# Resolution: The United States Federal Government Should Substantially Increase Regulations and/or Funding for Primary and/or Secondary Education.

# AFFIRMATIVE

## Inherency

#### The Ohio University Upward Program which provides services to low-income and first generation college students, is permanently closing due to lack of US Department of Education Grant Funds, and this school is just one of many.

Susan Tebben, writer, June 10, 2017, "OU Upward Bound On Its Way Out," WOUB, <https://woub.org/2017/06/10/ou-upward-bound-on-its-way-out/>

**A 50-year-old program that provides services for low-income and potential first generation college students is going away due to funding cuts**, according to officials. **The Ohio University Upward Bound program will be permanently closing on June 30**, according to a letter sent to students and families on Wednesday by Director Kwabena Owusu-Kwarteng. **“This closure is due to the loss of the grant funds used to run the program from the U.S. Department of Education,**” Owusu-Kwarteng wrote. Because of the change, OU Upward Bound will not hold its summer phase from June 25 to July 29. **“Furthermore, Ohio University Upward Bound will not be able to provide academic year services starting in the fall 2017, including academic advising, tutoring and weekend workshops,”** according to Owusu-Kwarteng. **The university and “lobbyists” are working to petition the loss of the funding, the director said, but the success of the efforts is uncertain.**

#### STEM education is failing; there is a shortage of effective education, all the way down to the k-12 system.

Brian Kelly, Editor for US News & World Report, September 21, 2012, "The State of STEM and Jobs," US News & World Report, <https://www.usnews.com/news/articles/2012/09/21/the-state-of-stem-and-jobs> (accessed 5/26/17)

**STEM is as much about jobs as education.** It’s about middle-class jobs, many of which don’t require bachelor’s degrees. **Overall, STEM education is getting worse, not better.** At the college level, too many capable students are being washed out of STEM majors. Better teaching methods could increase retention and create 30,000 more engineers in four years. Some schools are showing how to do it; all schools need to follow. **Community colleges** are an undervalued resource offering the potential to help many students through skills-based learning tied to jobs. However, they **inherit too many high school graduates in need of remedial help and face continued government funding cuts. Cooperation with local businesses has been successful for some schools. For K-12 students, it’s about doing your math homework. Math is the single most important subject for student success. Students who don’t master Algebra I by freshman year will have bleak prospects of getting a decent job. Women, Hispanics, and African- Americans are the biggest challenge and the biggest opportunity: Often for cultural reasons, they are underrepresented in many STEM areas, yet they make up the bulk of the future workforce.** Mentor programs have helped change perceptions of STEM careers.

#### Particularly in fields like physics, men dominate STEM fields, but the National Science Foundation wants to change this.

Debora Lima, reporter for South Florida Small Business Journal, May 18, 2017, "Local university to lead nationwide STEM education initiative," South Florida Business Journal, <http://www.bizjournals.com/southflorida/news/2017/05/18/local-university-to-lead-nationwide-stem-education.html> (accessed 5/26/17)

“We could accomplish something that’s never been done in history,” Hazari said. “We could change the face of physics in the United States**.”In the U.S. and beyond, the field of physics is typically dominated by men, with just about 8 percent of bachelor’s degrees in science, technology, engineering and math (STEM) fields being awarded to women, according to a 2016 STEM index produced by defense giant Raytheon and U.S. News and World Report. This is despite the fact that women make up half of the students enrolled in introductory physics courses in high school,** Hazari said. **The pilot phase of the project, slated to begin with the new school year in August, will involve 10 teachers who will test lesson plans and establish best practices to ensure that a teaching framework that works toward the initiative’s goal can be replicated at other schools nationwide. By 2018, the campaign will expand to 24 teachers. If progress continues, the targeted goal of reaching 16,000 physics teachers – or about 60 percent of all U.S. high-school physics teachers – will begin by 2019.** If only one-third of the nation’s high-school physics teachers recruited at least one female student to pursue a physics major, the nation’s gender gap in physics careers could be sharply alleviated, Hazari said. “**We could achieve the largest increase of women in physics in any decade in history,**” she said. **The overarching idea of the project, expected to conclude in 2020, is to give researchers more data to determine how these methods can be applied to other STEM fields, including engineering, where women are traditionally underrepresented.**

#### Science funding is in a state of crisis and could cripple the science and technology enterprise of our nation.

Scott Jaschik, Editor and Founder of Inside Higher Ed, March 16, 2017, "Trump Seeks Deep Cuts in Education and Science," Inside Higher Ed, <https://www.insidehighered.com/news/2017/03/16/trump-seeks-deep-cuts-education-and-science-programs> (accessed 5/25/17)

**As expected, the science budget seeks cuts across a number of agencies that support research on climate change and the environment. But the budget also proposes to cut funding for the National Institutes of Health by nearly 20 percent, to $25.9 billion. The budget plan states that savings will come in part from "consolidations and structural changes across NIH organizations and activities**. **The budget also reduces administrative costs and rebalance[s] federal contributions to research funding."** The NIH is the largest federal supporter of research and development, and its grants support research at universities nationwide. (Most NIH research is done through grants, and not at the NIH.) Rush Holt, CEO of the American Association for the Advancement of Science, issued a statement Thursday in which he said that t**he Trump budget plan "would cripple the science and technology enterprise through shortsighted cuts to discovery science programs and critical mission agencies alike."**

#### Trump's budget for STEM fields is risking the nation's workforce competitiveness according to NASA.

CBS News Staff, May 17, 2017, "Senators urge continued funding for NASA's Office of Education," CBS19, <http://www.newsplex.com/content/news/Senators-urge-continued-funding-for-NASAs-Office-of-Education-422802034.html> (accessed 5/25/17)

