned if a President Trump governed in a way that was consistent with the way that candidate Trump expressed during the campaign.” In a debate following Hayden’s comments, Trump was asked what he would do if the military disobeyed his illegal orders. His reply: “They won’t refuse. They’re not gonna refuse me. Believe me.” Moderator Brett Baier shot back, “but they’re illegal [orders].” Trump brushed off the criticism: “I’m a leader, I’ve always been a leader. I’ve never had any problem leading people. If I say do it, they’re going to do it.” This is Trump’s modus operandi. The law is always subordinate to his leadership, and he will do whatever it takes to achieve his terrific goals. The next day — after his handlers no doubt got to him — Trump issued a statement purporting to walk back his outrageous remarks: “[I would] use every legal power that I have to stop these terrorist enemies,” he said. “I do, however, understand that the United States is bound by laws and treaties and I will not order our military or other officials to violate those laws and will seek their advice on such matters. I will not order a military officer to disobey the law. It is clear that as president I will be bound by laws just like all Americans and I will meet those responsibilities.” This statement is not reassuring. As George Mason University law professor Ilya Somin pointed out, “that is not the same thing as saying he will refrain from ordering the military to target civilians.” He only said he would obey the law. Trump did not state that ordering the execution of innocent family members would be illegal. But as president, he would have expansive authority to decide how the law and the Constitution ought to be interpreted. Compare President Bush’s interpretation of his Article II war powers with President Obama’s interpretation of his discretion to enforce immigration laws. “The really important question,” Professor Somin asks, “is what [Trump] think[s] the law is and how much it constrains presidential power.” The answer is: not much. One of the strongest rejoinders to the #NeverTrump movement is that a President Hillary Clinton could appoint four Supreme Court justices, and radically alter the High Court for a generation. At a minimum, Trump supporters counter, the presumptive Republican nominee can be trusted to nominate the right kind of justice. Don’t be so sure. For such a frequent litigant, Trump has a striking ignorance of how courts work. During an interview on ABC’s Good Morning America, he was asked what kind of justice he would appoint to the High Court. “Well, I’d probably appoint people that would look very seriously at [Hillary Clinton’s] e-mail disaster because it’s a criminal activity, and I would appoint people that would look very seriously at that to start off with.” Trump’s muddled answer makes it difficult to understand exactly what he is getting at. However, in no sense should a justice-to-be care, at all, about Secretary Clinton’s e-mail situation. Monumental issues of constitutional law hang in the balance with these appointments. Further, it is unclear if Trump even understands what courts do. During a February debate, Senator Cruz criticized Trump for suggesting he would nominate his sister to the Supreme Court, Judge Maryanne Trump Barry, who wrote a decision supporting partial-birth abortion. The real-estate tycoon displayed a stunning ignorance of the judicial function when he said Cruz was “criticizing my sister for signing a certain bill.” Huh? Judges don’t sign bills. They write opinions. Trump continued: “You know who else signed that bill? Justice Samuel Alito, a very conservative member of the Supreme Court, with my sister, signed that bill.” Again, Alito did not “sign the bill,” nor did he agree with Judge Trump Barry’s opinion. Alito’s opinion concurring in judgment stated in the very first sentence, “I do not join Judge Barry’s opinion, which was never necessary and is now obsolete.” Trump doesn’t even seem to understand how justices decide issues of constitutional law. Fox News host Bill O’Reilly asked Trump if he would appoint a justice who would overturn Roe v. Wade. Trump replied, “I will appoint judges that will be pro-life.” He can’t even impose the correct litmus test. (Litmus tests are entirely inappropriate because they would force a justice to recuse himself after prejudging questions of law.) The question is not whether a justice, in his or her personal views is “pro-life.” The question is whether they view the 14th Amendment’s Due Process Clause as including a substantive right to abortion. It is entirely irrelevant what a nominee thinks about abortion. In 2012, Justice Scalia offered an answer that should give Trump some guidance: “The Constitution, in fact, says nothing at all about [abortions]. It is left to democratic choice. Now, regardless of what my views as a Catholic are, the Constitution says nothing about it.” It is not enough for Trump to promise to appoint justices in the mold of Scalia or Thomas — he must understand what that actually means. During the primary process, Trump has shown signs that perhaps he will seek some outside advice for his Supreme Court nominations. In an interview with the Washington Post, Trump said “I’m getting names. The Federalist people. Some very good people. The Heritage Foundation.” (Trump was referring to the Federalist Society for Law & Public Policy.) During a debate in February — hours after Justice Scalia passed away — Trump announced that he would nominate someone like Diane Sykes of the Seventh Circuit Court of Appeals or Bill Pryor of the Eleventh Circuit Court of Appeals. (These are both judges whom I deeply respect, and think would make excellent Supreme Court justices.) Two months later, he promised to “announce [who] these judges” are that he would consider. “I’m going to guarantee it. I’m going to tell people,” Trump said. “Because people are worried that, oh, maybe he’ll put the wrong judge in.” With the nomination now secured, the clock is already ticking for him to fulfill his promise and announce this list. I have no doubt that my colleagues at the Federalist Society and Heritage Foundation will make excellent recommendations to a Trump administration, including individuals like Judges Sykes and Pryor. However, I harbor serious doubts whether Trump will follow through. For example, within days of locking up the Republican nomination, Trump announced that his positions on income-tax rates for the wealthy, business taxes, and the minimum wage were evolving. On Meet the Press, he explained that whatever proposal he puts in his plan now “really is a floor,” but then he will “negotiate with senators and congressmen.” His campaign plans are only “where we’re starting.” If Trump can so easily buck conservative orthodoxy by floating raising taxes and increasing the minimum wage, why wouldn’t he do the same for the courts? Moreover, experience has taught us that, ultimately, it is the president’s decision who to nominate. President Ronald Reagan was burned after the failed nominations of Robert Bork and Douglas Ginsburg, so he fell back on the “Sacramento Republican,” Anthony Kennedy. President George H. W. Bush didn’t want to wage a massive confirmation battle, so he nominated “stealth” candidate David Souter to replace Justice Brennan. For President George W. Bush’s second selection, against all conventional wisdom and advice from outside groups, Bush selected his White House counsel Harriet Miers. Fortunately, after a massive backlash from the sorts of people Bush should have listened to in the first place, Miers withdrew, and Judge Alito was appointed in her stead. (Perhaps Bush liked the fact that Alito signed Judge Trump Barry’s bill.) Simply stated, no matter what advisers say, the president does what he wants for Supreme Court nominations. But the risk is much higher for a Trump presidency. A candidate who views the law as a means to an end, and has no grounding of constitutional limits, will be an absolute disaster when it comes time to picking a nominee. One can even imagine Trump striking a deal with Senate Democrats: swap a liberal Supreme Court justice for building a border wall. What a terrific deal! (In any event, the construction of the wall will be held up for years with waves of challenges based on environmental-impact statements and eminent-domain proceedings.) Or maybe Trump will appoint one his cronies to the Court, like Lyndon Johnson did with Abe Fortas. More troublingly, to the extent that President Trump continues President Obama’s abuse of executive action, the sort of justice a President Trump will look for is a deferential jurist who will uphold his constitutional violations. For all of Trump’s ridicule of Chief Justice Roberts for upholding Obamacare, the unpresidential nominee would likely want to appoint a justice to uphold his agenda, and look away from all manners of his demagoguery. President George W. Bush was committed to “judicial minimalism,” and appointed a justice who would defer to government, and be supportive of his war on terror: John Roberts. In the last sentence of NFIB v. Sebelius, which rewrote the Affordable Care Act’s insurance mandate as a tax, Chief Justice Roberts explained that “the Court does not express any opinion on the wisdom of the Affordable Care Act. Under the Constitution, that judgment is reserved to the people.” We may as well print that slogan on a red baseball cap. The glue that holds our Republic together is the separation of powers — something the presumptive Republican nominee seems utterly unconcerned with. Perhaps I can illustrate the separation of powers with an image even Mr. Trump will understand: a wall. The separation of powers exist between the three branches to block one faction from abusing and exploiting the other. In the timeless words of James Madison in Federalist No. 10, “ambition must be made to counteract ambition. In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself.” After eight years of an Obama presidency, there are no longer walls between our branches. Perhaps, there are what Mr. Trump would call small fences, or what Mr. Madison would call “parchment barriers.” The problem with these fences, as Mr. Trump has observed, is that ambitious people will trample over them. In such a regime, our most fundamental freedoms are in jeopardy. However, under Donald Trump’s constitution of one, there would be no wall. There would simply be a Boardwalk Emperor, unconstrained by the rule of law, who will do something terrific. Sad. Instead of building a Mexican wall, we need to rebuild the Madison Wall, and reassert the defined spheres of the executive, legislative, and judicial powers. It is only a Republic, if we can keep it.

#### Trump doesn’t even know what the separation of powers is and destroys any idea of checks and balances—the plan is key to build court power

Liptak, covers United States Supreme Court and studied in law at Yale Law School, 2016

(Adam, *The new York Times*, “Donald Trump Could Threaten U.S. Rule of Law, Scholars Say,” 06/03/2016, <https://www.nytimes.com/2016/06/04/us/politics/donald-trump-constitution-power.html?mcubz=1>, accessed 07/04/2017, AMS)

WASHINGTON — Donald J. Trump’s blustery attacks on the press, complaints about the judicial system and bold claims of presidential power collectively sketch out a constitutional worldview that shows contempt for the First Amendment, the separation of powers and the rule of law, legal experts across the political spectrum say.

Even as much of the Republican political establishment lines up behind its presumptive nominee, many conservative and libertarian legal scholars warn that electing Mr. Trump is a recipe for a constitutional crisis.

“Who knows what Donald Trump with a pen and phone would do?” asked [Ilya Shapiro](http://www.cato.org/people/ilya-shapiro), a lawyer with the libertarian Cato Institute.

With five months to go before Election Day, Mr. Trump has already said he would “loosen” libel laws to make it easier to sue news organizations. He has threatened to sic federal regulators on his critics. [He has encouraged rough treatment of demonstrators.](http://www.nytimes.com/2016/03/13/us/politics/donald-trumps-heated-words-were-destined-to-stir-violence-opponents-say.html)

His [proposal to bar Muslims from entry into the country](http://www.nytimes.com/politics/first-draft/2015/12/07/donald-trump-calls-for-banning-muslims-from-entering-u-s/?version=meter+at+0&module=meter-Links&pgtype=Blogs&contentId=&mediaId=&referrer=https%3A%2F%2Fwww.google.com%2F&priority=true&action=click&contentCollection=meter-links-click) tests the Constitution’s guarantees of religious freedom, due process and equal protection.

And, in what was a tipping point for some, [he attacked Judge Gonzalo P. Curiel of the Federal District Court in San Diego](http://www.nytimes.com/2016/05/31/us/judge-orders-documents-unsealed-in-trump-university-lawsuit.html), who is overseeing two class actions against Trump University.

Mr. Trump accused the judge of bias, falsely said he was Mexican and seemed to issue a threat.

“They ought to look into Judge Curiel, because what Judge Curiel is doing is a total disgrace,” Mr. Trump said. “O.K.? But we will come back in November. Wouldn’t that be wild if I am president and come back and do a civil case?”

[David Post](https://www.washingtonpost.com/people/david-post), a retired law professor who now writes for [the Volokh Conspiracy](https://www.washingtonpost.com/news/volokh-conspiracy/wp/2016/05/29/on-donald-trump-and-the-rule-of-law/), a conservative-leaning law blog, said those comments had crossed a line.

“This is how authoritarianism starts, with a president who does not respect the judiciary,” Mr. Post said. “You can criticize the judicial system, you can criticize individual cases, you can criticize individual judges. But the president has to be clear that the law is the law and that he enforces the law. That is his constitutional obligation.”

“If he is signaling that that is not his position, that’s a very serious constitutional problem,” Mr. Post said.

Beyond the attack on judicial independence is a broader question of Mr. Trump’s commitment to the separation of powers and to the principles of federalism enshrined in the Constitution. [Randy E. Barnett](http://www.nytimes.com/2012/03/27/us/randy-barnetts-pet-cause-end-of-health-law-hits-supreme-court.html?_r=0), a law professor at Georgetown and an architect of [the first major challenge to President Obama’s health care law](http://www.nytimes.com/2012/06/29/us/supreme-court-lets-health-law-largely-stand.html), said he had grave doubts on both fronts.

“You would like a president with some idea about constitutional limits on presidential powers, on congressional powers, on federal powers,” Professor Barnett said, “and I doubt he has any awareness of such limits.”

Republican leaders say they are confident that Mr. Trump would respect the rule of law if elected. “He’ll have a White House counsel,” Senator Mitch McConnell of Kentucky, the majority leader, told Hugh Hewitt, the radio host, on Monday. “There will be others who point out there’s certain things you can do and you can’t do.”

Senator John McCain, Republican of Arizona, who has become a reluctant supporter of Mr. Trump, said he did not believe that the nation would be in danger under his presidency.

“I still believe we have the institutions of government that would restrain someone who seeks to exceed their constitutional obligations,” Mr. McCain said. “We have a Congress. We have the Supreme Court. We’re not Romania.”

“Our institutions, including the press, are still strong enough to prevent” unconstitutional acts, he said.

Mr. Post said that view was too sanguine, given the executive branch’s practical primacy. “The president has all the power with respect to enforcing the law,” he said. “There’s only one of those three branches that actually has the guns in its hands, and that’s the executive.”

Republican officials have criticized Mr. Obama for what they have called his unconstitutional expansion of executive power. But some legal scholars who share that view say the problem under a President Trump would be worse.

“I don’t think he cares about separation of powers at all,” said [Richard Epstein](http://www.hoover.org/profiles/richard-epstein), a fellow at the Hoover Institution who also teaches at New York University and the University of Chicago.

President George W. Bush “often went beyond what he should have done,” Professor Epstein said. “I think Obama’s been much worse on that issue pretty consistently, and his underlings have been even more so. But I think Trump doesn’t even think there’s an issue to worry about. He just simply says whatever I want to do I will do.”

Mr. Trump has boasted that he will use Mr. Obama’s actions as precedent for his own expansive assertions of executive power.

“He’s led the way, to be honest with you,” he said in January on “[Meet the Press](http://www.nbcnews.com/meet-the-press/meet-press-january-10-2016-n493596),” referring to [Mr. Obama’s program to spare millions of immigrants in the country unlawfully from deportation](http://www.nytimes.com/2014/11/20/us/politics/obamacare-unlikely-for-undocumented-immigrants.html). “But I’m going to use them much better, and they’re going to serve a much better purpose than what he’s done.”

But Mr. Post said there was a difference between Mr. Obama’s view of executive power and that of Mr. Trump. “Whatever you think of Obama’s position on immigration, he is willing to submit to the courts,” he said. “There is no suggestion that he will disobey if the courts rule against him.”

Several law professors said they were less sure about Mr. Trump, citing the actions of another populist, President Andrew Jackson, who refused to enforce [an 1832 Supreme Court decision](https://www.law.cornell.edu/supremecourt/text/31/515) arising from a clash between Georgia and the Cherokee Nation.

“I can easily see a situation in which he would take the Andrew Jackson line,” Professor Epstein said, referring to a probably apocryphal comment attributed to Jackson about Chief Justice John Marshall: “John Marshall has made his decision; now let him enforce it.”

There are other precedents, said John C. Yoo, a law professor at the University of California, Berkeley, who took an expansive view of executive power as a lawyer in the Bush administration. “The only two other presidents I can think of who were so hostile to judges on an individual level and to the judiciary as a whole would be Thomas Jefferson and Franklin Roosevelt,” he said.

Both of those presidents chafed at what they saw as excessive judicial power. “But they weren’t doing it because they had cases before those judges as individuals,” Professor Yoo said. “They had legitimate separation-of-powers fights between the presidency and the judiciary. Trump is lashing out because he has a lawsuit in a private capacity, which is much more disturbing.”

Other legal scholars said they were worried about Mr. Trump’s commitment to the First Amendment. He has [taken particular aim at The Washington Post and its owner, Jeff Bezos](http://money.cnn.com/2016/05/13/technology/donald-trump-jeff-bezos-amazon/), the founder of Amazon.

“He owns Amazon,” Mr. Trump said in February. “He wants political influence so Amazon will benefit from it. That’s not right. And believe me, if I become president, oh do they have problems. They’re going to have such problems.”

More generally, Mr. Trump has discussed revising libel laws to make it easier to sue over critical coverage.

“I’m going to open up our libel laws so when they write purposely negative and horrible and false articles, we can sue them and win lots of money,” Mr. Trump [said in February](http://www.politico.com/blogs/on-media/2016/02/donald-trump-libel-laws-219866). “We’re going to open up those libel laws. So when The New York Times writes a hit piece which is a total disgrace or when The Washington Post, which is there for other reasons, writes a hit piece, we can sue them and win money instead of having no chance of winning because they’re totally protected.”

On one hand, Mr. Trump seemed to misunderstand the scope of presidential power. Libel is a state-law tort constrained by First Amendment principles, and a president’s views do not figure in its application.

On the other hand, said [Ilya Somin](http://faculty.law.gmu.edu/isomin/), a law professor at George Mason University, Mr. Trump’s comments betrayed a troubling disregard for free expression.

“There are very few serious constitutional thinkers who believe public figures should be able to use libel as indiscriminately as Trump seems to think they should,” Professor Somin said. “He poses a serious threat to the press and the First Amendment.”

# \* \* STEM NEG \* \*

## AFF UQ Q’s

### No STEM crisis

#### Talent shortage is to blame – AFF can’t solve, it’s not about skills or education

Hickey, Business Insider, ‘13

(Walter, Business Insider, “Americans Won’t Like Hearing The Real Reason That Silicon Valley Is Pushing So Hard For Immigration Reform,” June 1, <http://www.businessinsider.com/the-real-truth-about-the-stem-shortage-that-americans-dont-want-to-hear-2013-5> , 7-1-17, LNM)

Is there a shortage of talented workers in the fields of science, technology, engineering, and math (STEM) in America?

It's one of the most fundamental questions of the immigration reform debate.

The tech industry has made their feelings widely known. [Interest groups](http://www.renewoureconomy.org/sites/all/themes/pnae/not-coming-to-america.pdf) for the technology industry — as well [as some companies individually](http://www.microsoft.com/en-us/news/download/presskits/citizenship/MSNTS.pdf) — say we need way more STEM majors in America [to meet their needs](http://www.fwd.us/immigration_reform).

They argue that in order to meet these needs, since there aren't enough American STEM majors, they have to look elsewhere and recruit foreign-born talent to fulfill their demand for STEM-trained workers.

But the thing is, there isn't really a STEM shortage. There are plenty of graduates of technical fields in the U.S.

There is a different kind of shortage, but the American people won't like to admit it.

What there is, is a shortage of ultra-elite American-born talent, and Silicon Valley wants to hire the very best in the world. The view from Silicon Valley is that a lot of the U.S. talent, while bountiful in number, just doesn't stack up.

But Silicon Valley doesn't want to just come out and say this, since it will sound offensive to a lot of American-born grads. So Silicon Valley argues that there's a general STEM shortage.

The STEM Shortage Is A Myth.

#### The STEM crisis is a myth, creating a perception of missing students that escalates to job bust

Charette, member of the IEE and international authority on information technology and systems risk management, 2013

(Robert, IEEE Spectrum, “The STEM Crisis Is a Myth,” (08/30/2013, <http://spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth>, accessed 06/30/2017, AS)

In preparing this article, I went through hundreds of reports, articles, and white papers from the past six decades. There were plenty of data, but there was also an extraordinary amount of inconsistency. Who exactly is a STEM worker: somebody with a bachelor’s degree or higher in a STEM discipline? Somebody whose job requires use of a STEM subject? What about someone who manages STEM workers? And which disciplines and industries fall under the STEM umbrella?

Such definitions obviously affect the counts. For example, in the United States, both the National Science Foundation (NSF) and the Department of Commerce track the number of STEM jobs, but using different metrics. According to Commerce, [7.6 million individuals worked in STEM jobs in 2010](http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinalyjuly14_1.pdf), or about 5.5 percent of the U.S. workforce. That number includes professional and technical support occupations in the fields of computer science and mathematics, engineering, and life and physical sciences as well as management. The [NSF, by contrast, counts 12.4 million](http://www.nsf.gov/statistics/infbrief/nsf13311/) science and engineering jobs in the United States, including a number of areas that the Commerce Department excludes, such as health-care workers (4.3 million) and psychologists and social scientists (518 000).

Such inconsistencies don’t just create confusion for numbers junkies like me; they also make rational policy discussions difficult. Depending on your point of view, you can easily cherry-pick data to bolster your argument.

Another surprise was the apparent mismatch between earning a STEM degree and having a STEM job. Of the 7.6 million STEM workers counted by the Commerce Department, only 3.3 million possess STEM degrees. Viewed another way, about 15 million U.S. residents hold at least a bachelor’s degree in a STEM discipline, but three-fourths of them—11.4 million—work outside of STEM.

The departure of STEM graduates to other fields starts early. In 2008, the NSF surveyed STEM graduates who’d earned bachelor’s and master’s degrees in 2006 and 2007. It found that [2 out of 10 were already working in non-STEM fields](http://www.nsf.gov/statistics/nsf12328/content.cfm?pub_id=4169&id=2). And 10 years after receiving a STEM degree, [58 percent of STEM graduates had left the field](http://www9.georgetown.edu/grad/gppi/hpi/cew/pdfs/stem-complete.pdf), according to a 2011 study from Georgetown University.

The takeaway? At least in the United States, you don’t need a STEM degree to get a STEM job, and if you do get a degree, you won’t necessarily work in that field after you graduate. If there is in fact a STEM worker shortage, wouldn’t you expect more people with STEM degrees to be filling those jobs? And if many STEM jobs can be filled by people who don’t have STEM degrees, then why the big push to get more students to pursue STEM?

Now consider the projections that suggest a STEM worker shortfall. One of the most cited in recent U.S. debates comes from the 2011 Georgetown University report mentioned above, by Anthony P. Carnevale, Nicole Smith, and Michelle Melton of the [Center on Education and the Workforce](http://cew.georgetown.edu/). It estimated there will be slightly more than 2.4 million STEM job openings in the United States between 2008 and 2018, with 1.1 million newly created jobs and the rest to replace workers who retire or move to non-STEM fields; they conclude that there will be roughly 277 000 STEM vacancies per year.

But the Georgetown study did not fully account for the Great Recession. It projected a downturn in 2009 but then a steady increase in jobs beginning in 2010 and a return to normal by the year 2018. In fact, though, [more than 370 000 science and engineering jobs in the United States were lost in 2011](http://www.usnews.com/debate-club/should-h-b-visas-be-easier-to-get/h-1b-visas-a-symptom-of-special-interest-influence-in-dc), according to the Bureau of Labor Statistics.

I don’t mean to single out this study for criticism; it just illustrates the difficulty of accurately predicting STEM demand and supply even a year or two out, let alone over a prolonged period. Highly competitive science- and technology-driven industries are volatile, where radical restructurings and [boom-and-bust cycles have been the norm](http://www.todaysengineer.org/2003/Aug/Unemployment.pdf) for decades. Many STEM jobs today are also [targets for outsourcing](http://www.fas.org/sgp/crs/misc/RL32292.pdf) or [replacement by automation](http://www.npr.org/2011/11/03/141949820/how-technology-is-eliminating-higher-skill-jobs).

The nature of STEM work has also changed dramatically in the past several decades. In engineering, for instance, your job is no longer linked to a company but to a funded project. Long-term employment with a single company has been replaced by a series of de facto temporary positions that can quickly end when a project ends or the market shifts. To be sure, engineers in the 1950s were sometimes laid off during recessions, but they expected to be hired back when the economy picked up. That rarely happens today. And unlike in decades past, [employers seldom offer generous education and training](http://usatoday30.usatoday.com/money/workplace/story/2012-08-09/job-training/56922438/1) benefits to engineers to keep them current, so out-of-work engineers find they quickly become technologically obsolete.

Any of these factors can affect both short-term and longer-term demand for STEM workers, as well as for the particular skills those workers will need. The agencies that track science and engineering employment know this to be true. Buried in Chapter 3 of a [2012 NSF workforce study](http://www.nsf.gov/statistics/seind12/c3/c3s.htm), for instance, you’ll find this caveat: “Projections of employment growth are plagued by uncertain assumptions and are notoriously difficult to make.”

So is there a shortfall of STEM workers or isn’t there?

The Georgetown study estimates that nearly [two-thirds of the STEM job openings](http://www9.georgetown.edu/grad/gppi/hpi/cew/pdfs/stem-execsum.pdf) in the United States, or about 180 000 jobs per year, will require bachelor’s degrees. Now, if you apply the Commerce Department’s definition of STEM to the [NSF’s annual count of science and engineering bachelor’s degrees](file:///\\localhost\ttp\::www.nsf.gov:statistics:seind12:appendix.htm), that means about 252 000 STEM graduates emerged in 2009. So even if all the STEM openings were entry-level positions and even if only new STEM bachelor’s holders could compete for them, that still leaves 70 000 graduates unable to get a job in their chosen field.

Of course, the pool of U.S. STEM workers is much bigger than that: It includes new STEM master’s and Ph.D. graduates (in 2009, [around 80 000 and 25 000, respectively)](http://www.nsf.gov/statistics/seind12/append/c2/at02-01.pdf), STEM associate degree graduates (about 40 000), H-1B visa holders ([more than 50 000](http://www.nsf.gov/statistics/indicators/appendix)), other immigrants and visa holders with STEM degrees, technical certificate holders, and non-STEM degree recipients looking to find STEM-related work. And then there’s the vast number of STEM degree holders who graduated in previous years or decades.

Even in the computer and IT industry, the sector that employs the most STEM workers and is expected to grow the most over the next 5 to 10 years, not everyone who wants a job can find one. A recent [study by the Economic Policy Institute](http://www.epi.org/publication/bp359-guestworkers-high-skill-labor-market-analysis/) (EPI), a liberal-leaning think tank in Washington, D.C., found that more than a third of recent computer science graduates aren’t working in their chosen major; of that group, almost a third say the reason is that there are no jobs available.

Spot shortages for certain STEM specialists do crop up. For instance, the recent explosion in data analytics has sparked demand for [data scientists](http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation) in health care and retail. But the H-1B visa and similar immigrant hiring programs are meant to address such shortages. The problem is that students who are contemplating what field to specialize in can’t assume such shortages will still exist by the time they emerge from the educational pipeline.

What’s perhaps most perplexing about the claim of a STEM worker shortage is that many studies have directly contradicted it, including [reports from Duke University](http://www.issues.org/23.3/wadhwa.html), the [Rochester Institute of Technology](http://www.judiciary.senate.gov/pdf/04-22-13HiraTestimony.pdf), the [Alfred P. Sloan Foundation](http://rbm.nih.gov/stem/Teitelbaum.pdf), and the [Rand Corp](http://www.rand.org/content/dam/rand/pubs/monographs/2004/RAND_MG118.pdf). A 2004 Rand study, for example, stated that there was no evidence “that such shortages have existed at least since 1990, nor that they are on the horizon.”

That report argued that the best indicator of a shortfall would be a widespread rise in salaries throughout the STEM community. But the price of labor has not risen, as you would expect it to do if STEM workers were scarce. In computing and IT, wages have generally been stagnant for the past decade, according to the EPI and other analyses. And over the past 30 years, according to the Georgetown report, engineers’ and engineering technicians’ wages have grown the least of all STEM wages and also more slowly than those in non-STEM fields; while STEM workers as a group have seen wages rise 33 percent and non-STEM workers’ wages rose by 23 percent, engineering salaries grew by just 18 percent. The situation is even more grim for those who get a Ph.D. in science, math, or engineering. The Georgetown study states it succinctly: “At the highest levels of educational attainment, STEM wages are not competitive.”

Given all of the above, it is difficult to make a case that there has been, is, or will soon be a STEM labor shortage. “If there was really a STEM labor market crisis, you’d be seeing very different behaviors from companies,” notes Ron Hira, an associate professor of public policy at the Rochester Institute of Technology, in New York state. “You wouldn’t see companies cutting their retirement contributions, or hiring new workers and giving them worse benefits packages. Instead you would see signing bonuses, you’d see wage increases. You would see these companies really training their incumbent workers.”

“None of those things are observable,” Hira says. “In fact, they’re operating in the opposite way.”

So why the persistent anxiety that a STEM crisis exists? Michael S. Teitelbaum, a Wertheim Fellow at Harvard Law School and a senior advisor to the Alfred P. Sloan Foundation, has studied the phenomenon, and he says that in the United States the anxiety dates back to World War II. Ever since then it has tended to run in cycles that he calls “alarm, boom, and bust.” He says the cycle usually starts when “someone or some group sounds the alarm that there is a critical crisis of insufficient numbers of scientists, engineers, and mathematicians” and as a result the country “is in jeopardy of either a national security risk or of falling behind economically.” In the 1950s, he notes, Americans worried that the [Soviet Union was producing 95 000 scientists and engineers](http://pubs.acs.org/doi/abs/10.1021/cen-v033n015.p1522) a year while the United States was producing only about 57 000. In the 1980s, it was the perceived Japanese economic juggernaut that was the threat, and now it is China and India.

You’ll hear similar arguments made elsewhere. In India, the director general of the Defence Research and Development Organisation, Vijay Kumar Saraswat, recently noted that in his country, “[a meagre four persons out of every 1000 are choosing S&T or research](http://www.thehindu.com/news/cities/Vijayawada/india-facing-shortage-of-engineers-in-st-drdo-dg/article4356570.ece), as compared to 110 in Japan, 76 in Germany and Israel, 55 in USA, 46 in Korea and 8 in China.” Leaders in South Africa and Brazil cite similar statistics to show how they are likewise falling behind in the STEM race.