**More than 30 members of the U.S. Senate, including Tim Kaine and Mark Warner of Virginia, have sent a letter supporting NASA's Office of Education in the coming fiscal year.** Kaine and Tammy Baldwin (Wisconsin), the co-chairs of the Senate Career and Technical Education Caucus, are leading the group in sending the letter to the Senate Appropriations Committee. **President Donald Trump's proposed budget would eliminate the NASA Office of Education, which works to education students across the United States to pursue careers in science, technology, engineering and math, or STEM. According to a release, funding from the office enables students in Virginia to explore STEM-related fields at NASA Langley, NASA Wallops and the technology sector. "Given the importance of STEM education and the success of Hidden Figures, which was recently celebrated by high-ranking members of the Trump administration at a screening at the Smithsonian National Air and Space Museum, we were disappointed by President Trump's budget proposal to eliminate funding for NASA's Office of Education in FY18," wrote the senators in the letter. "We recognize that you face significant budget constraints, but we urge you to support the NASA Office of Education because its mission is critical to boosting the nation's workforce competitiveness."**

#### An infrastructure for STEM education already exists, though more federal funding is needed.

Center for Education Reform, May 23, 2017, "Statement by Jeanne Allen, Founder & CEO, Center for Education Reform on the impending official release of the Trump Administration's Fiscal Year 2018 Budget for the US Department of Education, PR Newswire, <http://www.prnewswire.com/news-releases/statement-by-jeanne-allen-founder--ceo-center-for-education-reform-on-the-impending-official-release-of-the-trump-administrations-fiscal-year-2018-budget-for-the-us-department-of-education-300462578.html> (accessed 5/25/17)

**Throughout the nation, at all levels, policymakers, parents, teachers and innovators are leading critical new endeavors to focus on student achievement, some by using new technologies in the classroom, some by implementing new schools of choice, some through boosting the traditional activities of districts.**

**Federal funding should support these efforts, not sustain or increase previously sanctioned programs that do not follow the needs of communities.**

#### Students lack access to STEM in the status quo.

Chris Kimrey, is an MPA candidate at the University of Pennsylvania Fels Institute of Government and editor of the Institute’s publication, Re:CAP, 2017 "Tackling STEM Education Problem in Underserved Philadelphia," Medium, [https://medium.com/@UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b](https://medium.com/%40UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b) (accessed 6/25/17)

**Students in underserved Philadelphia communities lack access to educational opportunities in STEM** (science, technology, engineering, and math). **The young minds of our children are ready, but are we building the environment to provide them the right resources? Evidence reveals a veritable black-hole of STEM access in urban environments, displaying a clear pattern impacting predominantly impoverished neighborhoods hardest. The young minds of our children are ready, but are we building the environment to provide them the right resources?**

## Plan: The United States Federal Government Should Substantially Increase Funding for Primary and Secondary Education in the United States by allocating $2 Billion dollars to Upward Bound Math & Science.

## Solvency

#### Staying in Upward Bound for longer periods is associated with better student outcomes.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf (accessed 6/15/17)

**The median length of program participation is 19 months. Each additional year that a student remains in Upward Bound is associated with a 9-percentage point increase in attendance at a postsecondary institution.**

#### Participating in UPMS, students that were low income were 3.3 times more likely to obtain a BA in their field after the program.

Margaret Cahalan and David Goodwin, The Council for Opportunity in Education, June 2014, "Setting the Record Straight: Strong Positive Impacts Found from the National Evaluation of Upward Bound," The Pell Institute for the Study of Opportunity in Higher Education, <http://files.eric.ed.gov/fulltext/ED555877.pdf> (Accessed 6/15/17)

As Figure 10 below indicates, **among those low-income sample members who reported receiving no pre-college supplemental services, about 7 percent were found to have received a BA degree within six years of their expected high school graduation date**. This is very similar to the national data from the National Educational Longitudinal Study (NELS) from the same time period (Ingles et. al. 2002) and also Census Bureau data on the percent of students from families in the lowest income quartile who attain a BA by age 24 (about 7 percent in 2004). Among those sample members not receiving Upward Bound or Upward Bound Math/Science (UBMS) but reporting receiving some other type of less intensive services such as Talent Search, about 15 percent had achieved a BA degree by six years after their expected high school graduation. **Among those who entered the UB or UBMS program, about 21 percent had attained a BA by six years after the expected high school graduation date (Cahalan, 2009). Thus the instrumental variables regression controlling for selection factors revealed that UB participants were 3.3 times more likely to obtain a BA in six years when compared to those reporting no participation in college access services and 1.4 times as likely when compared to those who reported participating in other presumably less intensive services.**

#### Upward Bound Math and Science is crucial to push students to pursue careers in the STEM field.

U.S. Department of Education, 2017, "Programs: Upward Bound Math and Science," U.S. Department of Education, <https://www2.ed.gov/programs/triomathsci/index.html> (accessed 6/15/17)

**The Upward Bound Math and Science program is designed to strengthen the math and science skills of participating students. The goal of the program is to help students recognize and develop their potential to excel in math and science and to encourage them to pursue postsecondary degrees in math and science, and ultimately careers in the math and science profession.**

#### Upward Bound Math and Science has a plethora of students designed to promote diversity in students in STEM.

U.S. Department of Education, 2017, "Programs: Upward Bound Math and Science," U.S. Department of Education, <https://www2.ed.gov/programs/triomathsci/index.html> (accessed 6/15/17)

**Program services include: summer programs with intensive math and science training; year-round counseling and advisement; exposure to university faculty members who do research in mathematics and the sciences; computer training; and participant-conducted scientific research under the guidance of faculty members or graduate students, who are serving as mentors; education or counseling services designed to improve the financial and economic literacy of students; and programs and activities previously mentioned that are specially designed for students who are limited English proficient, students from groups that are traditionally underrepresented in postsecondary education, students with disabilities, students who are homeless children and youths, students who are in foster care or are aging out of foster care system or other disconnected students.**

####  STEM fields need 1 million professionals by 2022, and those needs can be met with typically underrepresented populations.