“The government responds either with money [for research] or, more recently, with visas to increase the number of STEM workers,” Teitelbaum says. “This continues for a number of years until the claims of a shortage turn out not to be true and a bust ensues.” Students who graduate during the bust, he says, are shocked to discover that “they can’t find jobs, or they find jobs but not stable ones.”

At the moment, we’re in the alarm-heading-toward-boom part of the cycle. According to a recent report from the Government Accountability Office, the U.S. government spends more than [US $3 billion each year on 209 STEM-related initiatives](http://www.gao.gov/products/GAO-13-529T) overseen by 13 federal agencies. That’s about $100 for every U.S. student beyond primary school. In addition, major corporations are collectively spending millions to support STEM educational programs. And every U.S. state, along with a host of public and private universities, high schools, middle schools, and even primary schools, has its own STEM initiatives. The result is that many people’s fortunes are now tied to the STEM crisis, real or manufactured.

Clearly, powerful forces must be at work to perpetuate the cycle. One is obvious: the bottom line. Companies would rather not pay STEM professionals high salaries with lavish benefits, offer them training on the job, or guarantee them decades of stable employment. So having an oversupply of workers, whether domestically educated or imported, is to their benefit. It gives employers a larger pool from which they can pick the “best and the brightest,” and it helps keep wages in check. No less an authority than Alan Greenspan, former chairman of the Federal Reserve, said as much when in 2007 he advocated boosting the number of skilled immigrants entering the United States so as [to “suppress” the wages of their U.S.](http://www.boston.com/business/globe/articles/2007/03/14/greenspan_let_more_skilled_immigrants_in/)counterparts, which he considered too high.

Governments also push the STEM myth because an abundance of scientists and engineers is widely viewed as an [important engine for innovation and also for national defense](http://www.whitehouse.gov/blog/2011/07/14/stem-jobs-help-america-win-future). And the perception of a STEM crisis benefits higher education, says Ron Hira, because as “taxpayers subsidize more STEM education, that works in the interest of the universities” by allowing them to expand their enrollments.

An oversupply of STEM workers may also have a beneficial effect on the economy, says Georgetown’s Nicole Smith, one of the coauthors of the 2011 STEM study. If STEM graduates can’t find traditional STEM jobs, she says, “they will end up in other sectors of the economy and be productive.”

The problem with proclaiming a STEM shortage when one doesn’t exist is that such claims can actually create a shortage down the road, Teitelbaum says. When previous STEM cycles hit their “bust” phase, up-and-coming students took note and steered clear of those fields, as happened in computer science after the dot-com bubble burst in 2001.

Emphasizing STEM at the expense of other disciplines carries other risks. Without a good grounding in the arts, literature, and history, STEM students narrow their worldview—and their career options. [In a 2011 op-ed in The Wall Street Journal, Norman Augustine](http://online.wsj.com/article/SB10001424053111904265504576568351324914730.html), former chairman and CEO of Lockheed Martin, argued that point. “In my position as CEO of a firm employing over 80 000 engineers, I can testify that most were excellent engineers,” he wrote. “But the factor that most distinguished those who advanced in the organization was the ability to think broadly and read and write clearly.”

A broader view, I and many others would argue, is that everyone needs a solid grounding in science, engineering, and math. In that sense, there is indeed a shortage—a STEM knowledge shortage. To fill that shortage, you don’t necessarily need a college or university degree in a STEM discipline, but you do need to learn those subjects, and learn them well, from childhood until you head off to college or get a job. Improving everyone’s STEM skills would clearly be good for the workforce and for people’s employment prospects, for public policy debates, and for everyday tasks like balancing checkbooks and calculating risks. And, of course, when science, math, and engineering are taught well, they engage students’ intellectual curiosity about the world and how it works.

Many children born today are likely to live to be 100 and to have not just one distinct career but two or three by the time they retire at 80. Rather than spending our scarce resources on ending a mythical STEM shortage, we should figure out how to make all children literate in the sciences, technology, and the arts to give them the best foundation to pursue a career and then transition to new ones. And instead of continuing our current global obsession with STEM shortages, industry and government should focus on creating more STEM jobs that are enduring and satisfying as well.

#### Policymakers are Incorrect about the US Lacking in STEM

Salzman, Professor of Planning and Public Policy at Rutgers, 2013 (Hall, Issues in Science and Technology, “What Shortages? The Real Evidence About the STEM Workforce,” Summer 2013, http://issues.org/29-4/what-shortages-the-real-evidence-about-the-stem-workforce/, June 29, 2017 , IL)

Despite naysayers, the nation is producing more than enough quality workers in scientific and engineering fieldsand policymakers and industry leaders should proceed accordingly. Computer science graduates in 1998 often looked to Microsoft as the hottest employer in town-and as it turned out, for good reason. Within four years of joining the company, they would be part of a team that ushered in an operating system used the world over and become millionaires along the way. By 2002, a future with the company brought a good salary (but not instant millions) and membership on a team that not only could not develop the next New Thing but couldn't match the achievements of its competitors. Middle age had crept up on Microsoft and other information technology (IT) companies just a quarter century after the dawn of the microcomputer era. Established IT companies found that they could no longer attract the young, bright, hot graduates from the top universities, who instead flocked to new startups. Feeling the panic of rapidly rising salaries during the dot-com bubble and seeing the young upstart companies lure away the best talent, the IT industry worried about where it would find its future workforce. And thus began the drumbeat of "talent shortages," supported by a cascade of reports and echoing such cries of earlier decades, but attached to the broader fears of a nation that thought it was losing its dominance in the world. Today, most policymakers and industry leaders are united in their belief that the United States faces a high-tech talent crisis. The belief has become a central theme in discussions in Congress and the Executive Branch on immigration bills (and attending policies on bringing in high-skill guest workers), on education and the causes of economic stagnation domestically, and on the nation's competitive position globally. This enduring perception of a crisis of supply might logically lead to some obvious questions. Why is the market not producing graduates in science, technology, engineering, and mathematics-the STEM fields-who would be sufficient in quantity and quality to meet demand? Why does this particular labor market fail to operate as it should? But there are better questions to ask. Why is the widely accepted view of shortage at odds with study after study that has found the U.S. science and engineering supply to be strong and improving? And why are policymakers and industry leaders offering proposals that go against this solid body of evidence? STEM market and the economy Before offering a more detailed analysis, it is worthwhile to examine two widely cited claims about shortages: the headline-grabbing statement by the former head of Apple, Steve Jobs, to President Barack Obama about an engineering shortage, and the recent claim by the presidents Jobs and Competitiveness Council that the economy needs to produce an additional 10,000 engineers each year to address a shortage and thereby spur innovation to jump-start the lackluster jobs market and economy. At a meeting in February 2011, Jobs told the president that Apple would have located 700,000 manufacturing jobs in the UnitedStates instead of China if only the company had been able to find enough U.S. engineers to support its operations. Apart from there being no indication that Apple actually tried to search for engineers, or that it actually has a problem attracting engineers, some simple math suggests that the plausibility of this claim should be reconsidered. If Apple located its manufacturing in the United States and paid the national average for electronics production worker wages, it would cost the company about $42,000 per worker per year. In China, Apples contract manufacturer, Foxconn, pays workers $4,800 per year. Thus, manufacturing in the United States would cost Apple an additional $26 billion each and every year, an amount that is slightly more than the company's reported net profit for 2011. Even if the company was willing to sacrifice its entire profit for an act of patriotism, would it have been hamstrung by an engineering shortage? Apple surely could have outbid other companies for the 8,700 industrial engineers it said it needed, or it likely could have just matched wages and attracted them because of its reputation and perceived "cool" factor. It does not appear, then, that it was an engineering shortage that led to Apple's offshoring decision. The suggestion by the president's Jobs and Competitiveness Council that the nation's economy is hampered by a shortage of engineering graduates also earns doubt. To evaluate this claim, it is only necessary to turn to another of the president's councils, the Council of Advisors on Science and Technology. According to its analysis of the engineering workforce, the nation is currently graduating about 25,000 more engineers every year than find work in that field. Moreover, it seems that some companies suffer from a surfeit of technology workers. In September 2012, Hewlett Packard announced that it planned to lay off 15,000 workers by the year's end, reaching a total of 120,000 layoffs over the past decade. Or consider General Electric's recent relocation of its 115-year-old Xx-ray headquarters from Wisconsin to Beijing, after earlier expansion of its corporate R&D labs in India and China. These companies represent the general trend, in industry after industry, of locating STEM-intensive activities offshore while shrinking their U.S. workforces. IBM, for example has reduced its U.S. workforce by 30% and now has four times more offshore than domestic employees. It is thus a rather curious proposition that companies are seeking more STEM employees at the same time that they are laying off huge numbers of STEM workers and increasing the employment of offshore STEM workers who earn a fraction of U.S. salaries. It is not clear what producing another 10,000 engineers would do, especially as fewer engineering graduates find engineering jobs and salaries are flattening for all but a few fields. These examples illustrate the quandary of trying to understand the STEM shortage debates. On one hand, the claims of shortages and of an apparent failure of the market to produce enough workers do not appear to be supported by the available evidence. On the other hand, authoritative voices on shortages and the constant repetition of the claims are proving compelling enough for policymakers. Assessing the supply of-and demand for-STEM workers requires a broader look at the context and evidence. Brief history of skill shortages At the turn of the 20th century, U.S. industrialists were faced with skill shortages. The robber barons, facing a paucity of tile makers and other highly skilled craftsmen, had to bring in European tradesmen as guest workers to construct their mansions. Henry Ford also faced a skills shortage when developing plans to produce automobiles in Michigan. Automobile production at the time depended on highly skilled craftsmen, bicycle builders for the most part, to build handcrafted and expensive vehicles. Unable to find skilled workers in the nation's interior or to attract them to the region, Ford considered how he could build a high-technology product with workers drawn from the farms, lacking craft or industrial skills. His solution-the production line-changed the face of production the world over, although its success also required national networks of technology support services provided by shade-tree mechanics who learned auto repair by tinkering with engines in their yards at home. At the turn of the current century, high-technology indus- tries were facing many of the same dilemmas and choices of the past: how to develop a skilled workforce, and how to have highly engineered products produced and supported more widely and at lower cost. For its part, the IT industry was composed of several different segments: a product market that depended on a high-skill craft production model and a large services market that was a mix of legions of programmers performing routine development and higherskilled analysts and custom systems and services developers. During the 1990s, demand increased across the IT industry, as new products were developed, PCs proliferated, and inexperienced users needed ever greater levels of support. Toward the end of the 1990s, the demand for programmers was exacerbated by the Y2K crisis, which necessitated the modification of existing software systems or the transition to new enterprise-wide software packages (or both) that required extensive customization, debugging, implementation, and support across entire organizations. Along with these challenges, the industry faced steeply increasing salaries, further exacerbated by the emergence of the dot-com bubble, which had distorted this labor market by the lure of turning its workforce into nearly instant millionaires and creating a surge in labor demand that was not sustainable over the longer term. Genuine panic spread beyond the IT industry as forecasters, caught up in the enthusiasm of the "new economy," predicted vast expansion of the IT industry and growth of an "information economy" that would require knowledge workers in numbers exceeding the size of the rest of the economy. The industry responded to the challenges in similar fashion as its forbears: It trained legions of capable, if unskilled, workers in the interior (but of India, not the United States) and imported guest workers, often by routing them through colleges that could give them the industry-relevant skills to be employable. This shift in IT resulted in moving the more routine and lower-skilled work offshore and using lowercost offshore firms to do the service work onshore. There was widespread political reaction. In the course of a single year, 2004, the legislatures in 40 states introduced a total of more than 200 bills restricting offshoring (as compared with legislation proposed in only 4 states the year before). And the presidential candidate John Kerry, in a speech to his supporters, denounced offshoring firms and promised to eliminate tax loopholes for any "Benedict Arnold company or C.E.O. who take the jobs and money overseas and sticks you with the bill." It is in this context that it is possible to understand the genesis of the talent shortage claims. Initially, firms were focused on cost as the justification for moving operations offshore, and Wall Street analysts reacted favorably to every offshoring announcement. But in the face of growing public opposition to offshoring operations and layoffs, government and industry messaging about offshoring shifted from cost savings to the need for a talent search to compensate for a lack of sufficient supply of trained workers in the UnitedStates. Notably, the National Research Council in 2005 issued a report called Rising Above the Gathering Storm, which identified a need for the country to invest more in research and innovation and to train more people to do the work. And five years later, a follow-up report by committee chair Norm Augustine likened a perceived deepening of these problems to a Category 5 storm capable of wreaking untold destruction on the nations economy. The conclusions dominated the public narrative and continue to do so to this day, giving support to a peculiar claim that workforce shortages can best be met-and perhaps only be met-by increasing the inflow of high-skill guest workers. Truth in the evidence But researchers have time and again examined such claims and failed to find much evidence to support them. Examples of such reports include Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand, published by the Urban Institute in 2007, and Will the Scientific and Technology Workforce Meet the Requirements of the Federal Government? by RAND in 2004. Studies that Lindsay Lowell and I have conducted also have found not only significant progress in STEM education and workforce development, but an ample supply of top-performing STEM graduates for what is, in fact, the small segment of industries in the economy (employing about 4 to 5% of the entire workforce) that depend on STEM workers. Reviewing the empirical research in context, focusing on three key areas, may be useful for arriving at the facts needed to truly inform policy decisions about STEM-related issues. The first area to consider is the broad notion of a supply crisis in which the United States does not produce enough STEM graduates to meet industry demand. In fact, the nation graduates more than two times as many STEM students each year as find jobs in STEMfields. For the 180,000 or so openings annually, U.S. colleges and universities supply 500,000 graduates. Accepting that STEM field definitions are overly restrictive and that in even marginally related occupations there could be a productive use of workers with STEMdegrees, these numbers still represent a 50 to 70% greater supply than demand. Engineering has the highest rate at which graduates move into STEM occupations, but even here the supply is over 50% higher than the demand. IT, the industry most vocal about its inability to find enough workers, hires only two-thirds of each year's graduating class of bachelor's degree computer scientists. By comparison, three-quarters or more of graduates in health fields are hired into related occupations (see Figure 1). But proponents of supply crisis claims push even further, arguing that STEM is a "leaking pipeline," with students fleeing science and engineering fields in college because the courses are too difficult, the students are not prepared, or the students lose interest because society somehow has not provided them the motivation of a compelling national interest similar to the Cold War, with leaders now proclaiming a need for a new "Sputnik moment." Although the argument may sound plausible, the evidence once again is not quite aligned. Today's students are taking more science and math courses (and performing better in them) than in any past generation. The extensive STEM enhancement programs funded by the National Sci- ence Foundation and other government and nongovernmental foundations and organizations appear to have raised the general level of STEM education across a wide range of disciplines (for example, half of all college STEM credit hours are taken by non-STEM majors) and significantly increased STEM studies among underrepresented minorities and women. Remarkably, the number of STEM majors, from first year through graduation, expands rather than shrinks. And among students who graduate within six years of enrollment, the number who start with a non-STEM major but graduate with a STEM degree is greater than the number who start in a STEM major and graduate with a non-STEM degree (see Figure 2). Even in the demanding field of engineering at a top school such as Stanford University, one of every nine graduates did not start as an engineering major but transferred into the program after the first year. So, yes, some students enter college thinking they want to be a scientist or engineer and then move to another major for one reason or another, but it seems that a greater number of other students find at some point in their studies that a STEM degree is more attractive. Indeed, this loose coupling of students' initial disciplinary choices and ultimate career paths might be expected, because college is often a period of exploration. The U.S. education and employment system is not designed to be tightly coupled as in other countries such as Germany, with its highly proscribed education and career tracks (beginning at age 14 and involving a national curriculum of sequenced courses and skill development for most jobs, and credentialing of jobs throughout the skill spectrum). Instead, the UnitedStates has a fluid system in which career paths can be pursued through a range of disciplines and educational experiences. Among students entering college undecided or unknowledge able about future careers, it seems that the attraction of STEM is more compelling than popularly claimed. Importantly, this may well be a strength of the U.S. system: It allows those who are not passionate about the field to exit early and those who take longer to find their calling the ability to pursue it, and to bring with them a broader educational background. Failing to find current shortages, the argument then is turned to the qualifications of "STEM-eligible" students, and specifically to the idea that U.S. students, on average, do not perform well on international tests. But evidence for this claim fails for a number of reasons. First, average scores of the students tested (mostly middle-schoolers) do not indicate the performance of the actual population that finds its way into STEM occupations. Of the students tested, about 25% will graduate with a four-year college degree; of those students, about 17% will graduate in a STEM field; and of those students, about half will enter a STEM or STEM-related field. This suggests that the performance of one very small segment-2 to 4%-of the overall student population is actually sufficient for evaluating the supply potential for the STEM labor force. Second, the performance of the upper portion of the U.S. student distribution is world-class, and this segment is larger than most of the relevant populations in the oft-touted highperforming countries, such as Singapore, South Korea, Finland, or any of the central or eastern European countries formerly part of the Soviet Union. Third, the average test scores of the countries that are of most concern as economic competitors would be dismal if a more representative sample of their students were tested, as is the case in the United States. China and India, in particular, have very large illiterate populations that would lead to devastatingly low averages. Fourth, and of special interest, there is no credible evidence that scores on these tests have any relevance for the outcomes of interest: science and engineering performance, innovation, and economic competitiveness. A quick scan of the top-performing countries on education tests makes this apparent, because the list contains Slovenia, Estonia, the Czech Republic, and many other former Soviet countries, but not Brazil, Chile, or Israel. Moreover, the rotating list of top performers over the past decade does not appear to correspond to the rotating list of economic or innovation top-performing countries. Perhaps even more telling, despite decades of supposedly low performance by U.S. students, the world has seen no credible competitors to the nations innovation regions (Silicon Valley in California, Route 128/Kendall Square in Massachusetts, Research Triangle Park in North Carolina, the biopharma corridor of New York and New Jersey). No doubt there will be innovation hubs emerging in other parts of the world in the near future. But that will not be prevented by improving the average scores of U.S. students, nor is there a reason why the United States should try to prevent the rise of other global innovation hubs or the overall improvement of other national economies. As my colleague Leonard Lynn and I have argued, we need a new global innovation strategy to achieve collaborative advantage with rising technology powers. The second area to consider is the argument that even if STEM graduates are not employed in a STEM job, there are individual and social benefits to obtaining a STEM degree. But again, the evidence is thin, at best. Analyses typically compare STEM graduate salaries with those of all graduates, or STEM occupations with all occupations. An analysis conducted by my colleague Lindsay Lowell examined the average incomes among two sets of students: one group who started college interested in STEM, got a STEMdegree, and entered a STEM field; and another group that started with similar interests but then chose another, non-STEM occupation. He found that the students not entering a STEM occupation went into fields that paid more than STEM occupations. A STEM career, then, does not seem to offer pay advantages for high-performing students. Even for STEM graduates who do not go into STEM fields, it is claimed that they will still do better economically than non-STEMgraduates. There is some truth to that, but it is not the entire story. STEM graduates make up about 17% of four-year undergraduates and about 5 to 7% of the overall workforce. It is a reasonable premise that the selectivity of STEM fields will result in a group of students with above-average academic performance. It maybe that STEM graduates are, on average, higher-performing and go into higher-paying fields than those chosen by other students. My colleague Leonard Lynn and I have additional evidence from interviews and some quantitative evidence about the purported advantages of STEM training and jobs. Our interviews with engineers, technology managers, and others in STEM fields find a broad and deep consensus that these fields are not highly attractive as careers financially or for employment stability. In the IT industry, a common view among managers and workers is that the occupation was great for their generation but the ride is now over, and they would not recommend an IT or engineering career to their sons and daughters. The threat of offshoring and an influx of guest workers are paramount in their assessment of the prospects in these fields. In life sciences, the perception is much the same, as most Ph.D. graduates will be likely to hold one or two postdoctoral positions, earning $50,000 a year for half a decade or more, and then be thrown into a poor job market in their mid-30s. These might be careers worth pursuing if one loves the work and is willing to play the job lottery, but they are not occupations attractive to those for whom the pay and conditions (relative to their other options) weigh strongly in the decision. It may not be surprising, then, that some STEM students are showing a decline in persistence to stay in the field. Among recent cohorts we have studied, there has been a significant and dramatic decline in top-performing STEM students who make the transition to STEM occupations. This is in contrast to medical fields, which maintain their allure for the best and brightest, are still highly competitive, and have not significantly increased the number of degrees awarded for the past several decades. Although there may be a social cost in restricting the supply of workers, this must be evaluated in the context of the benefits of a market that continues to attract highly qualified students. In other words, in the market for STEM graduates, there is a price/quality tradeoff. So if you are a STEM-capable student, what type of education will provide you with the best occupational options? Remarkably, there is no in-depth research addressing this question. My colleagues and I will be conducting that analysis in an upcoming project and can then provide a much more accurate assessment of the actual value-added of a STEM education (versus selection bias). But the current bottom line is that there is little compelling evidence to support efforts to herd into STEM majors any students who do not have an abiding interest in a STEM career. The third area to consider is whether the customary market forces are, as claimed, not having their usual effect on supply and demand in STEM fields. This may be the most important claim, but what is the evidence that labor markets are not responsive? Would it not be logical to expect a rather high bar of evidence of market failure before advocating government intervention to distort the market-responsive level of supply? Here again, there is substantial evidence that the STEM labor market appears to work reasonably well. In the IT industry, from the 1990s through the peak of the dot-com bubble, wages climbed steeply. So, too, did the number of computer science graduates. After the bubble burst, wages fell, followed by a decline in the number of computer science graduates. Since then, wages have stayed well below their earlier peak and now hover around wage levels of the late 1990s. If there were a talent shortage, where are the market indicators (namely wage increases) that signal students there is an opportunity to pursue a career in this industry that is better than their alternatives? Or has government policy restructured this labor market to supply seemingly endless numbers of guest workers who, coming from low-wage countries and constrained in their employment options, will understandably flock to these jobs even if wages are stagnant? With current policies that provide guest workers in numbers equal to as much two-thirds of new jobs in IT, it becomes less important for the IT industry to use the domestic market to supply its workforce. The petroleum industry also claims to be experiencing a sharp rise in its demand for petroleum engineers as new exploration increases and its current workforce starts to retire. But unlike the IT industry, petroleum companies stepped up the wages offered to new graduates by 40% over five years. As a result, the number of graduates more than doubled. These natural experiments provide strong evidence that STEM labor markets are responsive to market signals. Immigration versus guest workers A final claim is that the success of the United States as an immigrant nation speaks to the benefits of an expansive guest worker program. It is this argument that presents the greatest confusion and conflicting claims that are genuinely difficult to disentangle. Distinguishing between labor policy and immigration policy is key to analyzing why the history of benefits from immigration is unlikely to occur from the new guest worker policies in some of the legislation now being developed. Immigration policy addresses broad issues of diversity, equity, opportunity, and the long-term vibrancy of the United States. Historically, the nations essential experience (for other than Native Americans) is the immigrant story in nearly everyone's family history, intertwined with the country's success as the beneficiary of talented immigrants fleeing social, economic, and political unrest in their home countries and seeking the opportunities particular to U.S. society. Immigration from high-skill diasporas has varied from accomplished Soviet émigrés fleeing a crumbling régime to Nazi scientists who were extracted from Germany as part of Operation Paperclip to advance strategic and military advantage in the Cold War. Research on immigration identifies a range of positive (and some negative) impacts, and the numerous examples of immigrant-founded companies and illustrious achievements of immigrants across different areas, from the arts to the sciences to business, testify to the benefits of a society that welcomes them. In contrast, many policymakers are promoting much narrower policies to promote an inflow of high-skill guest workers, even proposing such actions as awarding automatic green cards to any foreign STEM graduate of a U.S. university. But guest workers targeted to a specific industry sector and filling the vast majority of openings, unlike their immigrant counterparts, are likely to have a significantly negative impact on STEM (and particularly IT) labor markets, occupations, and careers. Thus, guest worker policy is vastly different from broader immigration policy, and the contributions of immigrants are also different from the impact of a large flow of high-skill guest workers targeted to one or several industries, particularly in the absence of compelling evidence of shortages. It is, in fact, the important role of immigration to the nation-socially and economically-that may be undermined by high-skill guest worker programs. In terms of labor market impact, particularly in hightechnology industries, a further distinction arises from the difference between the permanent domestic labor force (native and immigrant, citizen and permanent resident alike) and the temporary guest worker labor force. The various cases of notable immigrants typically involve those who came to become permanent members of the nation, and they generally migrated as children and grew up as part of U.S. society. People who immigrate to the United States become part of the domestic workforce, whereas guest workers are brought in for a specific sector of the labor market. Another important distinction is the difference between the "push" and "pull" drivers of immigration. Most of the broad waves of immigration, particularly high-skill immigration, have been push-driven, with people leaving their home country because of inhospitable conditions. In contrast, guest workers are recruited, or pulled, in large numbers, often for a particular industry. They will have a different impact on the labor force, and the effects may not be as nationally advantageous as widely proclaimed. The actual use of guest workers makes this clear. For example, the guest worker programs are being driven primarily by a small industry segment that is targeting largely entry-level workers; two-thirds of current entering IT guest workers are under the age of 30 (see Figure 3) Moreover, Ron Hira, an engineer and policy analyst who focuses on these issues, has found that the companies that bring in over half of all H-1B visa holders appear to have no need for them in their permanent U.S. workforce and do not sponsor them for permanent residency. Norman Matloff, a professor of computer science who follows immigration and high-tech workforce interactions, has observed that guest workers have lower rates of innovation than their U.S. counterparts. In addition, in earlier research my colleague Radha Biswas and I found that a large portion of IT guest workers are the necessary conduit for offshoring IT work, because an offshore project requires about a third of the team to be onshore to work with the client, do requirements analysis, and liaise with the offshore team. One might argue that offshoring provides some benefit to the U.S. economy (for example, by lowering wages and thus reducing product prices), but it does not expand or strengthen the domestic STEMworkforce. In fact, it has quite the opposite effect. The only clear impact of the large IT guest worker inflows over this decade can be seen in salary levels, which have remained at their late-1990s level and which dampen incentives for domestic students to pursue STEM careers (and, ultimately, for truly talented global students to come to the United States). Guest workers provide benefits to the companies that hire them in the form of lower wages, but there is little evidence to suggest that they strengthen the nations science, engineering, or technology workforces. Moreover, it is underrepresented minorities and recent permanent immigrants who are most likely to be disadvantaged through lower-paying jobs and job loss due to newly arriving guest workers. Basing policy on evidence It seems clear, then, that broad, diverse immigration policies can strengthen the nation, while targeted, restrictive guest worker policies are more likely to undermine it. It also seems clear that because evidence supposedly informs policy, the past failures of shortage predictions should serve as further caution to policymakers who may overlook the costs of illfounded conclusions. For all the unknowns and uncertainties of labor market projections and supply/demand analyses, there is still a substantial and solid body of research and experience that should caution policymakers about being swayed by conventional wisdom offered by prominent advocates for a particular policy that may have limited or shortterm benefit and that can have deeply negative and longlasting impacts. Finally, policymakers and industry leaders may want to reconsider the notion that science and engineering development and national competitiveness are best served by such a concentrated focus on one or just a few disciplines or workforces. Rather, it may be the range of disciplines and talents that provides the United States some of its dynamism, innovativeness, and creativity. William J. Baumol, an economist who has written extensively on labor markets and technology, has argued (especially in a notable article published by the National Bureau of Economic Research in 2004) that entrepreneurs, who are disproportionately responsible for major innovations over the past century, are innovative because they have not gone through formal science and engineering education. In his view, this is because "education for mastery of scientific knowledge and methods.. .can impede heterodox thinking and imagination," and because "large-firm R&D requires personnel who are highly educated in extant information and analytic methods, while successful independent entrepreneurs and inventors often lack such preparation." In the same vein, Steve Jobs has famously said that Apple, which is among the world's most highly valued companies, represents the intersection between technology and the humanities. And before him, Edwin Land, a pioneering figure behind Polaroid and a developer of the nations first advanced aerial imaging technology, as well as a key adviser in founding NASA, pointed to the importance of "standing at the intersection of humanities and science." The achievements by these and other truly innovative individuals who often reached success through different and unexpected routes should be seen as the strength of the fluidity of the U.S. education and career system. They should also be seen as coming from a broadly focused immigration policy and investment in the domestic workforce, rather than from finding narrow substitutions for the domestic workforce.

#### US is not Lacking STEM Opportunities

Miller, Chattanooga Times-Free Press Reporter, 2011 (Mary Helen Miller, *Christian Science Monitor*, “US Losing its Technological Edge? No!,” June 7 2011, https://www.csmonitor.com/Business/2011/0607/US-losing-its-technological-edge-No!, June 26 2017, IL).