White House Initiative on Educational Excellence for African Americans, March 16, 2016, "FACT SHEET: Spurring African-American STEM Degree Completion," White House, <https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion> (accessed 5/25/17)

**To meet the nation's evolving workforce needs, America will need to add 1 million more STEM professionals by 2022**. [ [1](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn01) ]**To meet this need and bring welcome diversity to STEM industries, we must continue to support and encourage STEM degree completion, especially for African-Americans and others who are underrepresented in these fields yet have a long history of achievement in STEM fields. Historically Black Colleges and Universities (HBCUs) are particularly critical to meeting the STEM challenge, as engines of economic growth and ladders of advancement for generations of African Americans. That's why the Administration has instituted policies that provide $850 million over the next decade to renew, reform, and expand programs to ensure students have the opportunity for educational and career success at HBCUs.** Over the past seven years, the Obama Administration's efforts have resulted in unprecedented levels of public-private collaboration in STEM education; policies and budgets focused on maximizing Federal investments to increase student access and engagement in active, rigorous STEM-learning experiences; and meaningful efforts to inspire and recognize young inventors, discoverers, and makers.

#### Federal investment and involvement in STEM is is key, particularly to create economic growth and prosperity.

Michael Ickowitz, a former ORISE science education project manager, serves as senior manager for international recruitment and market development for the University of New South Wales, 2017, "Investing in the Next Generation of Scientists and Engineers: The Key to Maintaining Global Competitiveness," US Department of Energy ORAU, <https://orise.orau.gov/stem/career-development/how-to-find-research-funding/investing-in-the-next-generation-of-scientists-and-engineers.html>

**This inherent dependence on R&D highlights and extends the importance of government involvement and support, as well as the need for a steady stream of well- trained scientists and STEM professionals. Economic growth depends directly on our ability to innovate. Studies show that R&D outcomes can be used as a measure of economic prosperity, mainly by measuring a nation’s number of patents and comparing them to gross domestic product.** Other studies suggest linkages between entrepreneurship and economic growth, and that newly created goods generate social ties and common interests in society. New goods as an output of the economy continuously spread American influence all over the world. Moreover, **R&D is at the crux of almost every arm of government: it impacts our energy, defense, health and environment. America influences the world not only by developing and exporting the newest cancer treatment or heavy machinery, but also by the technological superiority of our military and by our ability to solve large, complex problems.**

## AD 1: Hegemony

#### Current decline in US STEM leadership globally is not a fate, it's a choice.

Brian Kelly, Editor for US News & World Report, September 21, 2012, "The State of STEM and Jobs," US News & World Report, <https://www.usnews.com/news/articles/2012/09/21/the-state-of-stem-and-jobs> (accessed 5/26/17)

**The STEM problem in the United States is most clear when viewed against the gap we see between our high school students and those in China, South Korea, and much of Europe. Or the huge volume of mid-level engineers being produced by a place like Indi**a. “We’ve invested nearly a billion dollars,” said AT&T’s John Donovan of their education program, “because we need a continual supply of smart, skilled workers in our increasingly competitive workplace.” U.S. companies are seeing this need more clearly than the education establishment. **“Decline is a choice, it’s not a fate,**” said Wes Bush, CEO of Northrop Grumman.

#### STEM workers are crucial for the US to lead innovation in this competitive global world.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

**As global competition increases, more STEM-literate workers are vital to the U.S. and our ability to lead innovation, increase productivity, and compete effectively in a growing global economy.” (3) As a result, STEM workers are in demand. According to the U. S. Department of Commerce, from 2008 to 2018, STEM occupations are projected to grow at 17 percent, while others are estimated at 9.8 percent.** (4) **Closer to home, a February 19, 2016 article in the Puget Sound Business Journal reported that 90 percent of the 50,000 jobs in the State of Washington that go unfilled in 2017 will require STEM skills. Thus, for the U.S. to achieve economic growth and remain competitive on an international scale, these jobs must be filled.** This situation is, however, challenged by the current reality.

#### U.S. leadership is in part due to those in STEM fields, but it is important to make sure our citizenry maintains this primacy.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

Science, technology, engineering, and mathematics **(STEM) are everywhere, affects every aspect of our lives, and are vital to our future – the future of our region, our country, our world, and our children. The U.S. has developed as a global leader, in large part, through the genius and hard work of its scientists, engineers, and innovators. In a world that’s becoming increasingly complex, where success is driven** not only by what you know, but **by what you can do with what you know, it is more important than ever for our citizens to be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that can be learned by studying STEM subjects.**

#### A lack of STEM education is a national security problem as well, and the federal government needs to take a bigger role.

Brian Kelly, Editor for US News & World Report, September 21, 2012, "The State of STEM and Jobs," US News & World Report, <https://www.usnews.com/news/articles/2012/09/21/the-state-of-stem-and-jobs> (accessed 5/26/17)

STEM is a national problem with local and regional solutions. Some argue that **it is also a national security problem.**

**Businesses must be engaged in helping influence the education system for their own good; they need the workers. Schools must listen to the needs of employers. Education must be aligned to workforce needs. Business-school ties that involve apprenticeships and co-op learning that result in real jobs are demonstrating success.** Structured partnerships involving all parts of a community are essential and have been shown to work. Progressive states are encouraging and managing these. Several organizations are scaling state and local efforts by tying them into a national network. **The federal government has not been much of a factor. There needs to be a bigger federal role to focus and organize state and private efforts. The key short-term wish of many companies is for Congress to allow highly skilled foreign students to remain in the United States and fill positions that will then, in turn, create more jobs.**

#### Upward bound provides academic instruction and training to ensure success in school and beyond.

US Department of Education,2017, "Programs: Upward Bound," U.S. Department of Education, <https://www2.ed.gov/programs/trioupbound/index.html> (accessed 6/15/17)

**Upward Bound projects provide academic instruction in mathematics, laboratory sciences, composition, literature, and foreign languages. Tutoring, counseling, mentoring, cultural enrichment, work-study programs, education or counseling services designed to improve the financial and economic literacy of students; and programs and activities previously mentioned that are specially designed for students who are limited English proficient, students from groups that are traditionally underrepresented in postsecondary education, students with disabilities, students who are homeless children and youths, students who are in foster care or are aging out of foster care system or other disconnected students.**

#### STEM investments are key to strengthen our national security, global competitiveness, and economic superiority.

Michael Ickowitz, a former ORISE science education project manager, serves as senior manager for international recruitment and market development for the University of New South Wales, 2017, "Investing in the Next Generation of Scientists and Engineers: The Key to Maintaining Global Competitiveness," US Department of Energy ORAU, <https://orise.orau.gov/stem/career-development/how-to-find-research-funding/investing-in-the-next-generation-of-scientists-and-engineers.html>

**Why invest so heavily in developing the next generation of scientists and engineers? Investing in STEM education and scientific workforce development strengthens our nation’s security, global competitiveness and economic superiority. The global economy, and the well-being of people everywhere, is affected by research and development (R&D) innovations that transforms areas such as information technology, advanced manufacturing and health care.** Every advanced nation has some strategy to build and maintain a scientific workforce because they all depend on science and technology innovations for their continued prosperity and their ability to provide for and defend their citizens.

#### STEM fields are crucial to solving issues like climate change, finding advances in medicine and genetics, and finding solutions to pandemics.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

**Scientific and technological issues increasingly dominate the national discourse, from environmental debates on climate change and economic threats from invasive species, to concerns about cloning, genetically modified food, and the use of vaccines. New advances in areas such as medicine, genetics, communications and energy all directly affect our lives, and not to mention the impact of STEM in finding solutions when a pandemic hits or addressing issues of national security and defense.**

#### Withdrawal of us leadership sparks global power wars throughout europe, asia and the middle east, economic collapse, and nuclear prolif and war.

KHALILZAD (Rand Analyst, Envoy to Afghanistan) 1995

[Zalmay, “Losing the Moment”, Washington Quarterly, Spring

What might happen to the world if the United States turned inward? Without the United States and the North Atlantic Treaty Organization (NATO), rather than cooperating with each other, the West European nations might compete with each other for domination of East-Central Europe and the Middle East. In Western and Central Europe, Germany -- especially since unification -- would be the natural leading power. Either in cooperation or competition with Russia, Germany might seek influence over the territories located between them. German efforts are likely to be aimed at filling the vacuum, stabilizing the region, and precluding its domination by rival powers. Britain and France fear such a development. Given the strength of democracy in Germany and its preoccupation with absorbing the former East Germany, European concerns about Germany appear exaggerated. But it would be a mistake to assume that U.S. withdrawal could not, in the long run, result in the renationalization of Germany's security policy. The same is also true of Japan. Given a U.S. withdrawal from the world, Japan would have to look after its own security and build up its military capabilities. China, Korea, and the nations of Southeast Asia already fear Japanese hegemony. Without U.S. protection, Japan is likely to increase its military capability dramatically -- to balance the growing Chinese forces and still-significant Russian forces. This could result in arms races, including the possible acquisition by Japan of nuclear weapons. Given Japanese technological prowess, to say nothing of the plutonium stockpile Japan has acquired in the development of its nuclear power industry, it could obviously become a nuclear weapon state relatively quickly, if it should so decide. It could also build long-range missiles and carrier task forces.

With the shifting balance of power among Japan, China, Russia, and potential new regional powers such as India, Indonesia, and a united Korea could come significant risks of preventive or proeruptive war. Similarly, European competition for regional dominance could lead to major wars in Europe or East Asia. If the United States stayed out of such a war -- an unlikely prospect -- Europe or East Asia could become dominated by a hostile power. Such a development would threaten U.S. interests. A power that achieved such dominance would seek to exclude the United States from the area and threaten its interests-economic and political -- in the region. Besides, with the domination of Europe or East Asia, such a power might seek global hegemony and the United States would face another global Cold War and the risk of a world war even more catastrophic than the last.

In the Persian Gulf, U.S. withdrawal is likely to lead to an intensified struggle for regional domination. Iran and Iraq have, in the past, both sought regional hegemony. Without U.S. protection, the weak oil-rich states of the Gulf Cooperation Council (GCC) would be unlikely to retain their independence. To preclude this development, the Saudis might seek to acquire, perhaps by purchase, their own nuclear weapons. If either Iraq or Iran controlled the region that dominates the world supply of oil, it could gain a significant capability to damage the U.S. and world economies. Any country that gained hegemony would have vast economic resources at its disposal that could be used to build military capability as well as gain leverage over the United States and other oilimporting nations. Hegemony over the Persian Gulf by either Iran or Iraq would bring the rest of the Arab Middle East under its influence and domination because of the shift in the balance of power. Israeli security problems would multiply and the peace process would be fundamentally undermined, increasing the risk of war between the Arabs and the Israelis. The extension of instability, conflict, and hostile hegemony in East Asia, Europe, and the Persian Gulf would harm the economy of the United States even in the unlikely event that it was able to avoid involvement in major wars and conflicts. Higher oil prices would reduce the U.S. standard of living. Turmoil in Asia and Europe would force major economic readjustment in the United States, perhaps reducing U.S. exports and imports and jeopardizing U.S. investments in these regions. Given that total imports and exports are equal to a quarter of U.S. gross domestic product, the cost of necessary adjustments might be high. The higher level of turmoil in the world would also increase the likelihood of the proliferation of weapons of mass destruction (WMD) and means for their delivery. Already several rogue states such as North Korea and Iran are seeking nuclear weapons and long-range missiles. That danger would only increase if the United States withdrew from the world. The result would be a much more dangerous world in which many states possessed WMD capabilities; the likelihood of their actual use would increase accordingly. If this happened, the security of every nation in the world, including the United States, would be harmed.