Amid some $40 billion in budget cuts in April, Congress decided to preserve a favorite – education programs for science, technology, engineering, and math. "STEM" programs, as they're called, have rare bipartisan support in a Congress worried about the United States' economic competitiveness. Business groups are pushing for more funding. President Obama has called the crisis "our generation's Sputnik moment." But what if the crisis isn't real? Political rhetoric aside, there's no lack of workers to fill technical jobs. And the pipeline of US math and science students to fill future positions has not deteriorated in terms of international competitiveness in the past 15 years. "Every time we look at these shortage claims, we can't find them," says Hal Salzman, a public policy expert at Rutgers University in New Brunswick, N.J. Nobody argues that the US couldn't do better in improving science and math education and technological competitiveness. But if the justification for pumping up STEM education is an economic one, alarmist warnings could take money away from equally deserving programs. "They're asking the government to direct a huge number of resources to increase the supply for something that's not in great demand," says Mr. Salzman. "Does that come at the expense of dealing with real problems?" That the US might be losing its technological edge has been a recurring theme since at least the Soviet launch of Sputnik 1 in 1957, which galvanized US science education. Worries reemerged in the 1980s as Japanmade inroads into traditional US industries, such as automobiles. It is again a lively topic now as China challenges US primacy. "The number of jobs out there that require a strong foundation in STEM has grown dramatically," says Claus von Zastrow, chief operating officer of Change the Equation, a STEM education advocacy group. "The fact is that if students aren't able to keep pace with these demands, we can really question whether we'll remain at the forefront of innovation." Change the Equation, a group of more than 100 chief executive officers that formed last year to focus effective philanthropy and change standardized testing of STEM subjects at the state level, is driven by worries that the US economy and national security could become compromised if education falls behind. Likewise, a 2010 revision of a 2005 National Academies Presspublication warns that the US "has increasingly placed shackles on [innovative] prowess such that, if not relieved, the nation's ability to provide financially and personally rewarding jobs for its own citizens can be expected to decline at an accelerating pace." The America COMPETES Actwas signed into law in 2007 following the initial study, though it has yet to be funded. "This is one of those storms that builds up very slowly," says Norman Augustine, retired CEO of Lockheed Martin Corp. and chairman of the committee that wrote the original study. "It's not a lightning storm or earthquake. It's more like a hurricane that gradually comes upon you." But policymakers may want to take a closer look at the numbers before they take more action. Although the US has dropped slightly in its share of the world's technical publications and cited work, "on the whole the evidence did not support that we had a shortage of STEM workers in the economy," says James Hosek, a researcher at the RAND Corp. in Santa Monica, Calif., and coauthor with RAND's Titus Galama of a 2008 study on the issue. In fact, data show that the US accounts for 40 percent of the entire world's research and development spending, and it increased that spending more than any other region between 1993 and 2003. Between 1983 and 2007, the percentage of the workforce in science and engineering occupations grew from 2.6 percent to 4.3 percent. The number of graduates in the STEM fields exceeds the number of people who end up working in those fields. Those are healthy signs for the US, since there does seem to be a correlation between the size of a country's scientific workforce and its economic growth, according to a 2000 study by three Stanford University and University of California, Irvine, professors. What's not so clear is whether US student performance is that relevant. "If you put aside the statistics and look what's going on, it's not clear to me that you can predict economic growth on how kids are doing on international standardized tests," says Francisco Ramirez of Stanford, one of the coauthors of the 2000 study. In any case, American students have mostly improved their scores in the three tests since the 1995 TIMMS (Trends in International Mathematics and Science Study). And their rankings – typically low or average – among students in about 50 countries has not changed For Mr. Hosek, the most important investments for children are in high-quality education, in general, and health. STEM programs can have an emotional appeal, but "we do want some evidence, some assurance, that these policies really are effective and not just appealing," he says.

### SQ Solves STEM – video games

#### Video games spread STEM universally and are uniquely interactive, but still have flaws that must be researched

Mayo; founder of Mayo Enterprises, LLC, a consultancy in the areas of innovation, workforce, technology, and the future of learning; 2009

(Merrilea, Science Magazine, “Video Games: A Route to Large-Scale STEM Education?” 01/02/2009, <http://science.sciencemag.org/content/sci/323/5910/79.full.pdf>, accessed 06/30/2017, AS)

In the 2000-to-2005 time frame, ~450,000 students graduated annually in the United States with a bachelor’s degree in STEM (1). These numbers pale in comparison to the reach of a single computer video game (Figs. 1 and 2). World of Warcraft (2), a fantasy game, has over 10 million current subscribers, with ~2.5 million in North America (3). Food Force (4), the U.N.-produced game on the mechanics of food aid distribution, saw 1 million players in its first 6 weeks and 4 million players in its first year (5). Additionally, in the realm of K-to-12 science and math education, the virtual world Whyville (6), with its game-based activities, now sports 4 million subscribers (90% North American), with the dominant demographic being 8- to 14-year-old girls (7, 8). Although traditional education institutions pride themselves on educating citizens, they do so at a relatively small scale compared with the media now available. Is it possible to greatly expand the reach of STEM education with the use of video games as the medium? And to what level of effectiveness? At first, the idea of using video games to teach science and engineering seems laughable. However, sophisticated video game content already exists in topics ranging from immunology (9) (Fig. 3) to numerical methods (10, 11). The examples in Table 1 suggest that video games can yield a 7 to 40% positive learning increase over a lecture program. What’s more, there may be additional benefits to poor learners: One variant of the River City ecology game (12) diminished the learning gap between D and B students to the point where nearly all students were performing at the B-student level (13). Learning outcomes are by no means uniformly positive. Results from review studies (14, 15) make it clear that there are both well-designed games and poorly designed ones. Where learning benefits appear, they are attributed to effective pedagogical practices embedded in the game design (14–17). Of course, many of these same practices can also be applied to classroom, Web, or other forms of instruction with similar benefits, an approach known as game-informed learning (18). Unlike lectures, games can be adapted to the pace of the user. Games also simultaneously present information in multiple visual and auditory modes, which capitalizes on different learning styles. J. P. Gee (16) identifies the former as the “just-in-time principle” and the latter as the “multimodal principle” in his book on video game–based learning (16), reviewed in (19). Games are also particularly adept at dosing information delivery. Complex tasks are presented first as a small core experience that is practiced multiple times before being progressively extended into a longer, more complex sequence. The superior efficiency of this approach (known as concurrent chaining) has been compared with whole-task learning in (20). Gee (16) describes this kind of task structuring through his “incremental principle,” “concentrated sample principle,” and “bottom-up basic-skills principle.” Games are also useful for reinforcing information acquisition. The rich environment of objects and activities within games gives information “situated meaning”: the other contextual elements support the information being conveyed. Social surroundings can also reinforce content. Well-constructed social interactions around societal goals within the game will drive learner engagement and achievement, as has been studied in depth by S. Barab et al. in their Quest Atlantis project (21, 22). Content is further reinforced through continuous, immediate feedback: Almost every keystroke yields a response from the game. In contrast, students in a typical classroom get to ask 0.11 questions per hour (23). And, finally, a steady stream of positive rewards accompanies a game’s rapid feedback. Players accumulate points, levels, titles, or magic swords with some visible progress for even the tiniest successes. These rewards contribute to greater self-confidence/self-efficacy. Greater self-efficacy, in turn, translates to greater persistence and thus a higher level of accomplishment (24). Learner control over navigation through tasks and activities is a surprisingly important feature of effective learning games. The metastudy by J. J. Vogel et al. (15) found learner control/ autonomy to be one of the few easily identified predictors of enhanced learning outcomes, whereas the study by R. M. Ryan et al. (25) found that it was critical to enjoyment and motivation as well. Goals in games can often be reached by multiple routes [Gee’s “multiple routes principle” (16)]. But, in these branching decision structures, the learner must navigate between choices based on a considered estimation of relative consequences. In other words, the learner must operate at the highest level in B. S. Bloom’s Taxonomy of Educational Objectives (26), “Evaluation.” The active, participatory style of learning in games also departs from the traditionally passive lecture [Gee’s “active, critical learning principle” (16)]. Game-based tasks often require the formation of hypotheses, experimentation, and discovering the consequences of actions taken; in other words, they are very similar to the inquiry-based learning lauded by science educators (27). Increasingly, game activities are multiplayer in design, meaning problems are set up to be solved in teams. Anywhere from a handful up to 40 players interact at a time via text or voice, sharing strategies in the pursuit of game goals and learning from each other as they engage in the activity. In this context, the teacher becomes a “wise guide” who participates alongside the students. Although no game-based data are available, classroom studies show that collaborative learning yields, on average, a 50% improvement over solo learning (28). Finally,with all else being equal, games invite more time on task. Teenagers commonly spend 5 to 8 hours per week playing games, and this equals or surpasses the time spent on homework each week (29). B. D. Coller’s racing car game, designed to teach numerical methods, resulted in twice the time spent by students on homework as a traditional class, with greater depth of understanding of the relations between concepts, and an overwhelming demand for the follow-up course (10, 11). In contrast to the pedagogical and motivational elements found in games, some studies suggest that the lecture format is severely wanting.E. Seymour and N.Hewitt (30) chronicle near-universal antipathy to the undergraduate lecture experience, showing that 98% who leave science and engineering majors cite “poor teaching by faculty” as a major concern and that even 86% of those who stay say the same. R. R. Hake’s metastudy (31) of 6542 students in 62 introductory physics classes demonstrated only a 17% SD in learning outcomes across lecture-based classes. In contrast, the same study showed that switching to any interactive mode of instruction (e.g., group projects, Socratic lectures, participatory demonstrations) easily improved learning outcomes in introductory physics by 108%. One could certainly argue that games are about the most interactive type of content that exists today. If video games are valid pedagogical delivery vehicles and they reach many more people than lectures, why do we not see video games adopted as the learning vehicle of choice? Cultural adoption lag exists, but we also face challenges of quantity, quality, and sustainability. Quantity It is often assumed that games with academic content are inherently uninteresting. Yet, 4 million children voluntarily play math-and-science–based exploration games on Whyville.net (7). In my opinion, most academically developed games suffer from infrastructural challenges rather than content challenges, with respect to mass adoption. Examples include the lack of any distribution mechanism for the product, the lack of product discoverability, the prohibitive expense of content creation, the dearth of meaningful assessment (and therefore of consumer confidence in the product), and the lack of sustainable business models. The first infrastructural challenge is the lack of any mechanism for distribution, sales, or marketing. Grants will not pay for these essential business functions that are required to reach audiences in the millions. Instead, academic games are often relegated to the office shelf or personal Web site of their creator as soon as the grant is over. One way around this dilemma is for a third entity—for example, a not-for-profit organization—to take on the business activities in exchange for intellectual property rights from the content creator. Regarding the challenge of discoverability, academic game producers often use the Web as their distribution mechanism. However, three-dimensional (3D) content is not discoverable by search engines, which read text and text-based tags. For someone interested in capacitors, for example, Google cannot discover a virtual 3D capacitor in the middle of a game about electronics. Therefore, a key need in the area of 3D immersive games is the institution of a standardized metadata tagging system that allows users to locate appropriate 3D content with the use of common search engines. For the visually impaired who “see” 3D content only via voiced expression of tags, this tagging system is crucial. At present, there are multiple inconsistent tagging systems in use by specialized communities, but most games embed none of these. Expense is also an important factor. User-created 2D content floods the Web. We can imagine a future in which the same is true of 3D content, and this richness of content could spur a concurrent, expanding user base of 3D games, large and small. However, the reason that 2D content is so cheap and easy to generate is the fact that almost all of it can be easily repurposed: copied, pasted, and moved from one application, document, clip-art bank, or Web site to another. In contrast, 3D content has no standard file format and thus has a limited ability to repurpose content between applications. Moving to a common file format for 3D objects—Collada and/or X3D (32, 33)—would greatly reduce graphics development costs, moving high-quality video game creation into the academic/home-user price range. Quality The ability to distinguish between a high- and lowquality product will be essential to the growth and credibility of game-based learning as a field. However, the first step in delivering quality is to be able to measure it. Assessment data are notoriously expensive to obtain, typically costing as much to develop as the original game. Few funders are willing to bear this double cost. To address this issue, the Ewing Marion Kauffman Foundation (34) has begun investigating the possibility of creating a software infrastructure to automate certain assessment tasks, thereby standardizing assessment across different games, lowering the cost of assessment per game, and making it more likely that researchers and funders will engage in assessment activities. Automated assessment is surprisingly advanced in certain areas: For example, automated essay grading is now nearly identical to human essay grading (35, 36). Games may also extend assessment into new areas. Whereas we say that we value 21st-century skills such as problem solving, teamwork, communication, and leadership, these essential traits are nowhere to be found on a modern transcript. An attractive dimension of game-based assessment is the potential to track sequences of user actions and communications, then map these onto higher-order skills and abilities. For example, in the case of problem solving, one can easily measure how often a user attempts a given problem. Attempt frequency (especially if each attempt is different) correlates highly to improved problem solving. Similarly, by monitoring users’ keystrokes while they navigate search engine results, we can distinguish between hypothesis-driven searches and random searches, another key indicator of advanced problem-solving skills. Sustainability The last major hurdle in expanding the use of gamebased learning is arriving at sustainable business models. Academic game development, which depends on living from one grant to the next, is inherently unsustainable. However, if funders could lay the foundations in an initial grant, the same learning materials could transition to profit-generating models that could be used to expand the material’s reach after small-scale academic development is completed. These models could include corporate sponsorship, dual pay (free to some, but a fee for others) or sliding-scale fee models, subscriptions, site licensing, and the sale of virtual goods (e.g., virtual clothing to be worn by the player’s in-game character, downloadable wallpapers, electronic books that give game hints). Other business models could include leader sales to countries with nationalized education systems and hence centralized buying power, partnerships with commercial game distributors, and microcredits for microknowledge (a far-future economic concept wherein a user would pay, say, $0.99 to learn the Pythagorean theorem via a small educational module, in exchange for a math mini-credit that could aggregate with other minicredits toward a degree). To my knowledge, none of these methods has yet been used to sustainably support academically developed games, with the possible exception of corporate sponsorship, which has supported the growth of academically developed but for-profit–operated Whyville. Summary Although the field is still in its embryonic stages, game-based learning has the potential to deliver science and math education to millions of users simultaneously. Unlike other mass-media experiments in education (e.g., TV, Webinars), games are a highly interactive medium with many key attributes shared with sophisticated pedagogical approaches. Large-scale adoption, however, still awaits key infrastructural developments to improve quantity (of users), quality (of product), and sustainability (of business models).

### False shortage turns the case

#### A false STEM shortage leads to mass layoffs, hiring freezes, and funding cuts

Teitelbaum, senior research associate with the labor and Worklife Program at Harvard Law School, 2014

(Michael, The Atlantic, “The Myth of the Science and Engineering Shortage,” 03/19/2017, <https://www.theatlantic.com/education/archive/2014/03/the-myth-of-the-science-and-engineering-shortage/284359/>, accessed 06/30/2017, AS)

Claims of workforce shortages in science and engineering are hardly new. Indeed there have been no fewer than five “rounds” of “alarm/boom/bust” cycles since World War II. Each lasted about 10 to 15 years, and was initiated by alarms of “shortages,” followed by policies to increase the supply of scientists and engineers. Unfortunately most were followed by painful busts—mass layoffs, hiring freezes, and funding cuts that inflicted severe damage to careers of both mature professionals and the booming numbers of emerging graduates, while also discouraging new entrants to these fields.

Round one from the decade immediately following World War II, waning a decade later.

Round two following the Sputnik launches in 1957 but waning sharply by the late 1960s, leading to a bust of serious magnitude in the 1970s.

Round three from the 1980s Reagan defense buildup, alarming Federal reports such as “A Nation at Risk” (1983), and new Federal funding for the “war on cancer.” Most of these had waned by the late 1980s, contributing to an ensuing bust in the early 1990s.

Round four from the mid-1990s, driven by concurrent booms in several high-tech industries (e.g. information technology, internet, telecommunications, biotech), followed by concurrent busts beginning around 2001.

Round five from the rapid doubling of the National Institutes of Health budget between 1998 and 2003, followed by a bust when subsequent funding flattened.

Each of these rounds was accompanied by excessive claims, and a notable lack of credible evidence. Rounds one through three were motivated by existential Cold War concerns, with advocates focused on expanding the numbers of US students pursuing higher education and careers in science and engineering. As I discovered while researching my book, during rounds four and five, after Cold War security concerns had waned, shortage claimants focused on visa policies that enabled U.S. employers and universities to recruit large numbers of temporary workers and graduate students from countries (especially China and India) that had rapid growth in science and engineering graduates but much lower income levels.

One thing we might reasonably conclude is that over the past six decades there has been no shortage of shortage claims. But what about the present and foreseeable future?

Since 2005 a series of influential reports have been produced by respected organizations and individuals, once again pointing to alarming current (or more commonly “looming”) shortages due to failing K-12 education. Three such reports were published in 2005 alone, by the [Council on Competitiveness](http://www.compete.org/images/uploads/File/PDF%20Files/NII_Innovate_America.pdf), by a special committee appointed by the [National Research Council](http://www.nap.edu/catalog.php?record_id=11463#toc), and by a group of 15 [business and technology](http://www.tapcoalition.org/resource/pdf/TAP_report2.pdf) organizations. Were these the opening salvos of the “alarm” stage of another 10-15 year cycle of alarm/boom/bust, the sixth such cycle since World War II? A deep recession with high unemployment has intervened, and in any case we would not be able to know for sure until another 5 or more years have passed.

These publications report correctly that the average performance of American K-12 students is middling in international testing. These data also show that this average performance results from large numbers of both high-performing and low-performing US students. The average national scores reflect both ends of the scale, yet there continues to be a large pool of top science and math students in the U.S. OECD data on “high-performing” students suggests that the [U.S. produces](https://www.theatlantic.com/business/archive/2013/04/youll-be-shocked-by-how-many-of-the-worlds-top-students-are-american/275423/) about 33 percent of the world total in this category in the sciences, though only about 14 percent in mathematics.

No one should conclude from this that American K-12 science and math education does not need major improvement. Emphatically to the contrary: Every high school graduate should be competent in science and mathematics—essential to success in almost any 21st century occupation and to informed citizenship as well. But there is a big disconnect between this broad educational imperative and the numerically limited scope of the science and engineering workforce.

Editorial writers in respected publications continue to assert that American student interest in these fields is low and declining. Yet according to a recent [report from ACT](http://www.act.org/stemcondition/13/), the college admissions testing service, “student interest in STEM [Science,Technology, Engineering, Mathematics] is high overall,” characteristic of some 48 percent of high school graduates tested in 2013. American high-school students are [taking more math and science](http://nces.ed.gov/programs/digest/d12/tables/dt12_179.asp) courses than ever before. Meanwhile UCLA’s respected [annual surveys](http://heri.ucla.edu/monographs/TheAmericanFreshman2013.pdf) of entering college freshmen show that over the past several years nearly 40 percent have been reporting intentions to major in a STEM subject, not only a large fraction but also a substantial increase from past decades—this percentage was about 32 to 33 percent from 1995 to 2007.

Some of these students do change their minds and complete their degrees in different fields, but others shift into science and engineering majors. As noted earlier, the outcome is that the numbers of science and engineering graduates is at least double those being hired into such occupations each year.

The evidence all points to high levels of student interest, high-performance levels among the students most likely to pursue majors and careers in science and engineering, and large numbers of graduates in these fields.

Ironically the vigorous claims of shortages concern occupations in science and engineering, yet manage to ignore or reject most of the science-based evidence on the subject. The repeated past cycles of “alarm/boom/bust” have misallocated public and private resources by periodically expanding higher education in science and engineering beyond levels for which there were attractive career opportunities. In so doing they produced large unintended costs for those talented students who devoted many years of advanced education to prepare for careers that turned out to be unattractive by the time they graduated, or who later experienced massive layoffs in mid-career with few prospects to be rehired.

Recent forecasts of looming shortages of scientists and engineers may prove to be self-fulfilling prophecies if they result in further declines in the attractiveness of science and engineering careers for talented American students.

## SOLVENCY NEG

### 1NC Solvency frontline

#### 1. The US already spends way more per student than most countries, and yet student achievement is still low. Funding is not the solution.

National Academy of Sciences, et. al, nonprofit society of distinguished scholars engaged in scientific and engineering research, 07

[Private, nonprofit society of distinguished scholars engaged in scientific and engineering research, “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future”, 4-8-2007, <https://www.nap.edu/read/11463/chapter/2#3>, accessed 7-1-2017, NW]

Some of those who provided comments to the committee questioned the ability of K–12 reform based on the existing US educational model to produce effective, long-lasting improvements in the way our children learn. The United States currently spends more per student than all but one other country (Switzerland),a but it is losing ground in educational performance. Its relatively low student achievement through high school clearly shows that the system is inefficient, and dedicating additional funding to this system is not a guarantee of success. In fact, the biggest concerns involve disparate quality among K–12 institutions and the difficulty of measuring success.

#### 2. STEM programs will never work without completely reshaping all of education

Tucker, CEO of the National Center on Education and the Economy, 2012

(Marc, <http://blogs.edweek.org>, “STEM: Why It Makes No Sense,” 06/19/2012, <http://blogs.edweek.org/edweek/top_performers/2012/06/stem_why_it_makes_no_sense.html>, accessed 6/28/2017, JME).

Of course you know what STEM stands for: Science, Technology, Engineering, and Mathematics. It's an acronym, signifying a program and a national priority. The argument for its centrality is simple. Our economy is technology-driven. The strength of that economy depends on our ability to turn out an endless bag full of technological triumphs. Our capacity to fulfill that promise in turn depends on the skills of our people in science, technology, engineering, and mathematics. But we are swiftly falling behind a growing number of other countries with respect to both the quality and quantity of people with the needed STEM skills. So, inevitably, we place a high priority on the production of more people with higher quality STEM skills. The logic is ironclad, isn't it? Or is it? Here is an interesting fact. The countries that are producing more people with higher skills in mathematics, science, engineering, technology, and science don't have STEM programs. When we do benchmarking research in those countries, we don't hear their educators talking about STEM priorities. We don't hear their industrial leaders doing that either. The term is not used. The programs don't exist. What is going on here? How come they are doing better at this when we have STEM programs and they don't? The answer is that they have education systems that work and we don't. When we start falling behind in an area, we invent a program. When they start falling behind, they ask, What's wrong with our system? And they fix it. The truth is that "programs" won't work in an arena like this. The causes of our poor performance in these disciplines run deep. Those causes implicate the inner workings of our education system. It is not possible to ring fence the STEM subjects from the system itself, nor is it possible to build a strong secondary school STEM program on a weak elementary school curriculum. If you try to do that, you will fail. If you think that you can fix the problems in the STEM subjects without fixing the larger system, you will find that any progress you make will be limited and even that progress will disappear very quickly as the system reverts to form as soon as your back is turned. This is not because educators are opposed to your objectives or fail to share your hopes for their students. It is because they are as much trapped by the system as you are. We are all in this together. Skeptical? Read on. The essentials of the strategies used by the top-performing countries to get to the top of the world's education league tables are not mysterious. They put more money behind their hardest-to-educate kids and less behind their easiest-to-educate, the opposite of what we do. They have very high standards for entering their teachers' colleges, as high as the standards for getting into their high status professional schools, whereas we have virtually no standards for entering teachers colleges. They insist that their teachers really know their subjects. This is true even in elementary school, where teachers are typically required to decide whether they will teach English and social studies or math and science, and they have to at least minor in the subjects they will teach in elementary school. In this country, of course, it is standard practice for our elementary school teachers to teach math without ever having taken a college-level math course, never mind having minored in math. They require their prospective teachers to spend a least a year mastering the craft of teaching before getting licensed, and then typically apprentice them to a master teacher for a year after they've been hired for their first job. We celebrate programs that pretend to teach teachers the craft of teaching in a few weeks and we don't even have people called master teachers in most of our school districts, never mind assign them to the preparation of new teachers. They pay their beginning teachers at about the same level as their beginning engineers, which is only a dream in the United States. Most have moved their teacher education programs out of their third tier institutions into their major research universities, something we have never considered doing. They have high quality national or state instructional systems which instantiate internationally benchmarked standards in all the core subjects in the curriculum into first class, deeply thoughtful course syllabi, and the resulting curriculum is used to create high quality (NOT multiple-choice, computer-scored) examinations; and they teach their teachers to teach those courses well in their schools of education. And they create curriculum frameworks, which specify a logical order for introducing topics grade by grade so that all students have an opportunity to study those topics in depth and at the right point in the sequence. There is more, about early childhood education, expenditure patterns, the way they handle school to work transition for young people, and the way they govern their systems, but this is enough to make my point. Our most effective competitors do not need STEM programs because they have done all these things, which are the things you have to do to have a first rate education system. Probably the single most important result of these measures is that they allow these countries to recruit their teachers from their top high school graduates, while the United States is increasingly recruiting from the bottom. This permits me to ask some questions. Do you think we will have top math and science performance in our secondary schools if we staff our elementary schools with teachers who know very little math or science and are scared of both? Do you think we can get top engineers from secondary schools that pay their math, science and engineering teachers (if they have any at all) far below what people trained in those subjects can make in private industry? Do you think that we can match the performance of the top-performing countries in math, science, engineering and technology without having done the work that they have done to build first rate curriculum to support all of those subjects from kindergarten through grade 12? Do you think that we can get the supply of young people we need to staff government and industry in the STEM areas while writing off our minority and low-income students, which is what we are doing every day, as long as we provide more money to our wealthiest students than to those who are harder to educate? Do you really believe that we will solve our STEM problems as long as young people believe that our teachers' colleges are the place you go if you cannot get into any other professional school? Are you with me so far? Good, because it is only one more step to the goal line. Do you believe that it is possible to greatly raise the standards for getting into teacher education programs for the STEM subjects while leaving the standards for getting into teacher prep programs for all the other subjects where they are? Do you think we can greatly raise pay for teachers in the STEM subjects while leaving the pay for teachers of other subjects where it is? Can you imagine how we would train our STEM teachers in our major universities and leave the training of teachers in all the other subjects in our former normal schools? Do you suppose that we could create professional working conditions for the STEM teachers in our schools while we leave all others working in the blue-collar environments in which they now teach? How, I wonder, would we change our school finance system for students going only to classes in the STEM subjects while we leave the same old school finance system in place for those same students while they study the other subjects in the curriculum? Can you imagine that the states would put in place very high quality and very expensive assessments for the STEM subjects and continue to use the same old multiple-choice-computer-scored tests for all the other subjects in the curriculum? Nope. None of that is going to happen. The people who believe that STEM is in many ways the key to a successful American economy in the years ahead--and I am one of them--will have to abandon their ring fence and join the rest of us. They will have to accept the fact that the only way to attain their goal is to reshape the whole system, following the examples of the nations that continue to outpace us every day. To get the progress they demand in STEM, they will have to abandon their belief that they can get what they want with STEM programs. It is not possible.

#### 3. Fed wastes money and time – no solvency – fifteen reasons

Edwards, Director of tax policy at the Cato Institute, 2014

(Chris, Director of tax policy at the Cato Institute, Cato Institute, 1-9-14, https://www.cato.org/publications/commentary/why-is-federal-government-so-wasteful, accessed 6/29/17, RCU)

I’ve followed federal budget issues for two decades, and there has been a never-ending stream of scandals regarding wasteful spending. Programs do not work, officials get caught frittering away taxpayer money, and many unscrupulous people are ripping off federal benefits. The Obamacare website disaster and the recent (and huge) [disability fraud bust](http://online.wsj.com/news/articles/SB10001424052702303933104579306270271026090" \t "_blank) in New York City are just the latest scandals.

Federal waste is not a modern phenomenon. As far back as the 19th century, the Bureau of Indian Affairs was rife with corruption and the Army Corps of Engineers was already known for pork-barrel spending and chronic cost overruns on projects.

Wasteful spending is a fundamental problem with the way the government works. Private businesses can also make bad decisions, have cost overruns, and misallocate investments. But private markets have built-in mechanisms to minimize those problems, whereas the government does not.

Here are 15 reasons for federal government wastefulness:

1. The government has become so huge that federal auditors, private watchdogs, and congressional oversight committees cannot even begin to review all the spending. The federal government funds more than 2,200 subsidy and benefit programs, and they are all susceptible to waste, fraud, and abuse.

2. People tend not to spend other people’s money as carefully as they spend their own. For federal decision makers, the source of funding for their favored programs can seem to be distant or abstract, but private-sector decision makers must weigh the costs and benefits of spending their own money.

3. Unlike in the private sector, poorly performing federal agencies are not subject to takeover bids, nor do they go bankrupt, and thus there is no built-in system to eliminate failed activities. In the private sector, roughly 10 percent of U.S. companies go out of business each year, and corporate executives get ousted all the time. In the private sector, poor performance gets punished.

4. There are more political rewards for federal policymakers to add new programs and expand existing ones than to weed out low-priority programs and waste. By contrast, private-sector decision makers are forced by bottom-line pressures to make tough decisions.

5. Federal managers face no profit incentive, giving them little reason to proactively reduce waste and cut costs. Indeed, without profits to worry about, federal managers often favor budget increases without any idea about whether expansion will add net value to society above the taxpayer costs.

6. Without the profit motive, there is little incentive for government workers and managers to innovate. There is less motivation than in the private sector to try and produce better services of higher quality.

7. To policymakers, costs are benefits, and that creates bad incentives. If a Pentagon project has a cost overrun, members with related jobs in their districts may not be worried because an overrun means more spending on their constituents. Academic research has shown that cost overruns are more frequent on government projects than on private-sector projects.

8. Even if a federal agency wanted to adopt business-style efficiencies, the output of much government work is hard to measure, which would make it difficult to set performance goals for managers and workers.

9. Even if federal performance could be easily measured, federal worker pay is generally tied to longevity, not performance. Federal workers receive rising salaries even if they perform poorly.

10. Disciplining federal workers is difficult and they are rarely fired, which can result in agencies carrying heavy loads of poor performers.

11. The government needs complex regulations and extensive paperwork to carry out routine functions such as procurement. One reason is that in the public sector there are no clear goals such as maximizing profits. Another reason is the need to prevent public corruption. The plethora of rules adds to federal inefficiency and sluggishness.

12. Because of the frequent turnover of political appointees in federal agencies, many agencies experience continual changes in their missions driven by transitory and political factors.

13. Congress imposes extra costs on federal agencies in carrying out their duties, such as resisting closure of low-value facilities or cutting projects that affect the states or districts of important members.

14. Federal agencies can get influenced or “captured” by special interest groups that steer policies toward narrow goals, rather than broad public-interest goals.

15. The sheer size of the federal government makes coordination and decision making for many activities very difficult. The multiplicity of congressional committees and executive branch agencies — each with an interest in expansion or mission creep — has led to a great deal of overlap and duplication in federal activities.