## AD 2: Diversity

#### Current science and engineer demographics lean towards white men dominating most fields.

Laurel Raymond, Reporter for Think Progress, February 26, 2016, "National Science Foundation Launches Million Dollar Initiative to Improve Diversity in STEM," Think Progress, <https://thinkprogress.org/national-science-foundation-launches-million-dollar-initiative-to-improve-diversity-in-stem-3f2f4183d3e> (accessed 5/26/17)

**The current science and engineering workforce is heavily slanted towards white men, partly because the older working population tends to be overwhelmingly white and male. In recent years, women have taken home more bachelor’s degrees then men and around half of all science and engineering degrees. However, this varies greatly by degree field; while women take home a majority of biosciences degrees, in some of the most in-demand and high-earning fields — engineering, computer sciences, mathematics, and physics — their numbers lag far behind men** This overall pattern holds for STEM degrees awarded to underrepresented minorities. Most of the gains in recent years have been in psychology and the social sciences, while their share in engineering and the physical sciences have remained flat and their share in math and statistics degrees has actually dropped.**Plus, a persistent education gap means that underrepresented minorities are far less likely to enroll in college, contributing to a lower share of the overall degrees (including STEM). And the higher in the educational totem pole, the lower the share of women and underrepresented minorities attaining degrees.**

#### Current STEM fields lack diversity.

Laurel Raymond, Reporter for Think Progress, February 26, 2016, "National Science Foundation Launches Million Dollar Initiative to Improve Diversity in STEM," Think Progress, <https://thinkprogress.org/national-science-foundation-launches-million-dollar-initiative-to-improve-diversity-in-stem-3f2f4183d3e> (accessed 5/26/17)

**The lack of diversity in STEM (science, technology, engineering, and mathematics) fields has been a persistent problem for decades. White men currently take up 51 percent of all STEM jobs despite making up only 31 percent of the population — which means women and most minority groups are underrepresented and underserved. Not only does this contribute to race and gender wage gaps— STEM workers typically have higher salaries and currently enjoy a lower rate of unemployment than the general working population — but it also critically shortchanges the STEM community, since it means there are likely talented minds that haven’t been reached, and important perspectives that are missing.**

#### Cutting funding to Upward Bound hurts students of low-income and HBCU's.

Barnett Wright, Reporter for the Birmingham Times, July 3, 2017, Cuts to HBCU Grants Raise Alarm for Rep. Terri Sewell, 41 Members of Congress," Birmingham Times, <https://www.birminghamtimes.com/2017/07/cuts-to-hbcu-grants-raise-alarm-for-rep-terri-sewell-41-members-of-congress/> (accessed 7/3/17)

**Congresswoman Terri A. Sewell (D-AL), Congresswoman Gwen Moore (D-WI) and 41 members of the Congressional Black Caucus on Friday urged U.S. Secretary of Education Betsy DeVos to provide clarity on cuts to an Upward Bound program designed to help low-income students attend Historically Black Colleges and Universities (HBCUs).** “We’re calling on Secretary DeVos to work with members of Congress to identify and address the issues that have led to such a devastating loss on our HBCU campuses,” Sewell said. **The Birmingham Times reported last week that Miles College, Talladega College and Tuskegee University – three Historically Black Colleges and Universities (HBCUs) in the state of Alabama — are among the 77 schools that had federal grants for the Upward Bound program rejected by the U.S. Department of Education. “Historically Black Colleges and Universities are an integral part of our nation’s education system and our history,” said Sewell on Friday. “For many of my constituents, these schools are where the first member of their family went to college and where the next generation is getting their degree.**

#### Students from diverse backgrounds find barriers to education access.

Enrica Ruggs, Rice University, and Michelle Hebl, Rice University, 2012, "Literature Overview: Diversity, Inclusion, and Cultural Awareness for Classroom and Outreach Education," Assessing Women and Men in Higher Education, <http://www.engr.psu.edu/awe/ARPAbstracts/DiversityInclusion/ARP_DiversityInclusionCulturalAwareness_Overview.pdf>

**Although the education system is becoming more diverse, students who come from stigmatized groups (e.g., groups that are the target of negative stereotypes, prejudice, and discrimination) still perceive barriers to education. These perceptions may be the result of both actual differences in the treatment of students in the classroom and the inability of educators to understand students and be sensitive to and inclusive in teaching styles and content.**

#### Outreach programs like Upward Bound are critical for students to reach access to education.

Enrica Ruggs, Rice University, and Michelle Hebl, Rice University, 2012, "Literature Overview: Diversity, Inclusion, and Cultural Awareness for Classroom and Outreach Education," Assessing Women and Men in Higher Education, <http://www.engr.psu.edu/awe/ARPAbstracts/DiversityInclusion/ARP_DiversityInclusionCulturalAwareness_Overview.pdf>

**A third strategy is to become aware of, incorporate, and promote outreach-education programs to prepare students, particularly those from disadvantaged backgrounds, as research shows that these types of programs (e.g., Upward Bound) are effective in helping students succeed at the next level of academia (Fields, 2001). Through outreach-education programs, educators and practitioners should seek to mend the pipeline for women and students from various racial and cultural backgrounds by introducing them to information in nontraditional fields and providing them with active learning projects within those fields so that they have the opportunity to explore for themselves. This is particularly important for outreach education programs geared toward engineering and science fields in which students can incorporate knowledge with laboratory experiences.** Engaging families in outreach programs is important because it helps them feel and become involved in supporting the academic success of their child. **Outreach programs can also educate parents on the costs of education as well as the available sources of financial support, which is beneficial for parents who see finances as a barrier to their child’s education.**

#### Upward Bound is critical to help eliminate achievement gaps for students in HBCU's.

Barnett Wright, Reporter for the Birmingham Times, July 3, 2017, Cuts to HBCU Grants Raise Alarm for Rep. Terri Sewell, 41 Members of Congress," Birmingham Times, <https://www.birminghamtimes.com/2017/07/cuts-to-hbcu-grants-raise-alarm-for-rep-terri-sewell-41-members-of-congress/> (accessed 7/3/17)

**“The Upward Bound program has been a critical asset to these HBCUs by providing millions of students with the security of an academic support system that can eliminate achievement gaps existing between the rich and the poor and between HBCU students and those who attend other institutions. Denying HBCUs this lifeline of support puts students at risk and our history at risk. During the FY17 grant period, a number of HBCUs lost funding for their Upward Bound programs, many for non-substantive errors such as font or file format. Sewell was among those in Congress who signed a letter to DeVos expressing concerns.** “As the TRIO Caucus co-chair and an Upward Bound graduate, I am deeply concerned about the denial of grant funding to HBCUs,” said Moore.  “**Upward Bound played an essential role in shaping my academic and professional success. Funding must continue in order to ensure that future generations have access to these resources.**  We hope that Secretary DeVos will respond to this letter affirming her commitment to Upward Bound students at our historically Black colleges. This administration should work to mitigate disparities not aggravate them.”

#### Need to Further Invest in STEM Degree Completion to help underrepresented populations.

White House Initiative on Educational Excellence for African Americans, March 16, 2016, "FACT SHEET: Spurring African-American STEM Degree Completion," White House, <https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion> (accessed 5/25/17)

African-American and Latino college enrollment is up by more than a million students since 2008. [ [4](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn04) ] While these institutions have made considerable progress, there is more to be done.  **Students of color still have low degree completion rates and low representation in STEM fields, where needs for professionals and technical personnel are growing tremendously. African-American students, like their Hispanic, American Indian, and Asian counterparts, are underrepresented in STEM programs and courses of study compared to their overall college enrollment rate. African-Americans received just 7.6 percent of all STEM bachelor's degrees and 4.5 percent of doctorates in STEM.** [ [5](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn05) ] In 2011, 11 percent of the workforce was black, while 6 percent of STEM workers were black (up from 2 percent in 1970). [ [6](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn06) ]

#### STEM diversity has not grown in almost two decades.

Chris Kimrey, is an MPA candidate at the University of Pennsylvania Fels Institute of Government and editor of the Institute’s publication, Re:CAP, 2017 "Tackling STEM Education Problem in Underserved Philadelphia," Medium, [https://medium.com/@UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b](https://medium.com/%40UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b) (accessed 6/25/17)

**STEM teachers in urban communities, especially those that reflect the ethnicity of the student, are limited. Lacking minority educators as role models, students of color may be less likely to pursue STEM fields, perpetuating a shortage of STEM educators. The outcome has impacts reaching far beyond Philadelphia. As a result of these systemic STEM education trends, the STEM workforce is no more diverse now than in 2001. More disconcerting is the fact that growth in the STEM professional field is masked by increasing gains by Caucasian and Asian professionals, predominantly men. The growth in STEM degrees among minorities has been nearly non-existent since 2001, at just above 6% of all degree earners, according to National Science Foundation data.**

#### STEM funding can decrease the racial and socioeconomic achievement gap that is plaguing students throughout the country.

Chris Kimrey, is an MPA candidate at the University of Pennsylvania Fels Institute of Government and editor of the Institute’s publication, Re:CAP, 2017 "Tackling STEM Education Problem in Underserved Philadelphia," Medium, [https://medium.com/@UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b](https://medium.com/%40UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b) (accessed 6/25/17)

**Among Pennsylvania students, the racial and socioeconomic achievement gap in math and science is stark. In 2015, minority students in eighth grade scored on average 30 points lower than their white peers on the state math exam, representing a 12-year low. Similarly, urban students in grades four and eight scored on average 30 points lower than suburban students on the state math exam. This problem disproportionately affects underserved communities lacking access to funding and resources for STEM education. The households in these underserved communities often have limited access to necessary academic resources and many only have one parent in the home**

#### Several Historically Black Colleges & Universities, including Miles college, are among 77 schools that need grants for Upward Bound as their grants were rejected.