What is the solution to these problems? There is no straightforward, technocratic way to “reinvent” the federal government to make it work with a decent amount of efficiency. Some of these problems can be reduced to an extent, but as long as the federal government is as large as it is, it will sadly continue wasting hundreds of billions of dollars from misallocation, mismanagement, and other problems.

The only real solution to the ongoing waste in the federal government is to downsize it. To improve the performance of American government, we should begin decentralizing funding and decision making for programs and activities out of Washington. We should revive federalism and hand more responsibilities back to state governments, while privatizing federal activities where we can.

## SCIENCE NEG

### A2 Science solves authoritarianism

#### Turn—Authoritative science education represses critical thinking by preventing students from challenging the standardized views

Zemplén, Associate Professor at the Budapest University of Technology and Economics, 2007

(Gabor, “Conflicting Agendas: Critical Thinking versus Science Education in the International Baccalaureate Theory of Knowledge Course,” Science & Education Journal, Volume 16 Issue 2, 178, February 2007, accessed on 6/30/17, ATH)

\*edited for gendered language

Furthermore, what if the students start to meddle with the view of science portrayed by the book? The teacher should only welcome such outbursts of the critical spirit – but at the same time she receives explicit instructions from the teacher’s book. This, at one point suggests: ‘Point out that other disciplines... are little closer to definite answers after thousands of years of inquiry, but that science has performed astonishingly well in just a few hundred years.’ (Alchin 2003a, p. 12). These quotes nicely illustrate the usually unrecognised conflict of TOK-like subjects and science courses. Are students allowed to say that science only found answers by changing the questions – and that they do not find these questions exciting, important, or worth pursuing? As another quotation stresses: ‘We need to dispel the notion that scientists are bad and boring middle-aged men in white coats and show that there is something wonderful about science’ (Alchin 2003a, p. 17).20 The book highlights the creativity of science – and with this reiterates what expert consensus, and international science education documents state (McComas et al. 1998; Zeidler et al. 2002, p. 345).21 Is this view necessarily reinforced by the students’ own experience if some close relatives are scientists? Is this really what they are to expect if they want to study sciences at the university or do a PhD? Can they openly question these views, or should a TOK teacher do everything to substitute one popular image of science with another, positive one, conforming more to the authoritarian rhetoric of education? And to do all this in a course, which is supposedly aimed at fostering individual thinking?

#### Turn—Science courses force conformity to established ideals and shut down argumentative thought

Zemplén, Associate Professor at the Budapest University of Technology and Economics, 2007

(Gabor, “Conflicting Agendas: Critical Thinking versus Science Education in the International Baccalaureate Theory of Knowledge Course,” Science & Education Journal, Volume 16 Issue 2, 178, February 2007, accessed on 6/30/17, ATH)

One problem that separates science courses and NOS, SSI, and CT-focused subjects is that science is taught in a non- or pseudo-argumentative way. School science has to conform to scientists’ science to some extent – but as to its content matter, it generally focuses on non-controversial and well-established knowledge. Nevertheless science is an active process, and a human activity where argumentation is crucial and has a central role to play in the production of knowledge. But is it possible to use a general theory of argumentation which can help both CT and science education? This would be all the more important as more and more people think that the current omission of argumentation ‘is a problem that needs to be seriously addressed’ (Driver et al. 2000, p. 309).

#### Turn—modern day’s society’s perception of science prevents a stable international order

Luke, Department of Political Science, Virginia Polytechnic Institute and State University, 2013

(Timothy W., “Working towards critical realism: Scientific man, power politics and democratic decline,” International Politics, Volume 50, Number 6, 881, November 2013, accessed on 6/30/17, ATH)

Whether it is Morgenthau (1974) and his ‘scientific man’, or Marcuse (1964) and his ‘one-dimensional man’, the perfection of rationalization from both of their critical perspectives fosters its own irrationalities for modern politics. Consequently, the activity of making effective strategic judgments, while managing the contradictions rising out of rationalization, complicates crisis management, interpretation and legitimation. As statesmen-in-action cope with the demands of power politics, the deficits of scientific man make it difficult to construct a more equitable and stable international order. Morgenthau detected the intellectual limits and ethical incapacities of ‘scientific man’ in the liberal universalism of Pax Americana with its many ups and downs since 1945. Global strategic choices today are equally complex, so turning to contemporary critical theory’s parallel critique is well worth doing. Indeed, bringing critical theory and classical realist thought together (Bell, 1960; Wheatland, 2009) could clarify these conditions for a new critical realism (Halton, 1995). Recognizing the increasingly common predominance of ‘scientific man’, and how much the cultural codes of embedded scientificity are swamping so many other domains of life, it is crucial to return to Morgenthau and critical theory for this project. The diverse practices of truth-telling, or verdiction, are essential for critique. This practice of parrhēsia is crucial for truly understanding power politics (Foucault, 2011), even though power politics itself also runs just as much, if not more, on rhetoric

### A2 STEM solves sci dip

#### Turn—STEM education promotes hegemonic ideologies by regurgitating the values already present in culture

Zeidler, Professor of Science Education at USF, 2016

(Dana L., “STEM education: A deficit framework for the twenty first century? A sociocultural socioscientific response,” Cultural Studies of Science Education, Volume 11 Issue 1, 13, March 2016, accessed on 7/1/17, ATH)

We don’t find much help from examining suggestions of the National Research Council (NRC 2011). This document purports to outline criteria for identifying the ‘‘best practices’’ of effective STEM schools. The focus of their report is limited to the science and mathematics aspects of STEM. The report expresses concern, and rightfully so, about the significant gaps in achievement for US students by the time they finish 8th grade, particularly for ‘‘underserved’’ students. The general goal of promoting more inclusion in STEM fields is, of course, laudable. The report identifies fairly generic key elements that promote effective STEM instruction such as high capacity teachers, strong leadership, proper instructional time, and the like. While the report acknowledges that school cultures need to support learning, where success is defined in many ways over different settings, it carries with it shades of what would can be referred to as ‘‘crypto-positivism,’’ where an unexamined set of cultural epistemological beliefs becomes decontextualized (Friedrich 1992), and the knowledge derived from those beliefs becomes objectified and generalized (e.g., as in the case of ‘‘best practices’’) so as to unwittingly endorse the norms and values already dominant in that culture (Kincheloe and Tobin 2009). The failure to appreciate the unique temporal, cultural, economic, and political webs of social matrices that make up the immediate lives and environments of students’ epistemological views only furthers hegemonic powers. This is precisely why there has been some pushback to the mainstay STEM program evaluation approaches (‘‘scientifically’’ randomized quantitative approaches with generalizability powers) that organizations like the American Association for the Advancement of Science, National Science Foundation or the U.S. Department of Education typically endorse (Lawrenz and Huffman 2006). For example, the Institute of Education Sciences (an initiative of the US Department of Education) has produced a procedures and standards handbook used for ‘‘…critical assessments of scientific evidence on the effectiveness of education programs, policies, and practices… (2010, p. 1). The singular focus of those guidelines is on randomized controlled trail and comparisons group quasi-experimental designs yielding statistical significance. The crypto-positivism hegemonic message here does not seem all that crypto—sociocultural research that may rely on qualitative inquiry is too messy, not scientifically sound, not valued, and certainly not funded.

#### Turn—STEM education as suggested will produce yet another generation of uninvolved and unengaged citizens.

Zeidler, Professor of Science Education at USF, 2016

(Dana L., “STEM education: A deficit framework for the twenty first century? A sociocultural socioscientific response,” Cultural Studies of Science Education, Volume 11 Issue 1, 13, March 2016, accessed on 7/1/17, ATH)

The difference between the educational cost of implementing STEM, in and of itself as an inherently deficit model, and the integration of STEM in a holistic sociocultural model is staggering, not because of any monetary challenges, but because not doing so is destined to produce another generation of uninvolved, unengaged and uninformed citizens. Using current SSI research as a one sociocultural metric, reconceptualizing STEM research to be inclusive of those fundamental human characteristics embedded in SSI research over the next decade, will, more likely lead to a value-added model of surplus. The ‘‘extras’’ are realized by increased student engagement, development of more sophisticated modes of reasoning, more robust epistemological understandings of the NOS, as well as the normation of character within scientific traditions. Research in effective STEM initiatives ought to uproot its inherently restrictive silos and branch out into sociocultural and socioscientific venues of theory and practice.

### A2 STEM solves sci literacy

#### STEM education creates a silted version of science literacy and prevents effective policy-making

Zeidler, Professor of Science Education at USF, 2016

(Dana L., “STEM education: A deficit framework for the twenty first century? A sociocultural socioscientific response,” Cultural Studies of Science Education, Volume 11 Issue 1, 13, March 2016, accessed on 7/1/17, ATH)

STEM-based programs, at the present, tend to be conceived and entrenched in silos of science, technology, engineering and mathematics; attention is then directed at crosscutting connections among those areas. The problem at-hand is that doing so creates a stilted understanding of scientific literacy. Moreover, the restrictive nature of STEM silos effectively removes it from the cultural milieu of ordinary experiences by ordinary students. The overlap of STEM silos are typically focused on aspects of scientism that perpetuate unreflective narratives and undue confidence in public policy derived from scientific programs steeped in objectivity. But it is difficult, if not impossible, to find language in STEM-related initiatives that advocate for and call attention to the serious exploration of science in guided by human-based morality that allows students to reflect on their own knowledge formation, clarify and elucidate their own personal positions on issues, practice deriving policy, gain experience in the evaluation of credible evidence, understand the social context of how scientific knowledge is constructed and socially shared, or other ‘sociologics’ of scientific decisions that might question dominant hegemonic positions of science and its processes (Fountain 1998). Stated more simply, STEM education as typically envisioned and practiced, lacks ‘‘STEAM.’’ A focus on STEM sans ‘‘Arts’’ necessarily excludes important areas that inform and contextualize science by grounding them in sociocultural contexts. The Arts include areas like, for example, sociology, psychology, history, fine arts, philosophy and, ironically, education. Yakman (2008) provides an interesting visual representation of what a holistic sociocultural model (i.e., STEAM) conducive to scientific life-long learning might entail (Fig. 1 below).

#### STEM education cleaves a literate understanding of science, and is nor will be responsible for choices

Zeidler, Professor of Science Education at USF, 2016

(Dana L., “STEM education: A deficit framework for the twenty first century? A sociocultural socioscientific response,” Cultural Studies of Science Education, Volume 11 Issue 1, 13, March 2016, accessed on 7/1/17, ATH)

STEM focus as a hegemonic issue

STEM, as typically presented or discussed, particularly in the US policy literature (AAU 2011; NRC 2011, 2012, 2013a, b), appears to be rooted in a distinct view of science that leads to little more than that of a bifurcated understanding of science. Its myopic focus has the net effect of cleaving our understanding of science, and by extension, STEM-focused 12 D. L. Zeidler 123 initiatives, into two distinct conceptual camps. The practice of science may be thought of as having non-normative components (e.g., data gathering, observation, predictions, scientific methods and processes) and normative components (e.g., prescribing courses of action, choosing to create selected products, decisions about what ought to be done). Both aspects are complementary, and the recognition of how both contribute to a holistic understanding of the Nature of Science (NOS) is important in practice and policy formation in science education. However, the STEM movement tends to focus on the nonnormative pieces, to the virtual exclusion of the normative parts. For example, an examination of the Next Generation Science Standards (NRC 2012) reveals ‘‘crosscutting’’ concepts that clearly promote the non-normative parts, but muddles in dubious fashion the non-normative elements. A case in point is revealed in Nature of Science Standards section (NRC 2013a, p. 6) where among understandings of NOS it includes: • Science knowledge can describe consequences of actions but is not responsible for society’s decisions. • Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. • Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues

### A2 STEM modeling

#### US STEM education decisions won’t affect the international community – the tech market remains unconcerned by US education policy decisions

Ye, DFRobot CEO, 2017 (Ricky, The Next Web, “US STEM Market Declines, China Invests Heavily,” 6-19-17, <https://thenextweb.com/contributors/2017/06/19/us-stem-education-market-declines-china-invests-heavily/#.tnw_tJphQwDU>, 6-28-17 , MM).

The United States is a global superpower, but recent political decisions have called to question its commitment to certain core concepts, including science, technology, engineering and math education. In fact, between the conflicting interests of US Secretary of State Betsy DeVos’ [pro-STEM education stance](https://www.ed.gov/news/press-releases/statement-us-secretary-education-betsy-devos-following-womens-history-month-stem-event-smithsonians-national-air-and-space-museum" \t "_blank) and President Donald Trump’s intention to [cut NASA’s education office](https://www.washingtonpost.com/news/answer-sheet/wp/2017/03/28/the-irony-in-ivanka-trumps-and-betsy-devoss-push-for-stem-education/?utm_term=.3683a83715a3" \t "_blank), the world is questioning the fate of STEM education in US school systems.

Will a de-emphasis on US STEM education negatively impact STEM education policies worldwide?

Considering the number of global edtech businesses with products and services catering to the US education market, it makes sense that many are concerned about fate of their business with respect to this leading consumer demographic. But regardless of where the US government stands on STEM education today, international stakeholders shouldn’t lose sleep over the “uncertain” fate of US education policies.

US policy cannot make – or break – the global STEM education market

Global edtech companies have traditionally seen success launching products in the United States, considering the market’s strength and total worth of more than [$8 billion](https://www.theatlantic.com/education/archive/2015/11/quantifying-classroom-tech-market/414244/" \t "_blank). The largest [percentage](https://marketbrief.edweek.org/marketplace-k-12/k-12_global_hardware_market_grows_fueled_by_personal_computing/" \t "_blank) of the edtech hardware industry is based in North America, and the US is unquestionably the biggest producer of STEM goods and services in the world. If your product is accepted into the US market, edtech companies know that it is much easier to access other markets; in fact, US edtech companies raised an estimated [$1.03 billion across 138 venture deals](https://www.edsurge.com/news/2016-12-26-ka-ching-2016-us-edtech-funding-totals-1-billion" \t "_blank) in 2016.

However, despite the United States’ dominance in edtech, very few global companies rely solely on the US edtech market for the prosperity of their businesses. Perhaps this is due to many other countries [trailing close behind](https://www.usnews.com/news/stem-solutions/articles/2014/02/06/stem-study-china-asia-catching-up-to-less-dominant-us" \t "_blank) the US in supplying scientists and engineers to the workforce.

Edtech companies around the world should take solace in the fact that even American companies, like Microsoft, are focusing their efforts globally with respect to education. Microsoft, for example, partners with educational communities worldwide, including its involvement in the annual [Bett Show](http://www.bettshow.com/Exhibitor/Microsoft-WorldWide-Education/" \t "_blank) in London, to provide technology and educational programs that supplement the classroom experience.

Because edtech is a global phenomenon, one single country’s inhibitory policies around education cannot dismantle the entire community.

International commitment to STEM education strengthens all of us

Look at China, a country seemingly unaffected by President Trump’s proposed anti-education policies. While edtech and STEM education originated in the US, the Chinese have breathed their own life into the industry – [spending thousands](https://www.bloomberg.com/news/features/2016-12-20/china-s-tiger-moms-are-spending-thousands-for-stem-education-and-robot-classes-for-their-kids" \t "_blank) on related activities annually. The country’s STEM learning industry is projected to hit $15 billion by 2020, a forecast independent of Trump’s proposed plans to [downsize](https://www.washingtonpost.com/local/education/trump-seeks-to-slash-education-department-but-make-big-push-for-school-choice/2017/03/15/63b8b6f8-09a1-11e7-b77c-0047d15a24e0_story.html?utm_term=.780bef36823d" \t "_blank) the budget of the US Education Department.

And China isn’t the only country committed to exposing youngsters to STEM principles.

Late last year, the Organization for Economic Co-operation and Development issued its [2015 international rankings](http://www.keepeek.com/Digital-Asset-Management/oecd/education/pisa-2015-results-volume-i_9789264266490-en" \l "page1" \t "_blank) on student test scores in mathematics, reading and science – with many Asian and European nations placing much higher on average than the United States. Singapore, Japan, Estonia, Canada and China were among those placing in the [top 10](http://www.businessinsider.com/pisa-worldwide-ranking-of-math-science-reading-skills-2016-12" \t "_blank) markets for both science and math scores.

Science, technology, engineering and math: Beyond borders

While many advocates for STEM education in the United States are uneasy about the country’s current political policies, edtech companies on a global scale remain unconcerned. In fact, from my perspective as a China-based edtech executive that is heavily invested in the success of the US market, politics simply cannot not impact the weight of STEM education or the global commitment to the cause.

Reducing budget for education will never be a proper or reliable solution to reducing government expenses. Preparing today’s youth for the dawning autonomous revolution is the only method for equipping the future workforce to manage the innovation that will encompass industry. And STEM-focused programs and products best cultivate the skills necessary for our children to compete against international markets.

Executives in edtech should regard the US agenda (with respect to STEM education) as a minor blip in an industry otherwise experiencing significant forward momentum. One country’s “few steps backward” will not undo an entire global system.

Yes, the US is an advantageous market for STEM-focused products, and any opposition from the US government concerning education naturally raises questions, but there’s enough evidence that a thriving global education market – operating around the core value of education – exists beyond the boundaries of any one country’s borders.

### A2 STEM solves warming

#### Teaching STEM science does not solve climate change, rather it makes the problem worse

Battistoni ’12 (editorial intern at Mother Jones) (Alyssa Battistoni, Mother Jones, “Why Science Education Won’t Solve Our Climate Problems”, May 30, 2012, http://www.motherjones.com/politics/2012/05/science-education-wont-solve-climate-change/, July 1, 2017, EEM)

Think the reason we can’t address climate change is because people don’t understand climate science? Think again: a new study suggests that people with higher scientific comprehension use their abilities not to disinterestedly parse the complicated details of climate science, but to better fit available evidence to their preexisting values and group identifications.

A team of researchers associated with the Cultural Cognition Project at Yale Law School compared scientific literacy and numeracy with beliefs about climate change and value-laden worldviews for an article published this week in Nature Climate Change. Their conclusions? As individuals’ scientific comprehension went up, concern about climate change declined slightly. That relationship isn’t what you’d expect to see if ignorance about science explained a lack of concern about climate change, as the “scientific comprehension thesis” (SCT) would suggest; the graph below demonstrates the difference between what SCT predicts and how people actually responded.

But not everyone with greater scientific understanding was equally likely to be less concerned about climate change; the correlation split sharply depending on respondents’ worldviews. As the study explains, “members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about climate change. Rather, they were the ones among whom cultural polarization was greatest.” While those results don’t jibe with the SCT, they do make sense according something called the cultural cognition thesis (CCT), which suggests that people tend to perceive risks in a way that corresponds to the values of their identity groups.

Think about it: An oil worker who expresses concern about climate change may be mocked, while an English professor who calls climate science a hoax may be shunned. People therefore adjust their beliefs to fit those of others around them: according to the study, “public divisions over climate change stem not from the public’s incomprehension of science but from a distinctive conflict of interest: between the personal interest individuals have in forming beliefs in line with those held by others with whom they share close ties and the collective one they all share in making use of the best available science to promote common welfare.” Or, as researcher Ellen Peters of Ohio State University puts it, “What this study shows is that people with high science and math comprehension can think their way to conclusions that are better for them as individuals but are not necessarily better for society.”

More specifically, people with what the study identified as a “hierarchical individualist” worldview—one that values top-down authority—tended to see climate change as less of a risk as their scientific literacy and numeracy increased. On the other hand, people with an “egalitarian communitarian” worldview—one favoring “less regimented forms of social organization and greater collective attention to individual needs”—tended to perceive climate change as a greater risk as they gained scientific comprehension.

In short, when it comes to climate change, people tend to accept or reject scientific information based upon whether it threatens or supports their existing values and relationships, and the effect is stronger among those who are better able to understand the implications of that information for their values. The researchers’ conclusions suggest that climate change is fundamentally a political issue, not simply a technical problem or information gap. They also suggest that green-minded efforts to educate climate change deniers in hopes of getting them to change their views are naive at best.

People who don’t believe in climate change aren’t merely ignorant, uneducated, or anti-science; on the contrary, many of them are actually pretty good at assessing their (at least short term) interests and evaluating threats to them. That means we can’t ignore the political and value questions associated with climate change—any strategy that assumes everyone with adequate scientific education will reach the same conclusions is doomed to fail.

### Global warming impact – defense

#### No impact – mitigation and adaptation will solve---no tipping point or “1% risk” args

Mendelsohn 9 (Robert O. Mendelsohn 9, the Edwin Weyerhaeuser Davis Professor, Yale School of Forestry and Environmental Studies, Yale University, June 2009, “Climate Change and Economic Growth,” online: http://www.growthcommission.org/storage/cgdev/documents/gcwp060web.pdf)

**The** heart of the **debate about climate change** comes from a number of warnings from scientists and others that **give the impression that human-induced climate change is an immediate threat to society** (IPCC 2007a,b; Stern 2006). Millions of people might be vulnerable to health effects (IPCC 2007b), crop production might fall in the low latitudes (IPCC 2007b), water supplies might dwindle (IPCC 2007b), precipitation might fall in arid regions (IPCC 2007b), extreme events will grow exponentially (Stern 2006), and between 20–30 percent of species will risk extinction (IPCC 2007b). Even worse, there may be catastrophic events such as the melting of Greenland or Antarctic ice sheets causing severe sea level rise, which would inundate hundreds of millions of people (Dasgupta et al. 2009). Proponents argue there is no time to waste. Unless greenhouse gases are cut dramatically today, economic growth and well‐being may be at risk (Stern 2006). **These statements are** largely alarmist and misleading. Although climate change is a serious problem that deserves attention, **society’s immediate behavior has an** extremely low probability **of leading to** catastrophic consequences. The **science and economics** of climate **change is quite clear that emissions over the next few decades will lead to only** mild consequences. The severe impacts predicted by alarmists require a century (or two in the case of Stern 2006) of no mitigation. Many of the **predicted impacts assume there will be no or little adaptation**. The net economic impacts from climate change over the next 50 years will be small regardless. Most of **the more severe impacts will take more than a century or even a millennium to unfold and many of these “potential” impacts** will never occur because people will adapt. **It is not at all apparent that immediate and dramatic policies need to be developed to thwart long‐range climate risks**. What is needed are long‐run balanced responses.

#### Warming’s inevitable even with complete halting of emissions

Rood 14, Professor of Atmospheric, Oceanic and Space Sciences at the University of Michigan, December 11th <https://theconversation.com/what-would-happen-to-the-climate-if-we-stopped-emitting-greenhouse-gases-today-35011>, “What would happen to the climate if we stopped emitting greenhouse gases today?”

Earth’s climate is changing rapidly. We know this from billions of observations, documented in thousands of journal papers and texts and summarized every few years by the United Nations' Intergovernmental Panel on Climate Change. The primary cause of that change is the release of carbon dioxide from burning coal, oil and natural gas. International climate talks in Lima this week are laying the foundation for next year’s UN climate summit in Paris. While negotiations about reducing emissions grind on, how much warming are we already locked into? If we stop emitting greenhouse gases tomorrow, why would the temperature continue to rise? Basics of carbon and climate The carbon dioxide that accumulates in the atmosphere insulates the surface of the Earth. It’s like a warming blanket that holds in heat. This energy increases the Earth’s surface average temperature, heats the oceans and melts polar ice. As consequences, sea level rises and weather changes. Global average temperature has increased. Anomalies are relative to the mean temperature of 1961-1990. Since 1880, after carbon dioxide emissions took off with the Industrial Revolution, the average global temperature has increased about 1.5F (0.85C). Each of the last three decades has been warmer than the preceding decade, as well as warmer than the entire previous century. The Arctic is warming much faster than the average global temperature; ice in the Arctic Ocean is melting and the permafrost is thawing. Ice sheets in both the Arctic and Antarctic are melting. Ecosystems on both land and in the sea are changing. The observed changes are coherent and consistent with our theoretical understanding of the Earth’s energy balance and simulations from models that are used to understand past variability and to help us think about the future. Slam on the climate brakes What would happen to the climate if we were to stop emitting carbon dioxide today, right now? Would we return to the climate of our elders? The simple answer is no. Once we release the carbon dioxide stored in the fossil fuels we burn, it accumulates in and moves amongst the atmosphere, the oceans, the land, and the plants and animals of the biosphere. The released carbon dioxide will remain in the atmosphere for thousands of years. Only after many millennia will it return to rocks, for example, through the formation of calcium carbonate – limestone – as marine organisms' shells settle to the bottom of the ocean. But on time spans relevant to humans, once released the carbon dioxide is in our environment essentially forever. It does not go away, unless we, ourselves, remove it. If we stop emitting today, it’s not the end of the story for global warming. There’s a delay in temperature increase as the climate catches up with all the carbon that’s in the atmosphere. After maybe 40 more years, the climate will stabilize at a temperature higher than what was normal for previous generations. This decades-long lag between cause and effect is due to the long time it takes to heat the the ocean’s huge mass. The energy that is held at the Earth by the increased carbon dioxide does more than heat the air. It melts ice; it heats the ocean. Compared to air, it’s harder to raise the temperature of water – it takes time, decades. However, once the ocean temperature is elevated, it adds to the warming of the Earth’s surface. So even if carbon emissions stopped completely right now, as the oceans catch up with the atmosphere, the Earth’s temperature would rise about another 1.1F (0.6C). Scientists refer to this as committed warming. Ice, also responding to increasing heat in the ocean, will continue to melt. There’s already convincing evidence that significant glaciers in the West Antarctic ice sheets are lost. Ice, water, and air – the extra heat held on the Earth by carbon dioxide affects them all. That which has melted will stay melted – and more will melt. Ecosystems are altered by natural and manmade occurrences. As they recover, it will be in a different climate from that in which they evolved. The climate in which they recover will not be stable; it will be continuing to warm. There will be no new normal, only more change.

### Democracy impact – defense

#### Democratization doesn’t solve war – empirics

Kupchan, 2011 (Charles A, Professor of International Affairs – Georgetown University, April“Enmity into Amity: How Peace Breaks Out,” <http://library.fes.de/pdf-files/iez/07977.pdf>)

Second, contrary to conventional wisdom, democracy is not a necessary condition for stable peace. Although liberal democracies appear to be better equipped to fashion zones of peace due to their readiness to institu­tionalize strategic restraint and their more open societies – an attribute that advantages societal integration and narrative/identity change – regime type is a poor predic­tor of the potential for enemies to become friends. The Concert of Europe was divided between two liberalizing countries (Britain and France) and three absolute monar­chies (Russia, Prussia, and Austria), but nevertheless pre­served peace in Europe for almost four decades. Gen-eral Suharto was a repressive leader at home, but after taking power in 1966 he nonetheless guided Indonesia toward peace with Malaysia and played a leading role in the founding of ASEAN. Brazil and Argentina embarked down the path to peace in 1979 – when both countries were ruled by military juntas. These findings indicate that non-democracies can be reliable partners in peace and make clear that the United States, the EU, and de­mocracies around the world should choose enemies and friends on the basis of other states’ foreign policy behav-ior, not the nature of their domestic institutions.

#### US can’t promote democracy

Börzel ’15 [2015. Tanja A. Börzel holds the chair for European Integration at the Freie Universität Berlin. She received her PhD from the European University Institute in Florence, Italy in 1999. From 1999 to 2004, she conducted her research and taught at the Max Planck Institute for Research on Collective Goods in Bonn, the Humboldt-Universität zu Berlin and the University Heidelberg. “The noble west and the dirty rest? Western democracy promoters and illiberal regional powers” Democratization, 22:3, 519-535]

The EU and the US made democracy promotion an explicit goal of their foreign policy. Yet, they also pursue other goals, such as political stability, economic growth, energy supply, or security. While in principle these goals are seen as complementary, the democratization of (semi-)authoritarian countries entails the risk of their destabilization at least in the short run. The more unstable and the less democratic the target state is, the more difficult it is to reconcile democracy promotion with ensuring security and stability.30 This democratization-stability dilemma largely confirms the second hypothesis of the editors that Western democracy promoters only react to countervailing policies by non-democratic regional power if they prioritize democracy and human rights goals over stability and security goals.31 The prioritizing explains why the US and the EU ignored attempts of Saudi Arabia to undermine democratization processes in Arab Spring countries and the Gulf region.32 Liberal and illiberal regional powers equally prioritize stability and security.33 Ukraine is one of the few cases in which the EU and US have sought to counter the countervailing strategies of the illiberal regional power, arguably because of Russia’s attempts to destabilize the country. Thus, rather than prioritizing democracy over stability, Putin’s strategy of “managed instability”34 has driven the EU and the US to step up their efforts at democracy promotion supporting democratic political forces that have the greatest potential to politically and economically stabilize Ukraine.35 In accordance with the second hypothesis of the editors, interdependent relationships with illiberal regional powers, particularly with regard to energy and security, also make Western democracy promoters more likely to compromise their efforts at democracy promotion and tolerate countervailing strategies of illiberal regional powers.36 The EU and US have not been prepared to make full use of sanctions in order to counter Russia’s violations of Georgia’s and Ukraine’s territorial integrity in 2008 and 2014, respectively.37 While Ukraine and the EU signed the Association Agreement in August 2014, the Deep and Comprehensive Free Trade Agreement (DCFTA) has been suspended for a year amid Russia’s threats of retaliatory measures against both Ukraine and the EU. The EU also signalled that is was prepared to revise parts of the DCFTA to accommodate Russia’s concerns.38 In a similar vein, the US has been unwilling to risk its alliance with its most important allies in the region over Saudi Arabia’s assistance in suppressing the Shia uprising in Bahrain.39 Finally, China is too important for both the EU and the US to openly support Hong Kong’s “umbrella revolution” in its protests against Beijing’s efforts to compromise the “one country two systems” doctrine by curbing political freedoms.40 In sum, if illiberal powers only counteract Western democracy promotion if their economic or security interests are at stake, Western democracy promoters only respond to such countervailing strategies if they see their geopolitical interests challenged.