Kyoka Akers, Writer For The Birmingham Times, June 28, 2017, "Miles College, Area Schools Devastated by Loss of Upward Bound Program," Birmingham Times, <http://www.birminghamtimes.com/2017/06/miles-college-other-schools-devastated-by-loss-of-upward-bound-program/> (accessed 6/30/17)

**Miles College, Talladega College and Tuskegee University – three Historically Black Colleges and Universities (HBCUs) in the state of Alabama — are among the 77 schools that had federal grants, for programs designed to help low-income students, rejected by the U.S. Department of Education. The Upward Bound program, which is not being funded this summer, was in place to help high school students from low-income families, or families in which neither parent holds a bachelor’s degree, prepare for college. Under the program students were able to live on college campuses for the summer and attend classes as if they were actual college students. “There will be 81 students who will not get the benefit of the services for academic, cultural, and social enrichment that this program has provided in this community for more than 50 years,” said Rhonda Nunn, Guidance Counselor for Miles College Upward Bound program. “They won’t get tutoring, they won’t get tours of college campuses, the academic counseling or the financial aid assistance that they need.”**

#### The impact of Devos defunding Upward Bound is immense, especially for students of color in Birmingham.

Kyoka Akers, Writer For The Birmingham Times, June 28, 2017, "Miles College, Area Schools Devastated by Loss of Upward Bound Program," Birmingham Times, <http://www.birminghamtimes.com/2017/06/miles-college-other-schools-devastated-by-loss-of-upward-bound-program/> (accessed 6/30/17)

**Last month, U.S Secretary of Education, Betsy DeVos, said part of the problem stemmed from formatting and clerical issues, but she directed department staff “to allow flexibility on formatting and other technical elements on all grant applications. Bureaucratic red tape should never get in the way of helping students.” The impact on Birmingham area students is significant. Decarlo Howard, who will be a junior in the fall at Huffman High School, has participated in the Upward Bound program for the past two years. “Before I started Upward Bound I was shy,” said Howard. “It helped me get out of my comfort zone because I was forced to meet new people. It also helped me learn how to study and as a result I participate more in class and my grades have improved. “This is really a good program and it affects people’s lives. I have friends who were a part of this program and now they don’t have anything to do for the summer. We look forward to seeing each other. It (Upward Bound) made you feel like family. That’s what we go by now. We’re just one big family.”**

#### Maintaining diversity in STEM fields is crucial for STEM to adequately fulfill needs of national security, health and prosperity.

Laurel Raymond, Reporter for Think Progress, February 26, 2016, "National Science Foundation Launches Million Dollar Initiative to Improve Diversity in STEM," Think Progress, <https://thinkprogress.org/national-science-foundation-launches-million-dollar-initiative-to-improve-diversity-in-stem-3f2f4183d3e> (accessed 5/26/17)

**“Full participation of all of America’s STEM talent is critical to the advancement of science and engineering for national security, health, and prosperity,”** reads the NSF INCLUDES introduction. According to this thesis, **the problem isn’t that there are too many white men in the sciences. The problem is that there’s a smaller proportion of blacks, Hispanics, Native Americans, persons with disabilities, and women in the STEM workforce compared to the general population, and that socio-economic barriers still stand in the way of a STEM education — which means there’s talent in the population going untapped. This talent is necessary for the United States to advance in fields crucial to national security, health, and prosperity— as well as to make our research better and more socially relevant. “Diversity — of thought, perspective, and experience — is essential for excellence in research and innovation in science and engineering**,” writes Cordova.

#### Students in urban and rural communities suffer the most with lack of access to STEM education.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**Lack of STEM access is a critical equity issue in education, particularly for students in urban and rural communities, where access to high-level math and science courses is often out of reach. Soon, the impact of students living in STEM deserts will not only be reflected in those students' high school and college competition rates, but will also take a toll on the country's technological superiority, its economy and national security.**

## AD 3: Space

#### The new education budget under Trump fails to provide funding for Tile IV-A grants for funding STEM education projects.

Sydney Johnson, Assistant Editor for EdSurge Higher Education, May 23, 2017, "No Sign of Edtech In Department of Education’s Full Federal Budget Proposal," EdSurge, <https://www.edsurge.com/news/2017-05-23-no-sign-of-edtech-in-department-of-education-s-full-federal-budget-proposal> (accessed 5/25/17)

On May 23, President Trump released his highly anticipated, full budget proposal, which includes massive cuts to the U.S. Department of Education (ED). The President is requesting to eliminate $9 billion (or a 13 percent decrease) in U.S. education funding overall, with major reductions to after-school and professional development programs. Big boosts, however were given to school choice initiatives.

The budget did not mention many details about the Office of Education Technology, or how the staggering cuts could affect edtech initiatives like the department’s #GoOpen campaign or its commitment to connect 99 percent of American students to broadband by 2018. The department also did not respond to questions around how the budget could affect the Office of Education Technology and its programs. **What is clear, however, is that the proposal does not include funding for Title IV-A, which covers a flexible block grant program called Student Support and Academic Enrichment Grants. The grants are intended to fund programs around STEM education, college and career counseling, and supporting effective use of technology around blended learning and edtech devices. Title IV-A received $1.65 billion in fiscal year 2017.**

#### Federal investment is key; NASA education is crucial for STEM applications due to its close working relationship with the community.

CBS News Staff, May 17, 2017, "Senators urge continued funding for NASA's Office of Education," CBS19, <http://www.newsplex.com/content/news/Senators-urge-continued-funding-for-NASAs-Office-of-Education-422802034.html> (accessed 5/25/17)

**"The experiences, activities, and inspiration that NASA Education provides to students, teachers and the community can't be duplicated by any other organization. No other federal agency works so closely with the scientists and engineers who make it possible for us all to explore and discover space - this is STEM in action. My career was only possible because of the programs committed to providing opportunity to anyone willing to pursue their dreams. It is imperative that we inspire the next generation of STEM explorers by continuing to fund NASA education."**

#### NASA STEM education initiatives are crucial to open doors for young, talented students at every education level.

CBS News Staff, May 17, 2017, "Senators urge continued funding for NASA's Office of Education," CBS19, <http://www.newsplex.com/content/news/Senators-urge-continued-funding-for-NASAs-Office-of-Education-422802034.html> (accessed 5/25/17)