## SCI DIP NEG

### Science diplomacy bad

#### Science diplomacy is more likely to increase conflict – innovation rate & political interests

David Dickson, June 4, 2009. http://www.scidev.net/en/editorials/the-limits-of-science-diplomacy.html

But whether scientific cooperation can become a precursor for political collaboration is less evident. For example, despite hopes that the Middle East synchrotron would help bring peace to the region, several countries have been reluctant to support it until the Palestine problem is resolved. Indeed, one speaker at the London meeting (organised by the UK's Royal Society and the American Association for the Advancement of Science) even suggested that the changes scientific innovations bring inevitably lead to turbulence and upheaval. In such a context, viewing science as a driver for peace may be wishful thinking. Conflicting ethos Perhaps the most contentious area discussed at the meeting was how science diplomacy can frame developed countries' efforts to help build scientific capacity in the developing world. There is little to quarrel with in collaborative efforts that are put forward with a genuine desire for partnership. Indeed, partnership — whether between individuals, institutions or countries — is the new buzzword in the "science for development" community. But true partnership requires transparent relations between partners who are prepared to meet as equals. And that goes against diplomats' implicit role: to promote and defend their own countries' interests. John Beddington, the British government's chief scientific adviser, may have been a bit harsh when he told the meeting that a diplomat is someone who is "sent abroad to lie for his country". But he touched a raw nerve. Worlds apart yet co-dependent The truth is that science and politics make an uneasy alliance. Both need the other. Politicians need science to achieve their goals, whether social, economic or — unfortunately — military; scientists need political support to fund their research. But they also occupy different universes. Politics is, at root, about exercising power by one means or another. Science is — or should be — about pursuing robust knowledge that can be put to useful purposes. A strategy for promoting science diplomacy that respects these differences deserves support. Particularly so if it focuses on ways to leverage political and financial backing for science's more humanitarian goals, such as tackling climate change or reducing world poverty. But a commitment to science diplomacy that ignores the differences — acting for example as if science can substitute politics (or perhaps more worryingly, vice versa), is dangerous.

#### Prior political agreements better explain peaceful cooperation – no unique benefit to scientific ties.

David Dickson, SciDev.net, June 2, 2009. http://scidevnet.wordpress.com/2009/06/02/science-diplomacy-the-case-for-caution/

Indeed, a case can be made that where scientific projects have successfully involved substantial international collaboration, such success is often heavily dependent on a prior political commitment to cooperation, rather than a mechanism for securing cooperation where the political will is lacking. Three messages appeared to emerge from the two days of discussion. Firstly, where the political will to collaborate does exist, a joint scientific project can be a useful expression of that will. Furthermore, it can be an enlightening experience for all those directly involved. But it is seldom a magic wand that can secure broader cooperation where none existed before.

### A2 Sci dip solves war

#### Politics overwhelms science – no internal link to cooperation – larger risk of a turn

David Dickson, June 28, 2010. http://scidevnet.wordpress.com/category/science-diplomacy-conference-2010/

But others referred to the failure of the Copenhagen climate summit last December to come up with a meaningful agreement on action as a demonstration of the limitations of this way of thinking. It was argued that this failure had been partly due to a misplaced belief that scientific consensus would be sufficient to generate a commitment to collective action, without taking into account the political impact that scientific ideas would have. Another example that received considerable attention was the current construction of a synchrotron facility SESAME in Jordan, a project that is already is bringing together researchers in a range of scientific disciplines from various countries in the Middle East (including Israel, Egypt and Palestine, as well as both Greece and Turkey). The promoters of SESAME hope that – as with the building of CERN 60 years ago, and its operation as a research centre involving, for example, physicists from both Russia and the United States – SESAME will become a symbol of what regional collaboration can achieve. In that sense, it would become what one participant described as a “beacon of hope” for the region. But others cautioned that, however successful SESAME may turn out to be in purely scientific terms, its potential impact on the Middle East peace process should not be exaggerated. Political conflicts have deep roots that cannot easily be papered over, however open-minded scientists may be to professional colleagues coming from other political contexts. Indeed, there was even a warning that in the developing world, high profile scientific projects, particular those with explicit political backing, could end up doing damage by inadvertently favouring one social group over another. Scientists should be wary of having their prestige used in this way; those who did so could come over as patronising, appearing unaware of political realities.

#### More ev

David Dickson, SciDev.net, June 2, 2009. http://scidevnet.wordpress.com/2009/06/02/science-diplomacy-the-case-for-caution/

One of the frustrations of meetings at which scientists gather to discuss policy-related issues is the speed with which the requirements for evidence-based discussion they would expect in a professional context can go out of the window. Such has been the issue over the past two days in the meeting jointly organised in London by the American Association for the Advancement of Science (AAAS) and the Royal Society on the topic “New Frontiers in Science Diplomacy“. There has been much lively discussion on the value of international collaboration in achieving scientific goals, on the need for researchers to work together on the scientific aspects of global challenges such as climate change and food security, and on the importance of science capacity building in developing countries in order to make this possible. But there remained little evidence at the end of the meeting on how useful it was to lump all these activities together under the umbrella term of “science diplomacy”. More significantly, although numerous claims were made during the conference about the broader social and political value of scientific collaboration – for example, in establishing a framework for collaboration in other areas, and in particular reducing tensions between rival countries – little was produced to demonstrate whether this hypothesis is true. If it is not, then some of the arguments made on behalf of “science diplomacy”, and in particular its value as a mechanism for exercising “soft power” in foreign policy, do not stand up to close scrutiny.

#### Science just offers a new means of interstate domination.

David Dickson, February 25, 2011. http://www.scidev.net/en/science-and-innovation-policy/editorials/now-is-the-time-for-science-diplomacy-in-the-arab-world.html

I have argued previously that science diplomacy — the use of scientific cooperation as a tool of international diplomacy — has a key weakness: despite what its supporters sometimes claim, it can never substitute for political initiatives. Nothing illustrates this more clearly than the lack of any significant follow-through to, or indeed impact of, a speech given by Obama in Cairo in the summer of 2009, in which he publicly advocated the use of closer scientific contacts between the United States and Muslim countries as a form of "soft diplomacy". But science diplomacy can be invaluable when it provides the basis for a genuine scientific partnership between two (or more) countries — and especially when such partnerships allow the sharing of skills and experience, for example through joint teaching or research projects. The danger of this approach, of course, is that the stronger partner may come to dominate, for example in planning or implementing a research project.

### A2 Sci dip solved in the Antarctic

#### Their evidence is hype – the Antarctic Treaty proves science does not prevent interstate friction.

Roger Launius, September 17, 2010. http://launiusr.wordpress.com/2010/09/17/governing-antarctica-a-continent-dedicated-to-science-or-a-place-of-geopolitical-rivalry/

Of course, the IGY did indeed play an important role in the resolution of the Antarctic sovereignty dispute, but not in quite the idealistic way that the traditional narrative has suggested. The actual science of the IGY, and the improved understanding of the Antarctic environment that it facilitated, played an important role in the partial resolution of the question of sovereignty. As officials in the treaty nations, especially in Great Britain and the United States, learned more about the reality of the Antarctica environment through the work of IGY—in particular the realization that it contained little or nothing of immediate economic value—they acceded to arguments in favor of internationalizing the continent. There was, in any eventuality, not much of a downside in the foreseeable future. Accordingly, the U.S. led an effort to diffuse geopolitical tensions in Antarctica by internationalizing the continent. As the various nations accepted this position they found themselves members of the Antarctic Treaty system’s “exclusive club,” which continues to govern the continent to this day. Initially the Antarctic Treaty signatory countries disagreed on the question of the Soviet Union’s role on the continent. U.S. officials, perhaps somewhat naively, believed that they could create a treaty regime for Antarctica that would exclude the Soviet Union. British officials—who were especially keen to resolve the dispute—argued, more realistically, that the communist superpower would have to be included for any internationalization of Antarctica to work. After some discussion, the British position prevailed. Since the ratification of the Antartic Treaty in 1960 the international partners have jockeyed and cajoled each other seeking to gain advantage, competitive or otherwise, in Antarctic activities.

### A2 Sci dip – Federoff indict

#### Federoff is a biotech shill

Pamela Drew August 25, 2008. http://pameladrew.newsvine.com/\_news/2008/08/25/1778758-will-nytimes-science-stoop-to-propaganda

It's almost like the problem you have when a lie compounds, at some point there's an awful lot to explain. It appears the NY Times finally decided to tip toe into the subject of gmo foods and use the tobacco industry strategy of employing a paid scientist to do it. The article titled An Advocate for Science Diplomacy is a feeble attempt by the New York Times to slide in the back door using an interview with Nina Fedoroff as an introduction to what we've been swallowing. As the press stayed silent, pretending it's nothing different from any other food, the problem with the cover up grew. Now, it seems the time has come to open discussion and what better way to begin than with a deceptive bit of propaganda from the industry that has been hidden from view? Federoff has all the superficial credentials one would look to for a legitimate scientific view but as with most people who support biotech there's more than meets the eye. By some measure tracing the decade of Nina's career and associations is like a microcosm of the covert industry growth itself. Since this deception took a decade to grow it takes a little patience and back story to unravel. It is after all a web of deception so hang in there through the tangles. We'll take it piece by piece and get to the ties that keep the hands of Monsanto and the other Biotech Brigade profiteers, hidden with a few degrees of separation from their supporters. August 19, 2008 A CONVERSATION WITH NINA V. FEDOROFF An Advocate for Science Diplomacy By CLAUDIA DREIFUS When she was a single mother in the early 1960s, Nina V. Fedoroff, 66, defied odds and conventionality by working her way through college, graduate school and postdoctoral studies. Dr. Fedoroff, a member of the National Academy of Sciences, did fundamental research on plant transposons, or jumping genes, and was among the first to clone plant DNA. She is science adviser to the secretary of state and administrator of the Agency for International Development. We spoke last month in Washington and later on the telephone. An edited version of the conversations follows. Unless being a hand picked Ambassador, by the most industry friendly Administration in US history, raises a red flag, one would need to look to Federofff's biotech pedigree to explain the untenable science she offers in the interview. Let's start with the CV details provided and move on to the missing ones. Like so many programs with benevolent aims, USAID has been influenced by an agenda of promoting the profit objectives of industry. Few have benefitted biotech more than USAID which donates food in the name of addressing global hunger, but forces Nations who don't accept gmo technology to allow gmo as aid. Nations who refuse to accept the gmo grains, either based on concerns for health or fears that the patented seeds will be planted and grow their indebtedness have been targeted for reprisals. Examples of USAID shipments as a mechanism to dump biotech on the poor are plentiful. Here is one that reflects the essence of the benevolent policy feeding the poor of India. The USDA has instructed US Aid Agencies to act as international policemen on behalf of US biotech corporations. In the minutes of its meeting with aid agencies it is made clear that US Aid Agencies are expected to immediately report any opposition to GM food imports by recipient nations to USAID, that they are to make investigations to enable USAID to classify objections as either 'political' or 'trade' related and that USAID will then take the necessary 'diplomatic action' (sanctions?, WTO prosecutions?, aid cancellations/, IMF action?) to ensure that the shipments are accepted. http://www.mindfully.org/GE/2003/USAID-Report-AntiGM14jan03.htm Now for the details of Nina's career history that missed the interview introduction, taken from the biography posted at Penn State's Huck Institute where she was a founding member of the biotech Consortium that became a biotech education program. Much of the picture comes from associations and there'd be a book if we detailed them all.

### A2 Sci dip internals – defense frontline

#### Unclear motivations and mobility restrictions undercut science diplomacy

National Research Council, et al, research arm of the National Academies of Sciences, Engineering, and Medicine, 2012

(*U.S. and International Perspectives on Global Science Policy and Science Diplomacy: Report of a Workshop*,page 31-35, RCU).

The U.S. government has been actively undertaking science diplomacy efforts in the last few years. Some participants stated that these efforts are most important when there are difficult governmental relationships, which can lead to sensitivity as to the motivation behind these efforts. They noted that the limitations on U.S. use of science in diplomacy are often long-standing policies and laws that were motivated originally and primarily by a concern for control of technology, whereas now what seems most needed is engagement and the embrace of competition. This is particularly salient in unnecessarily cumbersome mobility controls, that is, visas and travel restrictions.

Foreign professionals were described as often being of two minds: They value collaborating with U.S. counterparts, yet many are also apprehensive about attending conferences within the United States because of visa uncertainties and difficulties, and security controls. Science envoy Gebisa Ejeta noted that implementation of controls in the United States since September 11, 2001, has been very discouraging and has stifled its global engagement capacities. Several workshop participants also noted that U.S. policies ought to recognize that effective competition raises the bar for everyone and serves as a major source of future opportunities.

#### Science diplomacy is held back by weak public-private partnerships

National Research Council, et al, research arm of the National Academies of Sciences, Engineering, and Medicine, 2012

(*U.S. and International Perspectives on Global Science Policy and Science Diplomacy: Report of a Workshop*,page 31-35, RCU).

Many participants emphasized the importance of the private sector in global science and technology engagement. As Eric Bone of the U.S. Department of State observed, partnerships with the private sector are essential, and science diplomacy should not be restricted to a government-to-government exercise. Unfortunately, capacity for this type of partnership is weak in the developing world, noted Gebisa Ejeta. A related impediment, he said, is that existing policy and regulatory frameworks have been perceived by some as biased towards the developed world. This is particularly relevant to intellectual property rights, such as the ones generated by the 1985 Utility Patent Act for biological agents and products. This act encouraged the heavy infusion of financial resources to private-sector research in the field of molecular biology. It also resulted inadvertently in a significant reduction in public research spending in both developed and developing countries. These new investments in the private sector triggered a rush of patenting, in some cases fueling misunderstandings among poor and rich nations. Ejeta added that public–private partnerships in the developed world also need to be revisited. For example, increases of private investments in agricultural biotechnology are associated generally with decreased public spending, thus creating an unhealthy imbalance.

#### Governmental inflexibility blocks science diplomacy

National Research Council, et al, research arm of the National Academies of Sciences, Engineering, and Medicine, 2012

(*U.S. and International Perspectives on Global Science Policy and Science Diplomacy: Report of a Workshop*,page 31-35, RCU).

Despite the many efforts put forward by the U.S. government, the discussion identified difficulties for foreign organizations in engaging U.S. governmental science agencies. Discussion leader Michael Clegg pointed to the diversity and the structural complexity of the U.S. science agencies and the lack of mechanisms for coordinating and integrating diplomatic activities undertaken by the government, businesses, and NGOs. Existing bureaucratic diversity and inflexibility, he said, often makes communication with U.S. agencies difficult and inhibits science diplomacy endeavors. Eric Bone also noted the disconnect between the form that science diplomacy is taking today and the current organizational structure.

Volker ter Meulen, of University of Würzburg and former president of the German Academy of Sciences Leopoldina, underlined the common inflexibility in decision-making processes and described a political culture of “short-termism” among policy makers, where science is expected to provide easy answers quickly and contribute on short notice to single issues. Instead, he suggested building longer-term relationships between scientific and political communities based on trust and mutual confidence. He also noted the importance of creating and maintaining flexibility in political decision making and of being “prepared for the unexpected” to be able to deal with future developments and a changing evidence base.

Another barrier that was identified by several workshop participants is the lack of incentives in both the U.S. government and academia for the participation of U.S. professionals in international science. Gebisa Ejeta observed that scientific achievements enabled by global collaborations are often not credited appropriately, and for most academic leaders, engagement in international development is undertaken at the expense of their domestic responsibilities. Several workshop participants also highlighted the importance of engaging scientists in diplomatic conversations. They emphasized the need for more science attachés in U.S. embassies and suggested implementing a better structure within the State Department to make it easy, attractive, and useful for people from the science community to serve as science attachés.

#### Lack of human capital and infrastructure in developing nations prevents science diplomacy from flowering

National Research Council, et al, research arm of the National Academies of Sciences, Engineering, and Medicine, 2012

(*U.S. and International Perspectives on Global Science Policy and Science Diplomacy: Report of a Workshop*,page 31-35, RCU).

A serious lack of human capital, coherent national science and technology strategies, and research infrastructures in potentially partnering countries was identified by some workshop participants as an important barrier to more effective international engagement. Gebisa Ejeta and others stated that weak human capacity, in part owing to brain drain, and the lack of adequate research infrastructure in developing countries has too often derailed promising science-based developments or worse, prevented their successful exploitation.

Ejeta also underlined the differences in goals and aspirations between institutions in the United States and those in developing countries that often create an awkward dialogue about the objectives of collaborative partnerships. Most of the advanced research institutions in the developed world aim at creating a global public good; in contrast, research centers in most developing countries focus on the development of locally needed products and services. Nevertheless, he believed that the two goals are mutually supportive, and if the parties communicate and work together, a win-win scenario often can be reached. He also noted an overreliance in developing countries on external funding to capitalize on science diplomacy and global science cooperation opportunities, which is, of course, largely because of insufficient local resource commitment to science. There is a shortage of functional research centers and science support architecture such as science and technology commissions, merit-based funding mechanisms, or science academies in the developing world.2 Several participants identified building such structures as an important goal of science diplomacy.

#### Science diplomacy fails – no unified voice

National Research Council, et al, research arm of the National Academies of Sciences, Engineering, and Medicine, 2012

(*U.S. and International Perspectives on Global Science Policy and Science Diplomacy: Report of a Workshop*,Volker ter Meulen, former President, German Academy of Sciences Leopoldina, page 31-35, RCU).

Many workshop participants underlined the failure of scientists to effectively engage policy makers and the public in understanding the role of science and its potential value in diplomacy and in development.

According to Volker ter Meulen, the main challenges are the lack of a unified voice to speak on behalf of science and the lack of experience within the political institutions to use science and effectively communicate with the science community. This challenge is often compounded by the multiplicity of other voices in a crowded world. In a very complicated diplomatic system, involving NGOs, intergovernmental organizations, media, and new communication modes and networks, the scientific community must learn how to inform and engage more effectively with all these groups and governments. Furthermore, several participants underscored the importance of recognizing that many of the major policy challenges require science in diplomacy across a broad front. For example, tackling the Millennium Development Goals requires understanding and action on food, health, and the environment, which involves multiple government departments and requires a coherent and integrated policy. Unfortunately, noted one discussant, there are often organizational barriers within and between governments, in addition to the low public understanding and support for such policies.

## COMPETITIVENESS NEG

### A2 Competitiveness – Jobs fail

#### STEM graduates don’t always go into STEM jobs

Robinson, journalist, 2014. Wesley, Washington Post, “Most with College STEM degrees Go to Work in Other Fields, Survey Finds” July 10 2014, <https://www.washingtonpost.com/local/education/most-with-college-stem-degrees-go-to-other-fields-of-work/2014/07/10/9aede466-084d-11e4-bbf1-cc51275e7f8f_story.html?utm_term=.5c944f73b655>, Accessed June 30 2017 by KMV

Nearly 75 percent of all holders of bachelor’s degrees in STEM disciplines don’t have jobs in STEM occupations, according to a survey that reached 3.5 million homes, said Liana Christin Landivar, a sociologist with the Census Bureau. The bureau’s American Community Survey is the largest household survey in the nation. About half of those who have degrees related to engineering, computers, math and statistics do get a STEM job, the survey found. The survey also found that men still have most of the jobs in STEM fields, especially in engineering and computers. Researchers cite access and opportunity as reasons women and minorities are underrepresented. The report comes at a time when national educational initiatives and funding are focused on increasing participation and graduation rates in the STEM disciplines, in part because of a belief that the United States is losing ground internationally. The Census Bureau data shows that most of those who dedicate their college years to STEM subjects veer into other fields.

#### Throwing money at STEM doesn’t solve competitiveness – STEM majors find the jobs boring and programs kill the manufacturing sector

Charette, Contributing Editor to IEEE Spectrum, 2012

(Robert, expert on on information technology and systems risk management, IEEE Spectrum, 6-8-12, http://spectrum.ieee.org/riskfactor/at-work/education/stem-education-in-the-us-is-more-or-less-needed, accessed 6/30/17, RCU)

Do we really know whether we have too few or too many STEM (Science, Technology, Engineering, and Mathematics) students to meet the future innovation and competitive needs of the US? That was one of the questions being addressed at a STEM conference on [measures for innovation and competitiveness](http://www.ieeeusa.org/calendar/conferences/stem/) that I attended this week in Washington, D.C. It was sponsored by several industry associations, including the American Association for the Advancement of Science (AAAS) and IEEE USA.

Since the 2007 publication of the influential National Science Foundation report, "[Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future](http://www.nap.edu/catalog.php?record_id=11463)," which examined the “erosion” of the “U.S. advantages in the marketplace and in science and technology” and which stated that a “coordinated federal effort is urgently needed to bolster U.S. competitiveness and pre-eminence in these areas,” there has been a bi-partisan consensus that  the way to reverse said erosion is to increase both the number of STEM graduates as well as STEM knowledge in the general student population, which has been on a [relative decline](http://www.nsf.gov/statistics/seind10/) over the past decade.

In response to the increasing concern over the dwindling supply of STEM students, back in 2009 the Obama Administration announced a $260 million government/private industry initiative called, “[Educate to Innovate](http://www.whitehouse.gov/the-press-office/president-obama-launches-educate-innovate-campaign-excellence-science-technology-en),” the aim of which was “to move American students to the top of the pack in science and math achievement over the next decade.”

More recently, the Administration proposed a new $100 million government/private industry [initiative](http://www.whitehouse.gov/the-press-office/2012/02/07/president-obama-host-white-house-science-fair) to train 100,000 STEM teachers and graduate 1 million additional STEM students over the next decade, an very ambitious goal given that about 167,000 students total [graduated](http://wraltechwire.com/business/tech_wire/news/blogpost/7485144/) with STEM degrees last year.

Even as these and dozens more [STEM initiatives](http://www.stemedcoalition.org/) have sprung up, there has been a lingering question about how much STEM professionals contribute to national innovation and competitiveness as well as [whether there truly is a STEM education shortfall](http://www.usnews.com/debate-club/should-foreign-stem-graduates-get-green-cards/no-shortage-of-qualified-american-stem-grads), and if so, by how much? Without good answers to these questions based on concrete data, national policy is formed and scarce national resources allocated based on anecdotal information which one can only hope provides the correct insights.

The speakers at the STEM workshop dug into these issues and more.  For instance, [Professor Richard Freeman](http://www.nber.org/~freeman/) from Harvard stated that while everyone generally agrees that “innovation” is critical to U.S.  economic and social progress, there aren’t good definitions of what the term means let alone how to measure innovation at a national level.  As a result, when R&D funding is reduced (as it has been for quite some time at the federal level in relation to GDP), no one is really sure what the effects are on future innovation and therefore economic or social progress.  Freeman proposed an approach to define and measure innovation (i.e., an "innovation index") so that when national policy decisions involving R&D funding are made there is some understanding as to what the end result will likely end up being.

In a similar vein, [Professor Nicholas Vonortas](http://elliott.gwu.edu/faculty/vonortas.cfm) from George Washington University spoke about the disconnect that seems to exist in US manufacturing and the role of STEM education.  He noted that the US manufacturing sector continues to [shrink](http://www.huffingtonpost.com/michele-nashhoff/manufacturing-jobs_b_1382704.html) from the size it once was (although it is [still the largest](http://www.seeitmarket.com/u-s-still-in-the-business-of-making-things/) in the world) and what remains increasingly depends on knowledge-intensive work. Furthermore, there exist high-skilled manufacturing jobs that are going unfilled and likely will continue to be for some time, as this Washington Post [story](http://www.washingtonpost.com/business/economy/us-manufacturing-sees-shortage-of-skilled-factory-workers/2012/02/17/gIQAo0MLOR_story.html) also noted a few months back.  This is important because in previous U.S. recessions, manufacturing has led the way out of them.  The assumption is that if these jobs go unfulfilled, what’s left of U. S. manufacturing will not only eventually disappear but the effects of the last recession and the current job stagnation will linger for a long time; therefore, the argument goes, if only there were more STEM graduates, the U.S. could at least preserve the manufacturing jobs that exist.

However, Vonortas noted that, when one digs into the data, most of the jobs going begging are apparently for production workers; not ones that would necessarily require STEM degrees.  In addition, manufacturing jobs may go begging because manufacturing is seen by students and their parents as a  poorly paying industry that doesn’t have a healthy long-term future.  Therefore, Vonortas says, there isn’t really any hard evidence to claim that the lack of STEM students is the problem or that more are the solution to maintaining U.S. manufacturing. U.S. policy makers may need to look at other avenues than STEM education to solve U.S. manufacturing issues.

One area where STEM students are needed is in aerospace and especially the defense industry. [Edward Swallow](http://www.irconnect.com/noc/press/pages/news_releases.html?d=175209) from Northrup Grumman discussed how aerospace and defense (A&D) is the leading employer of STEM professionals, but it is having a hard time attracting new STEM grads. One reason, similar to manufacturing, is that STEM graduates look at A&D as a declining industry, which given projected defense budget cuts, is not an unreasonable perspective.  Another is that usually U.S. citizenship and often a security clearance is required, which reduces those eligible to be employed. A third is that there are not a lot of exciting new aerospace or defense initiatives that spur the imagination of young engineers like there once were.

Swallow’s company and others in the A&D industry are pushing hard to increase the total number of STEM students (especially from minority groups and women) in order to meet their needs. But as another speaker, [Professor Ron Hira](http://www.rit.edu/news/experts.php?action=viewexpert&id=139) from Rochester Institute of Technology pointed out in his talk on the globalization of engineering and its impact, the US economy has created less than 50,000 new engineering jobs in the past decade. That lackluster performance can be attributed to both increased global competition and the [outsourcing](http://www.amazon.com/Outsourcing-America-National-Reclaim-American/dp/0814408680) of engineering and other STEM-related jobs even as 900,000 engineering students were graduating from colleges and universities.  The use of H-1B visas has also negatively impacted the availability of STEM jobs in the US, Hira argued.

All these factors may help explain why [only about half](http://cew.georgetown.edu/stem/) of those graduating with undergraduate STEM degrees actually work in the STEM-related fields after college, and after 10 years, only some eight percent still do. I should note that those with STEM degrees do seem to enjoy higher salaries than non-STEM degree co-workers in any field they so choose, which may be the best reason to get one.

By the end of the conference it was pretty clear that the assumption that a [major increase in STEM educational funding](http://www.cnn.com/2012/02/09/opinion/bennett-stem-education/index.html) is absolutely required for the US to avert future economic decline is not well tested. Funding may well be needed, but the current data provide mixed support.  I’ll provide a link to the speaker presentation videos when it appears, but in the meantime, you may want to read the Spectrum [article on jobless innovation](http://spectrum.ieee.org/at-work/innovation/jobless-innovation) that made many of the same points the speakers at the conference did.

#### No solvency – STEM jobs are deemed unattractive and Americans can’t out-compete foreign workers

Matloff, Computer Science professor at UC Davis, 2013

(Norman, *Economic Policy Institute*, “Are foreign students ‘the best and the brightest’?,” 2-28-13, http://www.epi.org/publication/bp356-foreign-students-best-brightest-immigration-policy/, 7-1-17, , RCU).

A term currently popular in STEM policymaker circles is diversion, referring to workers with a bachelor’s degree or higher in STEM but who work in non-STEM fields (Bernstein, Lowell, and Martin 2011; Carnevale, Smith, and Melton 2011). Though this is a recognition of the fact that there is indeed an internal brain drain occurring in STEM, it does not address the questions of why this is occurring. The issue is addressed in this section, and the nexus of this internal brain drain with the H-1B and other foreign worker programs will be shown.

On July 7, 2012, the Washington Post (Vastag 2012) reported on a major study by a high-level committee in the National Institutes of Health (NIH). The main findings were that the vast majority of those with doctorates in the life sciences are never able to secure a research job in the field, even after years of low-paid postdoctoral research work. The article illustrated the point with personal cases, such as a woman with a doctorate in neuroscience now working as an administrative assistant.

Readers who followed up by watching the video presentation of the NIH report (NIH 2012) may have been startled to find that the H-1B visa is part of the oversupply problem; the video mentioned the role of foreign researchers in the United States at several points. Approximately 54 percent of postdoctoral researchers are foreign, most of them on H-1B visas (Davis 2006). The NIH committee also stated that the resulting huge labor surplus, and the ensuing low wages and poor career prospects, are driving many of the nation’s best and brightest out of the field.

The diversion of educated workers due to the foreign influx is not at all limited to the lab sciences. A team of Berkeley economists identified this same problem in the CS/EE context in 1998 and elaborated on the point in a 2009 book (Brown and Linden 2009):

…high-tech engineers and managers have experienced lower wage growth than their counterparts nationally. …Why hasn’t the growth of high-tech wages kept up? …Foreign students are an important part of the story. …Approximately one-half of engineering Ph.D.s and one-third of engineering MSs were granted to foreign-born students in the mid-1990s. (Brown, Campbell, and Pinsonneault 1998, emphasis added)

The H-1B-caused internal brain drain was actually anticipated, if not actually planned, in the government’s central science agency back in 1989. The Policy Research and Analysis (PRA) division of the National Science Foundation (NSF) complained that Ph.D. salaries were too high. In an unpublished report, PRA proposed a remedy in the form of importing a large number of foreign students, stating:

These salary data show that real Ph.D.-level pay began to rise after 1982, moving from $52,000 to $64,000 in 1987 (measured in 1984 dollars). One set of salary projections show that real pay will reach $75,000 in 1996 and approach $100,000 shortly beyond the year 2000. …

[To] the extent that increases in foreign student enrollments in doctoral programs decline or turn negative for reasons other than state or national policies it may be in the national interest to actively encourage foreign students. …

A growing influx of foreign Ph.D.s into U.S. labor markets will hold down the level of Ph.D. salaries. …[The Americans] will select alternative career paths…by choosing to acquire a “professional” degree in business or law, or by switching into management as rapidly as possible after gaining employment in private industry…[as] the effective premium for acquiring a Ph.D. may actually be negative. (Weinstein 1998; emphasis added)

It is not clear whether the PRA report represented official NSF policy. However, the report did correctly project that the H-1B and related programs would drive American students away from doctoral study, i.e., would cause an internal brain drain in STEM.

Significantly, the PRA accurately forecast that the STEM wage suppression would cause American students to shift to business and law. As seen earlier, the PERM data show that Microsoft pays its financial analysts and lawyers much more than it pays its engineers.

Former Federal Reserve chairman Alan Greenspan has made a number of public statements advocating the importation of foreign tech workers as a means of holding down salaries (Thibodeau 2009). (Greenspan referred to tech workers as a “privileged elite,” apparently not placing the much higher-paid professions in the legal field and on Wall Street in that category.) The congressionally commissioned National Research Council study also concluded that H-1B adversely impacts tech wages (NRC 2001, 187).

Note that diversion cannot be viewed as a failure of the American K-12 educational system, as is often claimed. True, some students are weak in STEM or are disinterested in it, but the points made above apply to students who are skilled at STEM, and who do specialize in STEM in college. As remarked above, the issue of diversion concerns workers who have bachelor’s degrees in STEM but who, either immediately after attaining their degrees or later on, are working outside of STEM. Indeed, in the NIH study discussed above, the workers have doctorates in STEM, plus years of postdoctoral work.

As noted, the NIH fretted that the H-1B visa is resulting in loss of career to many Americans in lab science. In addition, the stagnant salaries caused by the foreign influx discourage young people from pursuing a career in STEM. Young people see these market signals and respond accordingly. Even many Indian immigrant engineers’ children see the tech field as unstable, subject to outsourcing to India (Grimes 2005). The talents STEM students have been applying—keen quantitative insight, good problem-solving and analytical skills, and so on—are much more highly rewarded outside STEM, as exemplified by the Microsoft salary analysis above. Georgetown University researcher Anthony Carnevale has remarked, “If you’re a high math student in America, from a purely economic point of view, it’s crazy to go into STEM” (Light and Silverman 2011).

A Forbes Magazine article cites the troubling effects of stagnant salaries and offshoring:

Between 2003 and 2006 the percentage of graduates from MIT going into financial services rose from 13 percent to almost 25 percent. …One can hardly blame these young hires. Financial firms offer considerably higher pay, better career prospects and insulation against off-shoring, than traditional science and engineering companies. … (Schramm 2011)

Gavin (2005) summarized the connection made by Richard Freeman of Harvard:

In his paper, Freeman argues that fewer American-born workers pursue science and engineering not only because they have more career choices than foreign workers, but also because some choices offer better wages. Average annual salaries for lawyers, for example, amounted to more than $20,000 above those for doctoral-level engineers and $50,000 more than those for life scientists with doctorates, according to Census data that Freeman cites in the paper….

U.S. companies, he added in an interview, have been quite willing to encourage a foreign supply of technical workers. This has allowed them to pay lower wages, but it has also created conditions that make science and engineering less attractive to Americans.

“You can’t say, ‘I want more visas’ and ‘I expect more Americans to enter the field,’” Freeman said. “The thing that always strikes me about these business guys is they never say, ‘We should be paying higher salaries.’”20

This internal brain drain might have been justified if the foreign workers were of higher caliber than the Americans, but, as shown earlier, this is not the case. The consistent theme in the results here has been that the immigrant engineers and programmers who first come to the United States on student visas—the group the industry lobbyists claim are most talented—are quite similar to the Americans in talent, or are of lesser talent than the Americans, contrary to the “genius” image projected by the industry.

### A2 STEM solves economy

#### STEM alone kills the economy, a holistic approach to education is key to forming a sustainable workforce and accessing the affs internal link to heg

Billimoria, Founder, Child and Youth Finance International, May 5, 2017

(Jeroo Billimoria, Founder, Child and Youth Finance International, “Is STEM education all it’s cracked up to be?”, pub 5/5/17, acc 7/5/17, https://medium.com/world-economic-forum/is-stem-education-all-its-cracked-up-to-be-d73d3364b8dd) eluth

STEM (science, technology, engineering and mathematics) is a buzzword for economic development and growth, frequently touted as a many-fold solution to prepare young people for employment, support the national workforce, and promote innovation and explore methods for accelerating future development. But is STEM education really the silver bullet? Does it truly boost economic growth and support the nation’s workforce? And is STEM the best way to equip young people with the skills, knowledge and opportunities to ensure they can be capable and responsible citizens? I believe that focusing solely on STEM presents a one-dimensional “fix” which fails to consider the many other factors that influence economic growth and development from context to context. Instead, a holistic approach is needed to equip the future workforce and secure economic development for emerging and modern economies alike. To adequately invest in the future, the creation of a generation of economic citizens is key to boosting economic growth and breaking ongoing cycles of poverty. Putting all our egg(head)s in one basket Although there are many opportunities and benefits linked to a solid STEM infrastructure and development of skills within a country, the current emphasis placed on investment in this sector pays little regard to the limitations resulting from a reliance on this subject area. In addition, STEM offers only a one-dimensional solution, which is inadequate for the multi-dimensional reality of economic development and growth. Rapidly changing technologies and global competition make it very difficult to predict occupational needs. While there is a need for scientific and technological knowledge in all countries, it has been suggested that there is not as big a shortage of STEM-related workers as previously thought. In addition, too much focus on STEM alone runs the risk of over-saturating certain sectors rather than producing a well-rounded workforce. There continues to be heavy emphasis on supporting STEM education as an answer to contributing to educational opportunities, strengthening the national workforce and supporting the economy for both emerging and developed economies. However, focusing on STEM is not enough. Educating young people in these subject areas may ensure they are experts on specific topics, but it does not necessarily create conscientious citizens who are capable of making responsible social and financial decisions. If we look to the recent financial crisis, lax monetary policies and inadequate corporate governance, which contributed to the global recession, were exacerbated by poor assessment of risks and a lack of regulatory transparency. This suggests a deficiency in responsible decision-making rather than a lack of expert subject knowledge — and while most of today’s youth will not deal directly with macroeconomic issues, every citizen contributes to the social and economic wellbeing of their country. So, what’s the answer? Making sure all young people receive the education and training to become responsible economic citizens is key to securing future economic stability. Presenting a comprehensive solution for empowering youth A holistic approach to educating and equipping young people with knowledge and skills presents a more comprehensive solution than relying on a one-sided focus like STEM education. Child and Youth Finance International promotes a model of economic citizenship, where economic and civic engagement promotes sustainable livelihoods, sustainable economic and financial well-being, a reduction in poverty and rights for self and others. Economic citizenship consists of three key elements: financial inclusion, financial education and social and livelihoods education. These building blocks of economic citizenship compliment the idea of financial inclusion with a focus on education and create a more holistic approach. To ensure a well-rounded workforce, young people must be provided with a comprehensive social, financial and livelihoods education and have the opportunity to develop a range of skills. UNICEF highlights that the importance of financial, social and livelihoods education has become increasingly discussed by a range of sectors and notes that it is becoming more important for young people to become competent and confident in achieving results to the best of their abilities. Combining livelihoods education with financial and social education and financial inclusion provides young people with the skills and knowledge they need to be responsible, capable citizens. Ensuring education is supported with economic and civic engagement can help nations fill the gaps resulting from a singular focus on these subjects and offer a holistic approach to addressing a range of social, economic and developmental issues for countries around the world. It is crucial that we adequately support the employees of tomorrow to prevent financial crises and support future economic stability. Aflatoun International found that, within their primary school programme, 91% of children had positive savings attitudes after participating in social and financial education. The research noted the benefits of early-age intervention and noted the success of social and financial education programmes, which are taught in a holistic manner. In addition to social, financial and livelihoods education, nations must work towards enhancing the skill-sets of young people entering the workforce — the OECD notes that “many education systems increasingly recognize the importance of developing students’ skills and understanding for tomorrow’s innovation societies”. In addition to avoiding a narrow and potentially incorrect forecast which comes with investing heavily in STEM subjects, providing young people with a multi-faceted education, skill development and access to services can offer enhanced opportunities, as companies often prefer strong basics to narrow expertise. Alongside the jobs they hold, children and youth represent the future economic actors that will influence the future of local and global economies through their financial decisions. A holistic approach is key to allowing children and youth to become more aware, empowered, responsible and integrated into the socio-economic life of their community. By promoting economic citizenship for youth, combining livelihoods education with social education, financial education and financial inclusion should be considered a long-term strategy for sustainable youth development, and one that can fit within the framework of the 2030 Development Agenda. Offering a comprehensive opportunity to nations can enable them to cater to the needs of their young people — enhancing financial literacy, teaching about social responsibilities and rights, or providing youth-friendly banking products and services, where necessary. This, combined with investment in livelihoods education and skills, can truly support the development of education systems, the creation of jobs and the future stability of economies worldwide. Investing in STEM is not enough, but adequately investing in the needs and capabilities of our young people presents a real solution and the chance to create a sustainable future. By promoting economic citizenship for young people, we can get to the root of the problem.

### A2 Competitiveness is good – Krugman

#### Catering to competitiveness leads to economic decline

Krugman; macroeconomics, trade, health care, social policy and politics; 2011

(Paul, The New York Times, “The Competition Myth,” 01/23/2011, <http://www.nytimes.com/2011/01/24/opinion/24krugman.html>, accessed 07/01/2017, AS)

But let’s not kid ourselves: talking about “competitiveness” as a goal is fundamentally misleading. At best, it’s a misdiagnosis of our problems. At worst, it could lead to policies based on the false idea that what’s good for corporations is good for America.

About that misdiagnosis: What sense does it make to view our current woes as stemming from lack of competitiveness?

It’s true that we’d have more jobs if we exported more and imported less. But the same is true of Europe and Japan, which also have depressed economies. And we can’t all export more while importing less, unless we can find another planet to sell to. Yes, we could demand that China shrink its trade surplus — but if confronting China is what Mr. Obama is proposing, he should say that plainly.

Furthermore, while America is running a trade deficit, this deficit is smaller than it was before the Great Recession began. It would help if we could make it smaller still. But ultimately, we’re in a mess because we had a financial crisis, not because American companies have lost their ability to compete with foreign rivals.

But isn’t it at least somewhat useful to think of our nation as if it were America Inc., competing in the global marketplace? No.

Consider: A corporate leader who increases profits by slashing his work force is thought to be successful. Well, that’s more or less what has happened in America recently: employment is way down, but profits are hitting new records. Who, exactly, considers this economic success?

Still, you might say that talk of competitiveness helps Mr. Obama quiet claims that he’s anti-business. That’s fine, as long as he realizes that the interests of nominally “American” corporations and the interests of the nation, which were never the same, are now less aligned than ever before.

Take the case of General Electric, whose chief executive, Jeffrey Immelt, has just been appointed to head that renamed advisory board. I have nothing against either G.E. or Mr. Immelt. But with fewer than half its workers based in the United States and less than half its revenues coming from U.S. operations, G.E.’s fortunes have very little to do with U.S. prosperity.

By the way, some have praised Mr. Immelt’s appointment on the grounds that at least he represents a company that actually makes things, rather than being yet another financial wheeler-dealer. Sorry to burst this bubble, but these days G.E. derives more revenue from its financial operations than it does from manufacturing — indeed, GE Capital, which received a government guarantee for its debt, was a major beneficiary of the Wall Street bailout.

So what does the administration’s embrace of the rhetoric of competitiveness mean for economic policy?

The favorable interpretation, as I said, is that it’s just packaging for an economic strategy centered on public investment, investment that’s actually about creating jobs now while promoting longer-term growth. The unfavorable interpretation is that Mr. Obama and his advisers really believe that the economy is ailing because they’ve been too tough on business, and that what America needs now is corporate tax cuts and across-the-board deregulation.

My guess is that we’re mainly talking about packaging here. And if the president does propose a serious increase in spending on infrastructure and education, I’ll be pleased.

But even if he proposes good policies, the fact that Mr. Obama feels the need to wrap these policies in bad metaphors is a sad commentary on the state of our discourse.

The financial crisis of 2008 was a teachable moment, an object lesson in what can go wrong if you trust a market economy to regulate itself. Nor should we forget that highly regulated economies, like Germany, did a much better job than we did at sustaining employment after the crisis hit. For whatever reason, however, the teachable moment came and went with nothing learned.

Mr. Obama himself may do all right: his approval rating is up, the economy is showing signs of life, and his chances of re-election look pretty good. But the ideology that brought economic disaster in 2008 is back on top — and seems likely to stay there until it brings disaster again.

### A2 Competitiveness is real – Krugman

#### The theory of competitiveness is flawed – the econ is not zero-sum and foreign competition is positive

Krugman, economist and New York Times columnist, 1994

(Paul, “Competiveness: A Dangerous Obsession”,*Foreign Affairs,*March/April 1994, n.d., page 34-35, RCU).

How can this be in our interdependent world? Part of the answer is that the world is not as interdependent as you might think: countries are nothing at all like corporations. Even today, U.S. exports are only lo percent of the value-added in the economy (which is equal to GNP). That is, the United States is still almost 90 percent an economy that produces goods and services for its own use. By contrast, even the largest corporation sells hardly any of its output to its own workers; the "exports" of General Motors—its sales to people who do not work there—are virtually all of its sales, which are more than 2.5 times the corporation's value-added.

Moreover, countries do not compete with each other the way corporations do. Coke and Pepsi are almost purely rivals: only a negligible fraction of Coca-Colas sales go to Pepsi workers, only a negligible fraction of the goods Coca-Cola workers buy are Pepsi products. So if Pepsi is successful, it tends to be at Coke's expense. But the major industrial countries, while they sell products that compete with each other, are also each other's main export markets and each other's main suppliers of useful imports. If the European economy does well, it need not be at U.S. expense; indeed, if anything a successful European economy is likely to help the U. S. economy by providing it with larger markets and selling it goods of superior quality at lower prices.

International trade, then, is not a zero-sum game. When productivity rises in Japan, the main result is a rise in Japanese real wages; American or European wages are in principle at least as likely to rise as to fall, and in practice seem to be virtually unaffected.

It would be possible to belabor the point, but the moral is clear: while competitive problems could arise in principle, as a practical, empirical matter the major nations of the world are not to any significant degree in economic competition with each other. Of course, there is always a rivalry for status and power—countries that grow faster will see their political rank rise. So it is always interesting to compare countries. But asserting that Japanese growth diminishes U.S. status is very different from saying that it reduces the U.S. standard of living—and it is the latter that the rhetoric of competitiveness asserts.

One can, of course, take the position that words mean what we want them to mean, that all are free, if they wish, to use the term "competitiveness" as a poetic way of saying productivity, without actually implying that international competition has anything to do with it. But few writers on competitiveness would accept this view. They believe that the facts tell a very different story, that we live, as Lester Thurow put it in his best-selling book. Head to Head, in a world of "win-lose" competition between the leading economies. How is this belief possible?

#### The notion of competiveness distracts from real issues and encourages flawed solutions

Krugman, economist and New York Times columnist, 1994

(Paul, “Competiveness: A Dangerous Obsession”,*Foreign Affairs,*March/April 1994, n.d., page 39-40, RCU).

T H E COMPETITIVE metaphor—the image of countries competing with each other in world markets in the same way that corporations do—derives much of its attractiveness from its seeming comprehensibility. Tell a group of businessmen that a country is like a corporation writ large, and you give them the comfort of feeling that they already understand the basics. Try to tell them about economic concepts like comparative advantage, and you are asking them to learn something new. It should not be surprising if many prefer a doctrine that offers the gain of apparent sophistication without the pain of hard thinking. The rhetoric of competitiveness has become so widespread, however, for three deeper reasons.

First, competitive images are exciting, and thrills sell tickets. The subtitle of Lester Thurow’s huge best-seller. Head to Head, is "The Coming Economic Battle among Japan, Europe, and America"; the jacket proclaims that "the decisive war of the century has begun . . . and America may already have decided to lose." Suppose that the subtitle had described the real situation: "The coming struggle in which each big economy will succeed or fail based on its own efforts, pretty much independently of how well the others do." Would Thurow have sold a tenth as many books?

Second, the idea that U.S. economic difficulties hinge crucially on our failures in international competition somewhat paradoxically makes those difficulties seem easier to solve. The productivity of the average American worker is determined by a complex array of factors, most of them unreachable by any likely government policy. So if you accept the reality that our "competitive" problem is really a domestic productivity problem pure and simple, you are unlikely to be optimistic about any dramatic turnaround. But if you can convince yourself that the problem is really one of failures in international competition—that imports are pushing workers out of high-wage jobs, or subsidized foreign competition is driving the United States out of the high value-added sectors—then the answers to economic malaise may seem to you to involve simple things like subsidizing high technology and being tough on Japan.

Finally, many of the world's leaders have found the competitive metaphor extremely useful as a political device. The rhetoric of competitiveness turns out to provide a good way either to justify hard choices or to avoid them. The example of Delors in Copenhagen shows the usefulness of competitive metaphors as an evasion. Delors had to say something at the EC summit; yet to say anything that addressed the real roots of European unemployment would have involved huge political risks. By turning the discussion to essentially irrelevant but plausible-sounding questions of competitiveness, he bought himself some time to come up with a better answer (which to some extent he provided in December's white paper on the European economy—a paper that still, however, retained "competitiveness" in its title).

#### Promoting a competitive ideology is problematic – misuse of funds, trade wars, and bad policymaking

Krugman, economist and New York Times columnist, 1994

(Paul, “Competiveness: A Dangerous Obsession”,*Foreign Affairs,*March/April 1994, n.d., page 41-44, RCU).

Thinking and speaking in terms of competitiveness poses three real dangers. First, it could result in the wasteful spending of government money supposedly to enhance U.S. competitiveness. Second, it could lead to protectionism and trade wars. Finally, and most important, it could result in bad public policy on a spectrum of important issues.

During the 1950s, fear of the Soviet Union induced the U.S. government to spend money on useful things like highways and science education. It also, however, led to considerable spending on more doubtful items like bomb shelters. The most obvious if least worrisome danger of the growing obsession with competitiveness is that it might lead to a similar misallocation of resources. To take an example, recent guidelines for government research funding have stressed the importance of supporting research that can improve U.S. international competitiveness. This exerts at least some bias toward inventions that can help manufacturing firms, which generally compete on international markets, rather than service producers, which generally do not. Yet most of our employment and value-added is now in services, and lagging productivity in services rather than manufactures has been the single most important factor in the stagnation of U.S. living standards.

A much more serious risk is that the obsession with competitiveness will lead to trade conflict, perhaps even to a world trade war. Most of those who have preached the doctrine of competitiveness have not been old-fashioned protectionists. They want their countries to win the global trade game, not drop out. But what if, despite its best efforts, a country does not seem to be winning, or lacks confidence that it can? Then the competitive diagnosis inevitably suggests that to close the borders is better than to risk having foreigners take away high-wage jobs and high-value sectors. At the very least, the focus on the supposedly competitive nature of international economic relations greases the rails for those who want confrontational if not frankly protectionist policies.

We can already see this process at work, in both the United States and Europe. In the United States, it was remarkable how quickly the sophisticated interventionist arguments advanced by Laura Tyson in her published work gave way to the simple-minded claim by U.S. Trade Representative Mickey Kantor that Japan's bilateral trade surplus was costing the United States millions of jobs. And the trade rhetoric of President Clinton, who stresses the supposed creation of high-wage jobs rather than the gains from specialization, left his administration in a weak position when it tried to argue with the claims of NAFTA foes that competition from cheap Mexican labor will destroy the U.S. manufacturing base.

Perhaps the most serious risk from the obsession with competitiveness, however, is its subtle indirect effect on the quality of economic discussion and policymaking. If top government officials are strongly committed to a particular economic doctrine, their commitment inevitably sets the tone for policy-making on all issues, even those which may seem to have nothing to do with that doctrine. And if an economic doctrine is flatly, completely and demonstrably wrong, the insistence that discussion adhere to that doctrine inevitably blurs the focus and diminishes the quality of policy discussion across a broad range of issues, including some that are very far from trade policy per se.

Consider, for example, the issue of health care reform, undoubtedly the most important economic initiative of the Clinton administration, almost surely an order of magnitude more important to U.S. living standards than anything that might be done about trade policy (unless the United States provokes a full-blown trade war). Since health care is an issue with few direct international linkages, one might have expected it to be largely insulated from any distortions of policy resulting from misguided concerns about competitiveness.

But the administration placed the development of the health care plan in the hands of Ira Magaziner, the same Magaziner who so conspicuously failed to do his homework in arguing for government promotion of high value-added industries. Magaziner's prior writings and consulting on economic policy focused almost entirely on the issue of international competition, his views on which may be summarized by the title of his 1990 book, The Silent War. His appointment reflected many factors, of course, not least his long personal friendship with the first couple. Still, it was not irrelevant that in an administration committed to the ideology of competitiveness Magaziner, who has consistently recommended that national industrial policies be based on the corporate strategy concepts he learned during his years at the Boston Consulting Group, was regarded as an economic policy expert.

We might also note the unusual process by which the health care reform was developed. In spite of the huge size of the task force, recognized experts in the health care field were almost completely absent, notably though not exclusively economists specializing in health care, including economists with impeccable liberal credentials like Henry Aaron of the Brookings Institution. Again, this may have reflected a number of factors, but it is probably not irrelevant that anyone who, like Magaziner, is strongly committed to the ideology of competitiveness is bound to have found professional economists notably unsympathetic in the past -- and to be unwilling to deal with them on any other issue.

To make a harsh but not entirely unjustified analogy, a government wedded to the ideology of competitiveness is as unlikely to make good economic policy as a government committed to creationism is to make good science policy, even in areas that have no direct relationship to the theory of evolution.

### Heg impact – decline now

#### US Heg in decline now, China and India are shaping a multi polar world

Layne, University Distinguished Professor, Robert M. Gates Chair in National Security, 2009

(Christopher Layne, University Distinguished Professor, Robert M. Gates Chair in National Security, Professor of International Affairs, “Review: The Waning of U. S. Hegemony—Myth or Reality? A Review Essay”, pub Summer 2009, acc 7/5/17, <http://www.jstor.org/stable/40389188)> eluth

China, India, and possibly Russia are emerging great powers.16 As Global Trends 2025 points out, the rise of China and India to great power status will re- store each to "the positions they held two centuries ago when China produced approximately 30 percent and India 15 percent of the world's wealth" (p. 7). Their ascent is being propelled by "the global shift in relative wealth and economic power" from North America and the Euro- Atlantic world to Asia - a shift "without precedent in modern history" (ibid.). By 2025, China figures to have the world's second-largest economy (measured by gross domestic prod- uct [GDPD and will be a first-rank military power (p. 30). India, buoyed by its strong economic growth rate, will "strive for a multipolar system with New Delhi as one of the poles" (ibid.). Although both states could encounter speed bumps that might slow - or even derail - their ascents to great power status, the NIC believes that the "chances are good that China and India will continue to rise" (p. 29).17 Because of uncertainties about economics, energy prices, domestic gover- nance issues, and especially demography, Russia's great power trajectory is more problematic than China's or India's (pp. 31-32).18 Between 2009 and 2025, Russia's population is forecast to drop from 141 million to below 130 mil- lion, affecting the availability of manpower for both the military and the labor pools (pp. 23-24, 30). If Russia overcomes its demographic challenge and con- tinues its revival as a great power, however, the NIC believes it "will be a lead- ing force in opposition to U.S. global dominance" (p. 32). Because its great power status is closely tied to its ability to control both the energy resources and pipelines of Central Asia and the Caucasus, Russia will also seek to rees- tablish its sphere of influence in the "near abroad" (pp. 32, 82). According to the NIC, in addition to relative decline, the United States will confront other constraints on its international role. U.S. military supremacy will no longer be as dominant as it has been since the Cold War's end (p. 93). The United States' soft power may diminish as its liberal model of political and economic development is challenged by authoritarian/statist alternatives (pp. 3, 8-9, 13-14). At home, economic and political constraints may under- mine U.S. hegemony.

### Heg impact – defense

#### No impact to hegemony – no correlation between US activism and stability

Fettweis, Tulane University political science professor, 11

(Christopher, 9/26/11, Comparative Strategy, 30: 316–332, “Free Riding or Restraint? Examining European Grand Strategy,” <http://www.tandfonline.com/doi/abs/10.1080/01495933.2011.605020#.U8Fu9vldWQx>, accessed 7-5-14)

It is perhaps worth noting that there is no evidence to support a direct relationship between the relative level of U.S. activism and international stability. In fact, the limited data we do have suggest the opposite may be true. During the 1990s, the United States cut back on its defense spending fairly substantially. By 1998, the United States was spending $100 billion less on defense in real terms than it had in 1990.51 To internationalists, defense hawks and believers in hegemonic stability, this irresponsible “peace dividend” endangered both national and global security. “No serious analyst of American military capabilities,” argued Kristol and Kagan, “doubts that the defense budget has been cut much too far to meet America’s responsibilities to itself and to world peace.”52 On the other hand, if the pacific trends were not based upon U.S. hegemony but a strengthening norm against interstate war, one would not have expected an increase in global instability and violence. The verdict from the past two decades is fairly plain: The world grew more peaceful while the United States cut its forces. No state seemed to believe that its security was endangered by a less-capable United States military, or at least none took any action that would suggest such a belief. No militaries were enhanced to address power vacuums, no security dilemmas drove insecurity or arms races, and no regional balancing occurred once the stabilizing presence of the U.S. military was diminished. The rest of the world acted as if the threat of international war was not a pressing concern, despite the reduction in U.S. capabilities. Most of all, the United States and its allies were no less safe. The incidence and magnitude of global conflict declined while the United States cut its military spending under President Clinton, and kept declining as the Bush Administration ramped the spending back up. No complex statistical analysis should be necessary to reach the conclusion that the two are unrelated. Military spending figures by themselves are insufficient to disprove a connection between overall U.S. actions and international stability. Once again, one could presumably argue that spending is not the only or even the best indication of hegemony, and that it is instead U.S. foreign political and security commitments that maintain stability. Since neither was significantly altered during this period, instability should not have been expected. Alternately, advocates of hegemonic stability could believe that relative rather than absolute spending is decisive in bringing peace. Although the United States cut back on its spending during the 1990s, its relative advantage never wavered. However, even if it is true that either U.S. commitments or relative spending account for global pacific trends, then at the very least stability can evidently be maintained at drastically lower levels of both. In other words, even if one can be allowed to argue in the alternative for a moment and suppose that there is in fact a level of engagement below which the United States cannot drop without increasing international disorder, a rational grand strategist would still recommend cutting back on engagement and spending until that level is determined. Grand strategic decisions are never final; continual adjustments can and must be made as time goes on. Basic logic suggests that the United States ought to spend the minimum amount of its blood and treasure while seeking the maximum return on its investment. And if the current era of stability is as stable as many believe it to be, no increase in conflict would ever occur irrespective of U.S. spending, which would save untold trillions for an increasingly debt-ridden nation. It is also perhaps worth noting that if opposite trends had unfolded, if other states had reacted to news of cuts in U.S. defense spending with more aggressive or insecure behavior, then internationalists would surely argue that their expectations had been fulfilled. If increases in conflict would have been interpreted as proof of the wisdom of internationalist strategies, then logical consistency demands that the lack thereof should at least pose a problem. As it stands, the only evidence we have regarding the likely systemic reaction to a more restrained United States suggests that the current peaceful trends are unrelated to U.S. military spending. Evidently the rest of the world can operate quite effectively without the presence of a global policeman. Those who think otherwise base their view on faith alone.

### Econ impact – defense

#### No impact to economic decline – new data

Drezner 14 Daniel, IR prof at Tufts, The System Worked: Global Economic Governance during the Great Recession, World Politics, Volume 66. Number 1, January 2014, pp. 123-164

The final significant outcome addresses a dog that hasn't barked: the effect of the Great Recession on cross-border conflict and violence. During the initial stages of the crisis, multiple analysts asserted that the financial crisis would lead states to increase their use of force as a tool for staying in power.42 They voiced genuine concern that the global economic downturn would lead to an increase in conflict—whether through greater internal repression, diversionary wars, arms races, or a ratcheting up of great power conflict. Violence in the Middle East, border disputes in the South China Sea, and even the disruptions of the Occupy movement fueled impressions of a surge in global public disorder. The aggregate data suggest otherwise, however. The Institute for Economics and Peace has concluded that "the average level of peacefulness in 2012 is approximately the same as it was in 2007."43 Interstate violence in particular has declined since the start of the financial crisis, as have military expenditures in most sampled countries. Other studies confirm that the Great Recession has not triggered any increase in violent conflict, as Lotta Themner and Peter Wallensteen conclude: "[T]he pattern is one of relative stability when we consider the trend for the past five years."44 The secular decline in violence that started with the end of the Cold War has not been reversed. Rogers Brubaker observes that "the crisis has not to date generated the surge in protectionist nationalism or ethnic exclusion that might have been expected."43

#### The US isn’t key to the global economy

Kenny 2015 (Charles; Why the Developing World Won't Catch the U.S. Economy's Cold; May 4; www.bloomberg.com/news/articles/2015-05-04/why-the-developing-world-won-t-catch-the-u-s-economy-s-cold; kdf)

Last week the U.S. Commerce Department announced that first-quarter GDP growth for 2015 was an anemic 0.2 percent. This immediately sparked fears that a U.S. slowdown could lead to a global recession. But the cliché about America sneezing and the rest of the world catching the cold doesn’t hold like it used to. The U.S. isn’t as contagious as it was, and developing countries in particular are far more robust to economic shocks. That’s good news for everyone. It means less volatility in Asia, Africa, and Latin America, which contributes to happier people, greater political stability, and stronger long-term growth—all of which should help lift the U.S. out of its own doldrums.

## ARTS TRADE-OFF

### 1NC Arts trade-off turn

#### STEM is complete hype— increase trades off with liberal arts

Ossola, science writer in Popular Science, Motherboard, and Scienceline, 2014

(Alexandra, *The Atlantic*, “Is the U.S. Focusing Too Much on STEM,” 12/03/2014, <https://www.theatlantic.com/education/archive/2014/12/is-the-us-focusing-too-much-on-stem/383353/>, accessed 06/30/2017, AS)

There’s been so much hype around STEM education that sometimes people forget what the acronym even stands for. It’s easy to lose sight of what STEM means in practice when school boards and politicians and CEOs describe its economic impact and tout its importance, oftentimes because it’s simply what they think people want to hear. Some economists have even questioned the statistics these STEM advocates cite to validate their programs and actions. STEM can sometimes be an overused buzzword, the negative impacts of which are felt by students who don’t get a quality, well-rounded education. But in general its hype is justified because students simply need greater scientific and technological literacy than they did before to function in today’s society and economy. “Anything that gets this kind of buzzword character tends to lose some of its real meaning in the process,” said [Michael Teitelbaum](http://www.law.harvard.edu/programs/lwp/people/staffBios/LWPstaff_michael_teitelbaum.html), a senior research associate with the Labor and Worklife Program at Harvard Law School and author of the new book [Falling Behind? Boom, Bust, and the Global Race for Scientific Talent](http://press.princeton.edu/titles/10208.html). STEM as an acronym has provided a strong basis for the movement that has grown around it. The history of the term is a little murky, but [Judith Ramaley](http://www.pdx.edu/hatfieldschool/judith-ramaley), who was then the Assistant Director of Education and Human Resources at the National Science Foundation, claims to have first suggested the term in 2001. This was a simple reordering of a previous acronym: SMET. “STEM just sounded better,” Ramaley said in a recent phone call. And while she’s not sure how much of the movement comes down to the acronym itself, she does know that “SMET is hard to rally around.” The acronym was a timely change for a series of subject areas that were rapidly moving into the national conversation. According to [David Drew](http://www.cgu.edu/pages/388.asp), an education professor at Claremont Graduate University in California and author of the book [STEM the Tide: Reforming Science, Technology, Engineering, and Math Education In America](http://books.google.com/books?id=lbLPfg_VkpgC&printsec=frontcover&dq=david+drew+stem+book&hl=en&sa=X&ei=6VVpVJr5F_PbsASOt4LICA&ved=0CB0Q6AEwAA#v=onepage&q=david%20drew%20stem%20book&f=false), three forces sparked the national discussion about STEM education. The first is a profound shift in the way the country’s economy functions, he said. Since the 1960s the U.S. economy has [moved closer](http://www.ritholtz.com/blog/2012/01/the-shift-from-manufacturing-to-service-economy/) to becoming a true service economy, with more members of the workforce devoting their time to customers and less time to the product itself, like they did in the earlier part of the 20th century when the economy was more focused on manufacturing. U.S. technology companies like Apple and IBM have been a big part of this shift, wrote Natalie McCullough, then the chief marketing officer at a renewal-focused firm called ServiceSource, in a [2012 article](http://www.forbes.com/sites/ciocentral/2012/04/19/services-not-manufacturing-will-revive-the-u-s-workforce/)in Forbes. “There’s a much more interesting domestic phenomenon here: the rise of high growth and high-value technicians who deliver a new world of advanced services for businesses and consumers alike,” she wrote. While some economists and policy makers [have predicted](http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinalyjuly14_1.pdf) a growthin STEM careers by 2018, the notion that the country will experience a shortage of scientists has more recently [been](http://cis.org/no-stem-shortage) [discredited](http://spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth) by education experts and academics. The second force that brought STEM to the forefront, Drew said, is “the recognition and frustration that we are setting up unnecessary unfair barriers for people.” By this he refers to the [unequal](https://www.theatlantic.com/education/archive/2014/10/the-female-pioneers-who-changed-stem-forever/381857/) [access](https://www.theatlantic.com/education/archive/2014/11/the-challenge-of-being-a-rural-science-teacher/382309/) to quality STEM education throughout the country, as well as the discrimination and discouragement faced by students who do try to pursue further education in these fields. This work has been covered extensively in the popular and scholarly media (I’ve [written](https://www.theatlantic.com/education/archive/2014/10/the-female-pioneers-who-changed-stem-forever/381857/) [about it](https://www.theatlantic.com/education/archive/2014/11/too-many-kids-quit-science-because-they-dont-think-theyre-smart/382165/), too) and has inspired  numerous initiatives, from mobile [DIY-engineering spaces](http://sparktruck.org/) to [government programs](http://www.energy.gov/diversity/listings/women-energy) that highlight departments’ diverse technical workforce, all of which are meant to level the playing field for students interested in STEM. Finally, Drew said, the U.S. cares about STEM now because it realized “that we’re not doing as well in STEM in K-12 education.” Much of this fear stems from the biennial findings of the [Program for International Student Assessment](http://nces.ed.gov/surveys/pisa/), an organization that issues a test to 15-year-olds all over the world to rank their competence in reading, math, and science. Those scary 2012 [statistics](http://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_1.asp)—that out of 65 education systems American students rank 27th in math and 20th in science—have generated headlines such as “U.S. Students Slide In Global Ranking On Math, Reading, Science” from [NPR](http://www.npr.org/blogs/thetwo-way/2013/12/03/248329823/u-s-high-school-students-slide-in-math-reading-science) and “U.S. teens lag in global education rankings as Asian countries rise to the top” on [NBC](http://www.nbcnews.com/news/other/us-teens-lag-global-education-rankings-asian-countries-rise-top-f2D11686930). But the metric used to determine America’s standing is far from perfect, and its 2012 score isn’t necessarily an aberration. “I found that the U.S. has always been in the middle—we’ve never been at the top,” Teitelbaum said, pointing out that many of the education systems at the top of [the list](http://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_4_1.asp) are cities, like Shanghai and Hong Kong, or very small countries like Singapore. “I’m not saying their performance is irrelevant,” Teitelbaum said, but the comparison shouldn’t be considered a direct one. “If you take a national average of the U.S., you have a huge disparity in educational performance across this country, even down to the local level, so you have a higher variety of educational outcomes,” he said, so it makes sense that Americans' average is not as high as smaller education systems. “We’re not falling back, some [other] countries are just rising, and the U.S. is not rising.” Other metrics corroborate the idea that the U.S. isn’t falling behind when it comes to STEM. [2012 data](http://stats.oecd.org/Index.aspx?DataSetCode=GERD_COST) from the Organization for Economic Cooperation and Development (OECD) shows that the U.S. spent more than any other country  on research and development. [Similar data](http://www.scientificamerican.com/article/best-countries-science-interactive/) from the OECD shows that, in 2011, American scientists had published the most papers in reputable scientific journals and had submitted the greatest number of patents. So, if the jobs don’t exist and the country isn’t moving up on the international rankings anytime soon, why place emphasis on STEM? “I think every kid who graduates needs to understand science, math, and technology,” said Teitelbaum, who was among the experts to [point out](https://www.theatlantic.com/education/archive/2014/03/the-myth-of-the-science-and-engineering-shortage/284359/2/) that the U.S. doesn’t have a shortage of STEM workers. “I think that being competent in STEM fields at the end of secondary school is the modern equivalent of being literate and numerate in the 19th century.” Many aspects of Americans’ daily lives require us to be more tech-savvy and quantitatively focused than prior generations, no matter the career. “Average citizens have been able to relate to [the dialogue about STEM] because of how much their lives have been changed by one aspect: technology,” Drew said. STEM may be a word that has been tossed around liberally in the past, Drew said, but without it educators wouldn’t be able to talk about the subjects as easily. “I think there are limitations to the term [STEM] but on balance it has been a positive contribution because it’s helped people facilitate the dialogue,” he said. One of slogan’s limitations, he added, is that policy-makers and CEOs sometimes give “noble speeches” where they speak generally about STEM’s value without getting into the specific skills that students can gain from various programs. When I asked Drew and Teitelbaum if the country is losing anything by emphasizing STEM in the way it has in recent years, both emphasized that the topic simply didn’t get enough attention before. Inevitably, if students spend more time on math then they’re spending less time on something else, Teitelbaum said. “But I think it’s a sensible thing to do—these subjects have gotten shortchanged in the past.”

#### Liberal arts education key to military success

Zengerle, featured in the Washington Post, 2016

(Joseph Zengerle  is a Washington lawyer, “The U.S. military is great on STEM. It should also be great on liberal arts.”, pub 10/3/16, acc 7/5/17, https://www.washingtonpost.com/posteverything/wp/2016/10/03/the-u-s-military-is-great-on-stem-it-should-also-be-great-on-the-liberal-arts/?utm\_term=.8a6687f0e5af) eluth

But even in an age of highly sophisticated warfare, our military leaders should not be too narrowly focused on STEM. If we want leaders who communicate clearly, solve problems creatively and appreciate cultural differences in theaters where they operate, studying the humanities is just as important as science, technology, engineering and math. When I attended Ranger and Airborne schools, a mandatory catchphrase was “move, shoot and communicate.” Communication was always a critical component of military tactics, and the more complicated combat has become, the more important it is to ensure clarity of thought and expression that relies upon a grounding in softer disciplines. Those who lead need to be ready for the moments when they must summon their troops — who may be hurt or drained by fatigue — to rise, to respond, to prevail against the odds. That power doesn’t come out of the barrel of a gun or the insignia of rank, much less a math formula. It comes from an understanding of human motivation that can be gained by studying psychology, by analyzing history, by reading great literature. Military leaders should know that the familiar notion of troops as a “band of brothers” originates with the stirring speech Shakespeare’s Henry V delivers to his outnumbered forces at the Battle of Agincourt. Military leaders also need to be agile thinkers who can assess an unfamiliar situation and strategize a plan. That might require a cost-benefit analysis, but it also requires an understanding that not everything can be quantified. As a special assistant to Gen. William Westmoreland in 1968, I became familiar with the Hamlet Evaluation System, a monthly report that quantified the level of “pacification” by color-coding each village in South Vietnam. When attacks throughout the country erupted during the Tet Offensive, the HES reports were quickly considered an unreliable gauge. By contrast, the success of the 2007 surge in the Iraq War was under the command of Gen. David Petraeus, who, with a PhD in international relations, employed a counterinsurgency strategy based on the Army manual he co-wrote that emphasized leaders’ flexibility and adaptability in dealing with indigenous populations. The utility of non-STEM learning is further reflected in the nature of mission assignments. President Lyndon Johnson said victory in Vietnam would depend on our winning the “hearts and minds” of the Vietnamese, an objective necessitating education in relevant history, language and culture for military personnel assigned to advisory roles. That remains true in many conflicts today. The mission of the military has expanded in ways that make a liberal arts background even more important. When Vice President Biden spoke to the graduating class at West Point in May, he told them: “You’re gonna need every tool your predecessors possessed … but you’re gonna need more.” He went on to talk about “next-generation technologies, like unmanned systems and autonomous machines” and the need to “dominate the cyber realm.” But he also spoke about “building the capacity of emerging countries” and managing “humanitarian crises posed by climate change, mass migration and the spread of infectious disease.” To take on these new challenges, rising military leaders benefit from a familiarity with foreign policy, public health and international development issues. The slide rule my classmates and I struggled to master every day passed out of use a long time ago. But the service academies should be cautious about what they put in its place. If they can expose the minds of officers in training with the right ideas and the right spirit, they will cultivate a cadre of tomorrow’s military leaders who will best serve the national interest.

### Arts trade-off – link extension

#### STEM funding is unnecessary, takes away from the humanities, and creates a skewed perception of value

Caplan-Bricker, assistant editor at The New Republic, 2013

(Nora, journalist, *New Republic*, 9-5-13, https://newrepublic.com/article/114608/stem-funding-dwarfs-humanities-only-one-crisis, accessed 7/1/17, RCU).

It’s common knowledge that the United States is miles behind other developed countries in STEM (science, technology, engineering, and math) education, and that our economy suffers from, [as Bill Gates has put it](http://www.microsoft.com/en-us/news/exec/billg/speeches/2008/congress.aspx" \t "_blank), “a severe shortfall of scientists and engineers with expertise to develop the next generation of breakthroughs.” And we also know that the humanities are in a downward slide, in part because they’ve been eclipsed by the dire need to focus on STEM. In the towers of higher education and the annals of our culture, we debate which discipline needs our hand-wringing the most.

If a recent feature in the Institute of Electrical and Electronics Engineers’ magazine, Spectrum, is to be believed, there's no debate to be had: “[The STEM Crisis Is a Myth](http://spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth" \t "_blank)” advances a convincing case that the U.S. is graduating more than enough scientists and mathematicians to satisfy the demands of its workforce. If this is true, it undermines the arms-race rhetoric pouring out of universities—and, more importantly, out of the federal government—about STEM education. In a speech this April, [President Barack Obama said](http://www.whitehouse.gov/issues/education/k-12/educate-innovate" \t "_blank) our future depends on “lifting up these subjects for the respect that they deserve,” and his proposed 2014 budget [pledged](http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_STEM.pdf" \t "_blank) another $3.1 billion to STEM schooling. If the sciences are not “in crisis,” but are in fact doing just fine, it begs the question: Why are we spending so much to revive them?

The state of affairs Spectrum describes is largely summarized by the graph below, which shows there are far more STEM-fluent U.S. residents than available STEM jobs. The article's author, Robert Charette, calculates that there are 11.4 million people with at least a bachelor’s degree in a STEM discipline who work outside of STEM, but only 277,000 vacancies in STEM jobs each year. What's more, he says, 392,000 people graduate with STEM degrees annually, and yet the country imports labor to fill shortages (real or imagined) by way of the H-1B visa program. Charette also scoffs at the idea that demand for workers has turned STEM salaries into a gravy train, citing a [study from Georgetown](http://www9.georgetown.edu/grad/gppi/hpi/cew/pdfs/stem-complete.pdf" \t "_blank) that concludes, “At the highest levels of educational attainment, STEM wages are not competitive.”

So why is the administration funneling its scant, unsequestered dollars into science education? Charette posits that it’s the government's way of fueling the economy—in short, of catering to “the bottom line”:

Companies would rather not pay STEM professionals high salaries with lavish benefits, offer them training on the job, or guarantee them decades of stable employment. So having an oversupply of workers, whether domestically educated or imported, is to their benefit. It gives employers a larger pool from which they can pick the “best and the brightest,” and it helps keep wages in check. No less an authority than Alan Greenspan, former chairman of the Federal Reserve, said as much when in 2007 he advocated boosting the number of skilled immigrants entering the United States so as [to “suppress” the wages of their U.S.](http://www.boston.com/business/globe/articles/2007/03/14/greenspan_let_more_skilled_immigrants_in/" \t "_blank)counterparts, which he considered too high.

But that effort to “keep wages in check” is eating up a lot of the federal funding pie—to the detriment of the humanities. Charette reports, “the U.S. government spends more than [U.S. $3 billion each year on 209 STEM-related initiatives](http://www.gao.gov/products/GAO-13-529T" \t "_blank) overseen by 13 federal agencies. That’s about $100 for every U.S. student beyond primary school.” According to “The Heart of the Matter,” a [report](http://www.humanitiescommission.org/_pdf/hss_report.pdf" \t "_blank) on the woeful state of the humanities released by the American Academy of Arts & Sciences this summer, the government pays for well over 50 percent of the scientific research done in universities, and close to 75 percent in some disciplines. Meanwhile, the humanities are fronting all but 20 percent of their own costs. The funding Obama apportions for the National Endowments for the Arts and Humanities has been creeping up in recent years, but is microscopic compared to STEM dollars; his proposed 2014 budget raises each endowment’s budget by around $200,000, to $145.5 million each.

"The Heart of the Matter” warns that all sources, from private philanthropists to state governments, are “scaling back their investments” in the humanities, “but the federal disinvestment may be the most worrisome indicator": "Federal research funding through the National Endowment for the Humanities, always a small fraction of the federal funding for science and engineering research, has been reduced disproportionately in recent years. The humanities and law were the only research fields in which the federal share of academic research expenditures was appreciably smaller in 2011 than six years earlier.”

Of course, it's easy to argue that the humanities don’t need as much funding as the sciences. Literary close reading, for instance, doesn’t require as many gadgets and gizmos as computer programming, or open-heart surgery; but scholars need money to live on just as much as scientists do. Worse, the imbalance in spending is so heavy that it's creating a skewed perception of value, too. This past winter, Florida Governor Rick Scott proposed charging college students [more for humanities majors](http://www.forbes.com/sites/alisongriswold/2013/01/18/majoring-in-the-humanities-might-soon-cost-you-more-in-florida/" \t "_blank) while keeping tuition low for quantitative majors that his task force considered “high-skill, high-wage, high-demand.” Obama’s fiscal policy implies what the task force in Florida was bold enough to say: that STEM fields are a good “return on investment,” while arts and letters are not.

This doesn’t have to be an either-or proposition. Charette signs off with the somewhat utopian hope that, since “many children born today are likely to live to be 100 and to have not just one distinct career but two or three by the time they retire at 80 … we should figure out how to make all children literate in the sciences, technology, and the arts to give them the best foundation to pursue a career and then transition to new ones.” It’s the kind of generalist entreaty that one usually hears from the humanities camp. It almost sounds like the beginnings of a truce.

### Arts trade-off – impact

#### The trade-off of humanities is troubling – a loss of personal exploration, less accessibility to underprivileged, and bad job trend predictions

Cohen, New York Times journalist on the national economy, 2016

(Patricia, author and award-winning reporter, The New York Times, 2-21-16, https://www.nytimes.com/2016/02/22/business/a-rising-call-to-promote-stem-education-and-cut-liberal-arts-funding.html, accessed 7/1/17, RCU).

When the Kentucky governor, Matt Bevin, suggested last month that students majoring in French literature should not receive state funding for their college education, he joined a growing number of elected officials who want to nudge students away from the humanities and toward more job-friendly subjects like electrical engineering.

Frustrated by soaring tuition costs, crushing student loan debt and a lack of skilled workers, particularly in science and technology, more and more states have adopted the idea of rewarding public colleges and universities for churning out students educated in fields seen as important to the economy.

When it comes to dividing the pot of money devoted to higher education, at least 15 states offer some type of bonus or premium for certain high-demand degrees, according to the National Conference of State Legislatures.

“There will be more incentives to electrical engineers than French literature majors, there just will,” Mr. Bevin, a Republican, said after announcing his spending plan. “All the people in the world who want to study French literature can do so; they’re just not going to be subsidized by the taxpayers like engineers will be, for example.”

Or, as Gov. Patrick McCrory of North Carolina once put it, higher-education funding should not be “based on butts in seats, but on how many of those butts can get jobs.”

What has incensed many educators is not so much the emphasis on work force development but the disdain for the humanities, particularly among Republicans. Several Republicans have portrayed a liberal arts education as an expendable, sometimes frivolous luxury that taxpayers should not be expected to pay for. The Republican presidential candidate Senator Marco Rubio, for example, has called for more welders and fewer philosophers. Gov. Rick Scott of Florida criticized anthropologists, and Mr. McCrory belittled gender studies.

Democrats have, for the most part, avoided denouncing the humanities, but they have argued that education and training should be better aligned with the job market.

The Obama administration, for example, proposed, much to the horror of many in academia, rating the country’s 7,000 colleges and universities not only on measures like completion rates and student loan debt, but also on earnings after graduation. Dozens of states have already moved to performance-based goals that more closely tie a portion of their higher education funding to particular outcomes like degrees earned or courses completed.

An engineering student in a lab at N.Y.U. A particular focus on jobs and earnings is gaining momentum at four-year colleges. Credit Nicole Craine for The New York Times

But the particular focus on jobs and earnings — originally limited to vocational programs and community colleges — is gaining momentum.

“There’s a deeper question of what public money should be used for,” said Anthony Carnevale, a Georgetown University professor who runs the Center on Education and the Workforce.

Education tends to be justified in terms of personal exploration and fulfillment, as well as creating informed citizens who make a functioning democracy possible. The humanities have traditionally been seen as crucial to both endeavors.

“The problem is that education is now the principal determinant of earnings, and we pay no attention to it at all. That’s gone too far,” Mr. Carnevale said. “There’s a lot of buyers’ regret out there.”

Mr. Carnevale argues that there should be much more information available to students about employment and wage prospects before they choose a major so that they can make informed choices. “We don’t want to take away Shakespeare. We’re just talking about helping people make good decisions,” he said. “You can’t be a lifelong learner if you’re not a lifelong earner.”

A graduate with a higher-earning degree could make up to $4 million more in lifetime earnings than other college graduates, Mr. Carnevale said. Most of the top earners in the liberal arts end up matching only the bottom earners in science, technology, engineering and mathematics — known as the STEM fields — and some will earn less than high school graduates who have vocational skills, like welders and mechanics.

A recent salary survey from the National Association of Colleges and Employers, a nonprofit membership organization that connects campus career officers with business recruiters, found once again that new STEM graduates were expected to command the highest overall average salaries in 2016. New engineers, for example, are expected to earn nearly $65,000 a year.

The average salary for new graduates who majored in humanities — including French literature — is projected to increase slightly from last year to $46,065, up from $45,042. Although data is more limited, these graduates seem to attract the most interest from employers in finance, insurance and real estate, the survey found. The average for social science majors is $46,585.

But informing students better is one thing. Penalizing certain majors in the form of reduced funding is another.

In his address to the Kentucky General Assembly, Mr. Bevin said, “The net result of putting public tax dollars into education is to ensure that we actually are graduating people that can go into the work force.”

Not surprisingly, humanities professors were among the most vocal critics of Mr. Bevin’s remarks. In an op-ed article last month in The Lexington Herald-Leader, Jeffrey N. Peters, who teaches French literature at the University of Kentucky, noted that Mr. Bevin graduated from the liberal arts university Washington and Lee with a bachelor’s degree in Japanese and East Asian Studies after studying abroad in Japan.

“I would like to thank Bevin for drawing on that formative experience to remind Kentuckians during his Tuesday budget presentation that the study of world languages, literatures and cultures is a valuable pursuit that has led countless college students to successful careers in education, business, international relations, the arts and — as his own story demonstrates — public service,” Mr. Peters wrote.

Mr. Bevin’s office offered few details about precisely how the funding formula would work. But in general, the trend of reducing funding the humanities and providing added incentives for STEM majors at public institutions would mean that a liberal arts education would be increasingly limited to those who could afford to attend expensive private institutions.

Other critics expressed concerns about allowing government officials to pick work force winners and losers.

“We are not good at predicting what jobs are going to be required in five years and 10 years down the road,” said Debra Humphreys, a senior vice president at the Association of American Colleges and Universities. She worries that underfunding the humanities will not only undermine educational quality but be bad economic policy. “You run a huge risk when you say you are going to divert money from this major to that major.”

Research by the association shows that employers are not as focused on individual majors as they are on the kind of broad-based analytic, communications and problem-solving skills that a humanities education specializes in, Ms. Humphreys said.

The question of whether to reward colleges for turning out STEM graduates or for higher job placement rates has generated a lot of debate in Tennessee, where all of the state’s higher education funding is tied to various performance measures, said Russ Deaton, the interim executive director of Tennessee’s Higher Education Commission.

“I’m not sure I trust myself to decide which degree programs or which fields deserve that premium and what that premium should be,” Mr. Deaton said.

“A lot of the feedback we get from employers is not only about the necessity of technical skills, but the soft skills as well — the ability to think creatively, to work in groups, things that you traditionally get in the liberal arts,” he said. “It’s not as simple as STEM is valued and worthy of incentives and everything else is not.”

## OFF CASE

### K Link – Capitalism

#### STEM is the ultimate leader of violent capitalism in education

Nelson, president of St. John’s College, 2014

(Christopher, “What’s Wrong with Pushing STEM Education,” 09/08/2017, <https://blogs.sjc.edu/christopher-nelson/2014/09/08/whats-wrong-pushing-stem-education/>, accessed 06/30/2017, AS)

The public clamor for education to promote STEM fields—science, technology, engineering, and mathematics—has grown as the number of young people showing interest in such studies has declined. Sadly, the attitude behind the clamor is almost entirely driven by the economic metaphor. It is as if our nation were a business, realizing that it needs more human resources in those fields in order to stay competitive, and it is demanding trained specialists. But the economic metaphor is woefully inept when it is applied to education. Edmund S. Phelps, a Nobel laureate in economics, recognizes this, and writes that the argument for more specialized training in STEM fields is [fundamentally flawed](http://forumblog.org/2014/09/stem-education-humanities-creativity-innovation/" \t "_blank): [blockquote source]because it treats an economy as an equation. According to this logic, job creation is a matter of slotting humans into identifiable opportunities, and economic growth is a matter of increasing the stock of human or physical capital, while exploiting scientific advances. This is a dark view of modern economies, and a depressing blueprint for the future.[/blockquote] I think this is right on the mark. Training people for specific jobs in which they will be used by others like tools is utterly inimical to the dignity of mankind. True education leads to whole, balanced, self-actualized human beings, not mere “scientists” or mere “creatives.” That is why the curriculum at St. John’s, for all our students, is nearly half mathematics and science, and makes no invidious distinctions between so-called “sciences” and so-called “humanities.”

#### Other countries aren’t economic competitors just because they have high test scores – academic focus obscures the root causes of poor education: poverty.

Lowell, professor at Georgetown University, 7

[Briant Lindsay, professor at Institute for the Study of International Migration at Georgetown University, “Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality and Workforce Demand”, Oct 2007, <http://www.urban.org/sites/default/files/publication/46796/411562-Into-the-Eye-of-the-Storm.PDF>, accessed 6-29-17, NW]

Current policy is driven by the twin perceptions of a labor market shortage of scientists and engineers and of a pool of qualified students that is small in number and declining in quality. Math and science education are viewed as the primary policy levers to increase labor market supply, supplemented by increased immigration. But those policy proposals that call for more math and science education, aimed at increasing the number of scientists and engineers, do not square with the educational performance and employment data that we have reviewed. Our review of the data finds not only little evidence to support those positions and, in fact, the available evidence indicates an ample supply of students whose preparation and performance has been increasing over the past decades. We are concerned that the consensus prescriptions are based on some misperceptions about efficient strategies for economic and social prosperity. It is difficult to conclude that the major economic “threats” to the United States are related to the performance levels of U.S. students as compared to students in other countries. Our major economic competitors, particularly emerging nation behemoths, are not among top test scoring nations. In fact, a sizeable portion of U.S. students perform at the top of the scale and graduate in substantial numbers. The logic of the education crisis reports fails on several of their key points. These reports focus on countries that score higher than the United States, primarily just on math, and then conclude these countries pose a “threat” to the U.S. economy. Should U.S. policy be driven by test score performance of students in Flemish Belgium, Latvian-speaking Latvia, or even Singapore, with 4.5 million people and a workforce of 2.4 million (one-sixtieth the size of the U.S. workforce)? How will these countries find the capital and the numbers of workers needed to “steal” any major portion of a U.S. industry? Perhaps one should, instead, look at the countries that are “competing” with the United States and examine the ways in which they are doing so and the ways in which the United States is, in comparison, deficient. As noted, nearly all the major global powers are not even on the list of leading test scoring countries. One of the countries that is a leading technology force, Singapore, is trying to emulate U.S. innovation and creativity and de-emphasize strict math and science test performance.25 Will better math and science performance increase the number of software programming jobs remaining in the United States? This seems unlikely until the Beijing or Bangalore wage is on parity with U.S. wages. Will better math and science education improve innovation? There is little empirical support for the argument that more math and science education will produce more scientists and engineers which, in turn, will increase the level of innovation. Nor does research establish that better test scores will improve the innovation performance of scientists and engineers who enter the workforce. Some even argue that science and engineering are less important economic drivers than they were in the past (Hill, 2007). There is an unexamined assumption that the United States is best served by the goal to be first in the world in science and math test scores. This confuses means and ends. First, the means to improving education is probably not through a narrow focus on math and science. The math and science deficits are not among the populations who are well-educated but, rather, the research suggests, those with non-school factors that hinder academic performance. As Boe and Shin argue, “The U.S. is not ‘first in the industrialized world’ in minimizing the percentage of its population living in poverty…. So why should anyone expect the U.S. to be first in the world in educational achievement? There is, after all, abundant evidence that these types of social indicators are strongly associated with educational achievement” (2005, 694). **A focus on the average test scores obscures the distribution of performance and its root causes**. Policy reports that focus on the performance of the upper end of the distribution (e.g., more AP classes and other advanced math and science coursework) assume that improvements here will increase S&E workforce size. But low averages and the pool of future high performers must be addressed by improving the performance of particular disadvantaged groups that face barriers to education that are not addressed by expanding or even improving math and science education. If improvement in national test score performance is the goal, greater improvements are more likely to come from improving the test scores of those in the lower end of the distribution. Although there are initiatives to address these problems, they need to be stepped up in “competitiveness” policy because these groups account for much of the international “performance gap.” Efficiency alone would dictate a focus on these groups as the most effective policy to increase U.S. performance. Another policy assumption is that test performance and more scientists and engineers will improve economic performance. The TIMSS analysis suggests curriculum changes would increase test scores by narrowing the curriculum and focusing on particular math and science components of the curriculum. Yet, it seems a different question should be asked: What are the factors that have led to the consistent high performance of the U.S. economy? Which factors have provided the U.S. economy more consistent growth than countries that more consistently score high on international tests? And what kind of workforce is likely to improve prospects of the United States in the future? In a provocative article, Ramirez et al. (2006) argue that policies to increase economic growth by improving aggregate student achievement are “not based on research evidence” (2006:1). They develop a number of regression models to test the relationships between educational performance and economic growth for nearly 40 countries over the period 1970 through 2000. They find that student achievement levels in math and science “has no effect on tertiary enrollment in science and engineering” (p. 17), and a tenuous relationship between educational achievement levels and national economic performance. They argue that the four Asian countries of South Korea, Japan, Singapore and Hong Kong are outliers and that their high academic achievement is endogenous. Without those countries, there is no cross-national relationship between level of education and national economic performance. This is also consistent with the TIMSS researchers finding of no relationship between TIMSS ranking and GNP. Instead, Ramirez et al. argue, “student achievement is an indicator of national commitments to development rather than a means to this development” (p.15).26

### K Link – Neolib

#### STEM education forwards neoliberalism – turns school into an economic competition that cements dangerous ideologies

Blumenfeld, Social Justice Author, ‘17

(Warren, Good Men Project, “STEM Education Essential But Not Enough to Sustain the Planet,” April 28, <https://goodmenproject.com/featured-content/stem-education-essential-but-not-enough-to-sustain-the-planet-wcz/>, 7-1-17, LNM)

I have never forgotten one essential point my educational psychology professor related to my class back at San José State University when I was working toward my Secondary Education Teacher’s Certification in 1970. His point crystallized for me the intent of true and meaningful learning. My professor explained that the term “education” is derived from two Latin roots: “e,” meaning “out of,” and “ducere,” meaning “to lead” or “to draw.” “Education,” he said, “is the process of drawing knowledge out of the student or leading the student toward knowledge, rather than putting or depositing information into what some educator’s perceive as the student’s waiting and docile mind”—what the Brazilian philosopher and educator [Paulo Reglus Neves Freire](https://en.wikipedia.org/wiki/Paulo_Freire)termed “the banking system of education.” I would ask, however, what effects has our age of “No Child Left Behind” and “Race to the Top,” eras of standardization, corporatization, globalization, privatization, and deregulation of the educational, business, banking, and corporate sectors have on learning? Educators, to be truly effective, must spend many years in self-reflection and must have a clear understanding of their motivations, strengths, limitations, “triggers,” and fears. Standardized curriculum and testing were initially intended to gauge students’ progress, but have, unfortunately, metastasized into benchmarks for student advancement through the levels of education, for teacher accountability, as well as criteria for school funding from the government. The new Core Standards curriculum policies, rather than improving the educational outcomes of our students, have the potential of merely reinforcing and extending the failed so-called “neoliberal” policies of the past unless implemented with care and foresight. The educational buzz word (or, rather, buzz acronym) is now STEM (Science Technology Engineering Math). Actually, since the time of Sputnik forward, we hear from the White House, to the school house, to the houses of industry that for us to achieve and maintain personal and national security, we must emphasize and rigorously promote STEM education in our schools and jobs in our economy. As we understand in plant biology that stems cannot take root and grow unless planted in a fertile nutrient-abundant soil, likewise STEM fields cannot take root and grow unless planted in a fertile foundation of the social sciences, humanities, the arts, and all in the context and development of creativity and critical thinking skills. According to the so-called “[Allocation Theory](https://en.wikipedia.org/wiki/Status_attainment)” of education, schooling has turned into a status competition, which confers success on some and failure on others. Our schools have morphed into assembly-line factories transforming students into workers, and then sorting these workers into jobs commanded by industry and business. In so doing, educational institutions legitimize and maintain the social order (read as the status quo). Schools drive individuals to fill certain roles or positions in society, which are not always based on the individuals’ talents or interests. For genuine learning to occur, for it to be transformational, it must be student centered—grounded on the shared experiences of the learners—and composed of at least two essential elements or domains: the “affective” (feelings) and the “cognitive” (informational). I design and implement my classes on a dialogic approach within a social justice framework in which students and educators cooperate in the process, whereby all are simultaneously the teacher and the learner. Educational psychologist Lev Vygotsky referred to this process as [Obuchenie](http://books.google.com/books?id=GUTyDVORhHkC&pg=PA24&lpg=PA24&dq=Vygotsky+Obuchenie&source=bl&ots=txcKUPGkzG&sig=bwy-Tw9GlGJ8SWTP-Pt7cbxVC3g&hl=en&sa=X&ei=PN55VIDFHoXHsQS_t4LIDA&ved=0CDsQ6AEwAw#v=onepage&q=Vygotsky%20Obuchenie&f=false). Education, as I have gained from Freire, is a path toward permanent liberation in which people became aware (conscientized) of their multiple positionalities (identity intersectionality), and through praxis (reflection and action), transform the world. Educators, to be truly effective, must spend many years in self-reflection and must have a clear understanding of their motivations, strengths, limitations, “triggers,” and fears. They must thoroughly come to terms with their positions in the world in terms of their social identities: both the ways in which they are privileged as well as how they have been the targets of systemic inequities. They are not afraid of showing vulnerability and admitting when they are wrong or when they “don’t know.” They have a firm grasp of the content area, and they work well with and are accessible to students and their peers. Realizing that students come from disparate backgrounds in terms of social identities, and that students learn in a variety of ways, educators must be “culturally competent,” and must be informed on the historical and cultural backgrounds of diverse student populations, pedagogical frameworks, theories of cognitive development, personality types, preferred sensory modes of learning, and others.

### K Link – Security

#### STEM advantages are false – just an excuse to boost national security

Arrington, Executive Director, ’14

(Austin, *The Harlem Times,* “Building a STEM Workforce – Top Priority for National Security,” December 3, <http://theharlemtimes.com/science-technology/building-stem-workforce-top-priority-national-security>, 7-1-17, LNM)

America’s ability to maintain its position as a technological superpower entirely depends on how we cultivate our future STEM (Science, Technology, Engineering, Mathematics) workforce. As the old guard leaves (those engineers and scientists whose shoulders we stand upon) people are starting to ask, “What now? What’s next?” The lack of young people pursuing degrees and careers in the science is starting to make people worry about who’s going to invent, design, and build the infrastructure of the future.

When you realize how crucial STEM is to the future wellbeing of America, it makes sense that the United States Department of Defense (DoD) is starting to get involved. The DoD is the executive branch of the federal government that coordinates all agencies and functions of the government concerned with national security. An absence in the STEM workforce is a huge issue, as it undermines multiple aspects of our national security at once. Without cutting edge STEM initiatives, America will fall behind technologically, from a defense standpoint, and of course economically.

Annually the DoD spends $1.7 billion on basic research, operating over 50 labs scattered across nearly two-dozen states, making them largest Federal employer of scientists and engineers in the nation. Not bad!

The DoD has even released a STEM Education and Outreach Strategic Plan. The primary goals of the Strategic Plan are to Inspire, Develop, Attract, and Deliver. The objectives of these goals include: increasing awareness about the importance of STEM; providing educational opportunities at the community level; engaging populations underrepresented in STEM fields; increasing diversity in STEM fields; increase the number of military personnel with STEM competencies; develop a systematic approach to identifying STEM education and outreach programs; and provide a publicly accessible inventory of DoD STEM programs.

Here are some stats pulled from the Strategic Plan to stress the current problem: In 1985 China granted about the same number of Engineering degrees as the US. They granted nearly 4 times as many by 2005. The average age of federal scientists and engineers is on the rise. What’s more, by 2020 a significant portion of DoD professionals working in the lab will be gone, either through retirement or attrition.

The Mission of the DoD’s Research Directorate for STEM Development is to “Provide Departmental leadership in STEM through policy development and oversight leveraging intradepartmental collaboration and interagency cooperation.” Here’s a list of the top DoD STEM initiatives:

· Air Force STEM: A tool to coordinate and connect Air Force STEM programs across the Air Force enterprise.

· Army’s Educational Outreach Program (AEOP): Research, education, competitions, internships and practical experiences designed to engage students and teachers in STEM education. One interesting curriculum from this Army-sponsored program is the eCYBERMISSION, which increases STEM literacy for middle school students through website tutorials based on next-gen technology

· National Defense Education Program (NDEP): This program gives students and researchers opportunities for direct engagement with DoD labs and technical staff.

· National Security Science and Engineering Faculty Fellowships (NSSEFF): Provides long-term funding to 29 scholars at top U.S. universities. These scholars work with nearly 400 undergraduate and graduate students and postdocs in executing their research, while providing a bridge to DoD research facilities.

· President’s Council of Advisors on Science and Technology (PCAST): An advisory group of the nation’s leading scientists and engineers who directly advise the President and the Executive Office of the President, making policy recommendations concerning science, technology, and innovation.

· Navy’s STEM to Stern (STEM2Stern) program: An information portal for students, teachers, counselors, and mentors.

· Science, Mathematics, and Research for Transformation (SMART) program: A scholarship-for-service program that has funded approximately undergraduate and graduate students in 19 different STEM fields.

· Systems Engineering Capstone: A pilot program designed to engineering skills and the pipeline of capable engineers to the DoD. 300 undergraduate and graduate students at 5 universities, 5 military institutions, and 6 partners have participated in the pilot program alongside DoD civilian, military, and industry mentors.

If America is to remain a world leader, it can’t afford to miss out on advancements in science or technology. In order to support the growth and continued prosperity of this country, America must continue to build on its STEM workforce, our backbone of ingenuity and security.

### CP – States

#### States solve STEM – fed approach fails

Lindsey M. Burke is a Policy Analyst in the Domestic Policy Studies Department and Jena Baker McNeill is Policy Analyst for Homeland Security in the Douglas and Sarah Allison Center for Foreign Policy Studies, a division of the Kathryn and Shelby Cullom Davis Institute for International Studies, at The Heritage Foundation, January 5, 2011. ““Educate to Innovate”: How the Obama Plan for STEM Education Falls Short,” http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short

A More Fundamental Problem

When President Obama announced his Administration’s plan to enhance STEM education, he affirmed that “we know that the nation that out-educates us today will out-compete us tomorrow.”[8] The President’s plan to enhance STEM education, much like similar efforts in the past to improve education through short-term bursts with federal dollars, falls short of the dramatic changes needed in the educational system to truly fill the gap.

The need to improve STEM education in the United States is no recent revelation. Over the past 50 years, American leaders have repeatedly discussed the need to enhance STEM education. Yet, despite increasing federal efforts and spending, U.S. students continue to under-perform in STEM subjects. In 2007, for instance, the America COMPETES Act created new federal funding for STEM education. The act included the creation of a new federal initiative to train 70,000 new teachers in Advanced Placement and International Baccalaureate courses, as well as initiatives intended to provide existing teachers with STEM training and to encourage university students pursuing STEM degrees to concurrently obtain teaching certifications. Despite these efforts, there remains a major shortage of qualified STEM teachers throughout the nation—and American students continue to perform worse than their peers in STEM subjects.[9]

Encouraging the private sector to get involved in the education of tomorrow’s workforce can align the education of today with the skills needed for tomorrow. Using creative approaches to tackle learning challenges is certainly a concept that should be embraced. The problem with the President’s approach, however, is that the root of America’s STEM education deficit is much more fundamental than the problems addressed by the President’s initiatives. The American K–12 education system is meant to function as a pipeline that prepares students for higher education and careers. But with an average annual dropout rate of close to 10 percent, there is little doubt that this pipeline has sprung a leak.[10] Even many of those who do graduate with a high school diploma lack the knowledge and skill-base to succeed in the STEM field.

In the United States today, just 73 percent of freshmen entering high school will graduate within four years, and those who do are often not adequately prepared for higher education and careers in STEM fields.[11] Too many students are not making it through the leaky pipeline of the American education system with the skills they need to succeed. The reasons for their underperformance stems from a number of problems:

A One-Size-Fits-All Approach. Despite increasing federal control over the American education system over the past 50 years, educational achievement across the country has continued to deteriorate.[12] A large part of the problem is that the federal focus centers on a one-size-fits-all approach. Most recently, this approach is part of the Obama Administration’s efforts to impose national education standards and tests on states. This is a significant federal overreach into states’ educational decision-making authority, and will likely result in the standardization of mediocrity, rather than a minimum benchmark for competency in math and English.[13] Applying a blanket approach to education reform undermines innovation in STEM education, increasing conformity at the expense of meeting the diverse needs of students and parents.

#### The increasing federal government presence has been unwanted and ineffective

Marc Tucker 2013, president of the National Center on Education and the Economy, January 24, 2013 (“How the executive branch is reshaping education ― with little debate”, *Education Week,* Accessed Online at: http://hechingerreport.org/how-the-executive-branch-is-reshaping-education-%E2%80%95-with-little-debate/, Accessed Online on 07-06-2017 SI)

WASHINGTON ― In December, the application from the State of California for a waiver from the provisions of the No Child Left Behind Act (NCLB) was denied by the U.S. Department of Education. This, we were told, was because California disagreed with some items on the Department’s reform agenda—especially those having to do with teacher quality—and did not include them in its application. State officials said that it would have cost them $2 billion to implement these unwanted features of questionable effectiveness.

What’s going on here? The American education system is being reshaped before our very own eyes in a truly fundamental way―and with little debate. National and state policymakers behave as if both levels of government have much the same roles in education: to set goals and standards, for example, and to create accountability systems, define teacher quality, determine strategies for producing quality teachers and improve the performance of low-performing schools. Left unresolved, the conflicts this creates are likely to deepen and worsen over time.

It has not always been this way.

Historically, the federal government’s role had been to aid, assist, prod and push the schools, districts and states. But the key word was always “aid.” From the 1950s to the 1990s, there was no question who was in charge and it was never the federal government. The feds avoided interfering in any important way with the design of the larger system and the way it worked, except with respect to school desegregation, which was primarily the result of decisions made by the courts rather than executive or legislative branch decisions.

The last few decades, the federal role in education has undergone a massive transformation. This process began in the George H.W. Bush administration, gained steam in the Clinton administration, was propelled forward powerfully by the George W. Bush administration and then given a big push over the fence by the Obama administration.

Over time, federal education funds had increasingly been thrust at states with few policy levers to impose responsible spending. Building on the work of George H.W. Bush’s administration, President Bill Clinton started the states on the road to adoption of national standards for student academic performance—a radical departure from the status quo and aided by a reliance on standardized testing. President George W. Bush and a bipartisan coalition then followed by imposing the draconian NCLB accountability scheme. As the new design for American education emerged, it became clear that standards could be a driver of accountability and the tests developed to match the standards could be used to reward or punish schools based on student progress.

The Obama administration took the next logical step in this process by redesigning the accountability system to focus not on schools, as under NCLB, but largely on teachers. This provided the country with a national system for improving teacher quality—or so it was argued. Along with the embrace of charter schools, merit pay and other measures to inject more competition into the education system, this has been the main education policy thrust of this administration.

This process over the past two-plus decades constitutes a fundamental redesign of the American institutional system for elementary and secondary education. In some cases, it was accomplished with the enthusiastic participation of the states, but in others it was done despite their strong resistance. Some parts of this agenda, like the push for explicit standards and the need to focus on teacher quality, are supported by research, but there is no evidence to support other key components, such as the idea that teacher quality is best improved by tying teacher promotion and retention to student performance on standardized tests or the insistence on the expansion of charter schools. Some of these components have enjoyed the enthusiastic backing of a significant—and bipartisan—majority of Congress. But significant items now are being added to this agenda in a process in which Congress has played no part, including the last two items just mentioned.

How can the United States have a Constitution that assigns responsibility for vital public education policy matters to the states, when, without deciding that such delegation was a bad idea, the nation one day opts to create a national system of academic standards, curriculum and testing; a national system for school accountability; and a national system for ensuring teacher quality?

No nation that has reached the top ranks of education performance has a system of governance in which the roles of the national government and the state or provincial levels of government are as ill-defined and overlapping in education as is now the case in the United States. The process has gotten this far because, in a time of acute financial distress, the states will put up with almost anything to keep their budgets from completely disintegrating. So the federal government, in this case meaning almost exclusively the executive branch, has managed to get a phenomenal amount of leverage for the amount of money it has had to spend.

Is that how we want these decisions made? Do we really want the executive branch of the federal government to decide, pretty much by itself, what the aims of American education should be and how they should be achieved?

The solutions as to how the American education system should be governed are not obvious. But we ought to have a conversation about it before we wake up one day to find that the executive branch of the federal government has become our national school board.

### A2 Fed uniformity key

#### States solve STEM – uniformity backfires

Lindsey M. Burke is a Policy Analyst in the Domestic Policy Studies Department and Jena Baker McNeill is Policy Analyst for Homeland Security in the Douglas and Sarah Allison Center for Foreign Policy Studies, a division of the Kathryn and Shelby Cullom Davis Institute for International Studies, at The Heritage Foundation, January 5, 2011. ““Educate to Innovate”: How the Obama Plan for STEM Education Falls Short,” http://www.heritage.org/education/report/educate-innovate-how-the-obama-plan-stem-education-falls-short

A STEM-educated workforce is vital to the security and the prosperity of the U.S. as industry and government increasingly demand highly trained STEM professionals to compete in the global market, and look to science and technology to help stay one step ahead of national security threats. The United States must not allow itself to continue to be outcompeted in science, technology, engineering, and mathematics. While the Administration’s Educate to Innovate initiative is intended to raise the U.S. “from the middle to the top of the pack in science and math,” this one-size-fits-all, federal approach fails to remedy the underlying problems of academic performance and does not plug the leaky pipeline in the American education system.

### A2 Fed key to econ coordination

#### States are more effective in providing education that leads to an economic boost

Berger and Fisher, President of Mass Budget and Policy Center and Professor of Physics, ‘13

(Noah and Peter, Economic Policy Institute, “A Well Educated Workforce is Key to State Prosperity, August 22, <http://www.epi.org/publication/states-education-productivity-growth-foundations/>, 7-1-17, LNM)

While national policies will have to play the major role in creating a national economy in which economic growth leads to incomes rising across the income spectrum, there are measures that states can take to strengthen the ability of working people to participate fully in the gains from economic growth. These include restoring state minimum wages to the real level that prevailed in the late 1960s, aggressively addressing problems of wage theft and employee misclassification, adopting higher wage standards in economic development programs, and other measures.

But most importantly, states can build a strong foundation for economic success and shared prosperity by investing in strategies that make their people more productive, chief among them education. Providing expanded access to high quality education and related supports—particularly for those young people who today lack such access—will not only expand economic opportunity for those individuals, but will also likely do more to strengthen the overall state economy than anything else a state government can do.

### A2 Fed key to perception

#### The CP solves the aff’s perception args better – states creates a more widespread perception than the Fed and spills over to the national level

**Haider-Markel**, Professor of Political Science at the University of Kansas, **2014**

(Donald, *The Oxford Handbook of State and Local Government*, n.p., RCU)

State processes of direct democracy also serve as a vehicle for citizens to respond to federal inaction or secure policies in excess of what is achieved in Congress or the Supreme Court. In a study of the federalism implications of state-level initiative processes, Kathleen Ferraiolo concluded that “direct democracy is a particularly fruitful institutional venue for policy entrepreneurs who wish to remedy a perceived defect in federal policy at the state level” (Ferraiolo, 2008: 507-8). Several state minimum-wage increases and stem cell research measures in the 2000s were initiated and approved by the people without any participation of state legislators. Meanwhile, affirmative-action opponents and medical-marijuana advocates have relied heavily on state initiative processes to secure goals not attainable in the US Supreme Court or through Congress. Moreover, as David Magleby noted, the initiative process has agenda-setting capabilities that often enable policy entrepreneurs to gain much more attention for their cause than would be possible by proceeding through the legislative process, given that “A vote on an issue in a single state can propel an issue onto the national agenda because of the widespread media attention given to some controversial initiatives” (Magleby, 1998: 148).

### A2 Fed key to funding

#### States are the future and solve better – K-12 teacher quality, Title I proliferation, and lifting up struggling schools are better tackled away from DC

Hess and Eden, director of education policy at the American Enterprise Institute, senior fellow at Manhattan Institute, 17

(Frederick and Max, U.S. News and World Report, 3-13-17, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-03-13/3-ways-states-can-lead-on-schooling-in-era-of-every-student-succeeds-act>, accessed 6/28/17, RCU)

Since 2008, the political pendulum in Washington has swung from Democratic control, to political gridlock, to Republican control. The period of divided government featured a lot more angry words than lawmaking. Democrats and Republicans did come together, though, on at least one significant piece of legislation: the Every Student Succeeds Act, the bill that President Barack Obama dubbed a "Christmas Miracle" in December 2015.

For all their disagreements, Democrats and Republicans on Capitol Hill could agree that the old No Child Left Behind Act was broken and that the Obama administration's ad hoc effort to steer state education policy through conditional "waivers" from No Child Left Behind was, in the words of Tennessee Republican Sen. Lamar Alexander, turning the Department of Education into a "national school board."

Thus, the Every Student Succeeds Act set out to rethink the balance between Washington and the states when it came to K-12 schooling. The new law retained the requirement that states test students regularly in reading and math in grades three through eight and again in high school. It retained the requirement that states report the results and use them to gauge school performance. It kept in place rules governing $16 billion in federal funds for low-income students.

But the law also dramatically rolled back Uncle Sam's role in deciding which schools are performing adequately, eliminated Washington's ability to dictate school improvement strategies, got rid of paper-driven federal rules intended to dictate which teachers are highly qualified and put clear new limits on the authority of the secretary of education. The result meant that state leaders would have new opportunities to lead.

The No Child Left Behind era featured widespread concerns about narrowing curricula, an ineffectual checklist-driven approach to school improvement, a fixation on testing and the sense that too many students and schools were treated as an afterthought because they were deemed to be doing "well enough." The new law offers a chance to do something about those concerns, while energizing school reform and separating it from the bitter politics of the nation's capital. Here are three of the places where there are enormous opportunities for states to lead the way.

First. states are well positioned to tackle teacher quality. Federal efforts have fallen flat: a George W. Bush-era mandate that teachers be "highly qualified" yielded mostly piles of paperwork, and Obama's encouragement of test-based teacher evaluations bred more backlash than meaningful change. The Every Student Succeeds Act, however, offers states federal funds to establish "teacher, principal, or other school leader preparation academies," giving them new ways to create alternatives to traditional schools of education. States could, for instance, establish several preparatory academies, charging each with particular responsibilities (e.g. preparing high-quality vocational specialists, science and math teachers or online instructors). The academies need not be linked to schools of education or even to universities – they might, for instance, be based at schools, making mentoring and apprenticeship core to their work.

Second, the law's new direct student services provision empowers state to make it easier for schools to offer academic courses to students who lack access. After all, more than one-third of high schools don't teach physics and half don't offer calculus. With the 3 percent of Title I funds made available for direct student services, states can provide online offerings that would provide every student – in the smallest rural school or the most challenged urban high school – access to just about every academic offering under the sun. A handful of states, such as Minnesota, Louisiana and Florida, have a course access initiative in place, but plenty of other states have been handed a big opportunity to catch up.

Third, states have the chance to reimagine how to best aid students in struggling schools. We know that it's possible to dramatically improve the performance of a struggling school – after all, it's been done! – but it has proven enormously difficult to do it consistently or at scale. Neither No Child Left Behind's interventions nor the Obama administration's $7 billion School Improvement Grant program showed an ability to produce consistent improvement. States now have an opportunity to work directly with local leaders to emphasize creativity, context and execution – rather than compliance with federal directives. States have a chance to explore how to leverage technology, employ new school models, pilot new motivational and disciplinary practices, reshape staffing and pay and much else. They should be bold, and then ruthless about studying and reporting on the results.

The prospects for statesmanship and bipartisan agreement in Washington on just about any issue seem dim. But Congress's last major bipartisan achievement has given state leaders a golden opportunity to rise above the fray and work together to improve K-12 education for all students.

### CP – useful ev

#### Implementation questions are key on an education topic

Means, Director, Center for Technology in Learning, SRI International, 2011

(Barbara, Congressional Documents and Publications, “House Science, Space, and Technology Subcommittee on Research and Science Education Hearing: "What Makes for Successful K-12 STEM Education: A Closer Look at Effective STEM Education Approaches,” 10/11/2011, https://search.proquest.com/pqrl/docview/898260643/652B9B0BBDB44EF8PQ/2?accountid=1557, accessed 06/27/2017, JME).

Education approaches that are significant enough to have long-lasting consequences are necessarily complex. We need research on the resource requirements, key choices and practices in implementing K-12 STEM education approaches, and on how the approaches can be implemented to good effect in different settings.

### DA – Federalism ev

#### Authority over education is shifting toward the states

Camera, Education Reporter, ‘17

(Lauren, US News, “STEM Funding Uncertain in Trump White House,” May 25, https://www.usnews.com/news/stem-solutions/articles/2017-05-25/funding-for-stem-programs-uncertain-in-trump-white-house , 6-30-17, LNM)

When it comes to boosting science, technology, engineering and math, the news from Washington isn't good. While the Trump administration has showed some signs of prioritizing [STEM](https://www.usnews.com/news/stem-solutions), federal programs that support STEM initiatives are on the chopping block under the president's recent budget proposal for fiscal year 2018. [Low-Income Students Not in STEM](https://www.usnews.com/news/stem-solutions/articles/2017-05-25/low-income-students-nowhere-to-be-found-in-stem) That was the bottom line from panelists at the 2017 U.S. News STEM Solutions conference session titled "A Look at the Future of Federal STEM Policy." The annual forum is taking place in San Diego from May 24 to 26. Among other things, the [spending plan](https://www.usnews.com/news/education-news/articles/2017-05-23/opposition-to-trumps-education-budget-mounts) would eliminate entirely a $1.6 billion pool of money created under the new federal education law, the Every Student Succeeds Act, which state and local school districts can use for high-quality STEM courses, increased access to STEM for underserved populations, science fairs and specialty STEM schools, afterschool programs, among many other things. The president's budget proposal would also ax federal spending on teacher preparation by $2.4 billion, money that school districts can use to recruit STEM educators and restructure pay scales for heard-to-fill jobs, which often include math and science teachers."That all sounds great, but unfortunately [those programs] might not happen with the budget," said Lindsey Gardner, director of external relations for the STEM Education Coalition. "We like to say flat funding is the new up with domestic spending. If you have flat funding then you're doing really well, but the president proposed large cuts this week." Overall, the spending plan would slash more than $9 billion from the Department of Education, a decrease of 13.5 percent. Notably, panelists said, the budget is nothing more than a funding proposal that signals the administration's priorities, and lawmakers in both the House and Senate have called it "dead on arrival."That doesn't mean, however, that there's appetite for an expanded federal role in education, even when it comes to STEM. If the recent reauthorization of the federal education law, which cleared Congress with overwhelming bipartisan support, is proof of anything, they said, it's that the federal government's footprint in education is only going to get smaller. "A lot of the decisions about what kids will be learning will be driven more by governors and state officials," Gardner said. "That's a really big change and it reflects the way policy is drifting in the country." But there are some promising signs that STEM is on the Trump administration's radar.In February, the president signed two laws aimed at increasing the number of women in STEM jobs. "It's unacceptable that we have so many American women who have these degrees but yet are not being employed in these fields," Trump said at the signing. "So I think that's going to change. That's going to change very rapidly." In March, Secretary of Education Betsy DeVos appeared at the Smithsonian National Air and Space Museum in Washington along with the president's daughter, Ivanka Trump, to tout the movie "Hidden Figures" and [highlight the importance of women](https://www.usnews.com/news/stem-solutions/articles/2017-03-28/nasa-white-house-celebrate-womens-history-month-by-encouraging-girls-in-stem) in the STEM fields. "There is certainly some swirling interest there," Gardner said In addition, Congress is also poised to reauthorize the $1.2 billion Carl D. Perkins Career and Technical Education Act, which sends money to schools districts for vocation education programs. The [proposed renewal](https://edworkforce.house.gov/news/documentsingle.aspx?DocumentID=401657" \t "_blank), which makes minimal changes to the underlying law, cleared the House education committee last week and is expected to pass the House with overwhelming bipartisan support. The chamber passed an almost identical reauthorization last year, 405-5. Even still, the legislation could stall in the Senate, as it did last year, as a result of a jammed schedule and higher priority items. "What's important to know is that states are not waiting around for federal law and federal policy," said Kate Kreamer, deputy executive director of Advance CTE. "They have made a lot of progress on their own and have used Perkins to feed what their vision is."

#### Elementary and secondary education is the responsibility of the states, not the feds

U.S. Department of Education ‘17

(*U.S. Department of Education,* “The Federal Role in Education,” May 25, <https://www2.ed.gov/about/overview/fed/role.html> , 6-30-17, LNM)

Education is primarily a State and local responsibility in the United States. It is States and communities, as well as public and private organizations of all kinds, that establish schools and colleges, develop curricula, and determine requirements for enrollment and graduation. The structure of education finance in America reflects this predominant State and local role. Of an estimated $1.15 trillion being spent nationwide on education at all levels for school year 2012-2013, a substantial majority will come from State, local, and private sources. This is especially true at the elementary and secondary level, where about 92 percent of the funds will come from non-Federal sources.

#### Trump and DeVos are scaling down education funding now

Brown, Strauss, and Douglas-Gabriel Washington Post national education specialist Danielle Douglas-Gabriel covers the economics of higher education for the Washington Post) ‘17

Funding for college work-study programs would be cut in half, public-service loan forgiveness would end and hundreds of millions of dollars that public schools could use for mental health, advanced coursework and other services would vanish under a [Trump](http://www.chicagotribune.com/topic/politics-government/donald-trump-PEBSL000163-topic.html) administration plan to cut $10.6 billion from federal education initiatives, according to budget documents obtained by The Washington Post. President Donald Trump and Education Secretary [Betsy DeVos](http://www.chicagotribune.com/topic/politics-government/betsy-devos-PEGPF00208-topic.html) have repeatedly said they want “to shrink the federal role in education.” The documents - described by an Education Department employee as a near-final version of the budget expected to be released next week - offer the clearest picture yet of how the administration intends to accomplish that goal.