**We are grateful for your past support for NASA’s Office of Education and the programs that inspire students across the country to pursue NASA and STEM-related careers. We believe that the NASA Office of Education supports important STEM education programs for students at every level, from K-12 to community college and doctoral degree programs. As we learned through the stories of Katherine Johnson, Dorothy Vaughan, and Mary Jackson in Hidden Figures, opening doors to STEM careers for young, talented people will ultimately enable the whole nation to reach new heights.**

#### STEM is key to send people to Mars, but not enough students are trained or interested.

Lockheed Martin, June 6, 2017, "New Poll: With First Mars Mission Approaching, Few Teachers Believe Students Interested In Subjects That Would Lead Them To Space Exploration Careers," PR Newswire, <http://www.prnewswire.com/news-releases/new-poll-with-first-mars-mission-approaching-few-teachers-believe-students-interested-in-subjects-that-would-lead-them-to-space-exploration-careers-300468322.html>

**A strong future Science, Technology, Engineering and Math (STEM) workforce is vital to sending humans to Mars, yet a new survey commissioned by Lockheed Martin (NYSE:**[**LMT**](http://studio-5.financialcontent.com/prnews?Page=Quote&Ticker=LMT)**) shows about a third of U.S. middle school and high school teachers (36 percent) see enthusiasm from their students about STEM learning.** To help address these findings, today the company unveiled new resources as part of its Generation Beyond program, including a [space-themed curriculum](https://www.generationbeyondinschool.com/resources) and [new app](https://www.youtube.com/watch?v=FooqIejMdus&list=PLqa9423Jd9Mp71Cp65nJ5t7O4wC0qj2pM&index=4) that simulates what it's like to explore the surface of Mars

#### To send a crew to Mars, students must be trained in STEM now.

Lockheed Martin, June 6, 2017, "New Poll: With First Mars Mission Approaching, Few Teachers Believe Students Interested In Subjects That Would Lead Them To Space Exploration Careers," PR Newswire, <http://www.prnewswire.com/news-releases/new-poll-with-first-mars-mission-approaching-few-teachers-believe-students-interested-in-subjects-that-would-lead-them-to-space-exploration-careers-300468322.html>

**NASA is planning to send a crew to Mars in the 2030s. To meet tomorrow's ambitious goals, the country will need thousands of today's students to follow career paths that will create the next generations of scientists, engineers and space explorers. According to the national survey of 1,000 teachers (conducted by Morar Consulting from April 5 – 11, ± 3.1% MOE), while just 38 percent of teachers report that a majority of students seem naturally interested in STEM, 83 percent see discussing space-related careers as a potential way to increase student focus on STEM. Other polling highlights include: 52 percent of teachers believe a near-term return to the moon would increase students' interest in STEM. 43 percent of teachers say their schools' curriculum is sufficiently preparing students for a STEM career (12 percent of which say very sufficiently preparing students). 23 percent of teachers agree that the current school curriculum is sufficiently preparing students for a career in space exploratio "America's hardworking teachers do an amazing job preparing students for success, and we owe them our support and partnership," said Rick Ambrose, executive vice president of Lockheed Martin Space Systems. "The new Generation Beyond curriculum connects students to the real-world exhilaration of space exploration to ignite their interest in STEM. It's incumbent on all of us to help teachers inspire the next generation of innovators and engineers."**

#### Exploration trades off with weaponization – resource re-allocation.

David M. Livingston, business consultant, financial advisor, and strategic planner, 8/10/2000, “From Earth to Mars: A Cooperative Plan,” http://www.spacefuture.com/archive/from\_earth\_to\_mars\_a\_cooperative\_plan.shtml

Despite the problems associated with putting humans on Mars, there are also benefits to be realized from such a mission. Both the public sector and the private sector have unique ways of benefiting from a manned voyage to Mars. Public-sector benefits include increased employment, the allocation of resources away from weapons to a space project, new technologies, scientific discoveries, and higher tax revenues. Some of the private-sector benefits include goodwill and a favorable public image as well as increased revenues and opportunities for corporate growth. High-paying jobs and employment opportunities will result from a Mars project. For example, maintaining and flying the Space Shuttle involves five NASA centers and approximately 25,000 high-paying jobs. A manned Mars mission has equal or greater potential for similar employment opportunities within both the public and private sectors. Another important benefit would be the probable allocation of resources away from military and weapons projects to the Mars project. Resources and talent will be dedicated to designing and developing the Mars mission.

#### Soft power solves the link and impact – exploration boosts US influence internationally.

Trevor Brown, MSc, S. Rajaratnam School of International Studies, Nanyang Technological University, Spring 2009, “Soft Power and Space Weaponization,” Air and Space Power Journal, http://www.airpower.au.af.mil/airchronicles/apj/apj09/spr09/brown.html

Analysts believe that the United States’ determination to maintain dominance in military space has caused it to lose ground in commercial space and space exploration. They maintain that the United States is giving up its civilian space leadership—an action that will have huge strategic implications. Although the US public may be indifferent to space commerce or scientific activities, technological feats in space remain something of a marvel to the broader world. In 1969 the world was captivated by man’s first walk on the moon. The Apollo program paid huge dividends in soft power at a time when the United States found itself dueling with the Soviets to attract other nations into its ideological camp. Unless the United States has a strong presence on the moon at the time of China’s manned lunar landing, scheduled for 2017, much of the world will have the impression that China has approached the United States in terms of technological sophistication and comprehensive national power.32 If recent trends hold, this is likely to come at a time when the new and emerging ideological confrontation between Beijing and Washington will have intensified considerably.

# AFFIRMATIVE EXTENSIONS

## Inherency Extensions

### More STEM Funding Needed

#### Current federal funding for education programs is insufficient and only a fraction of spending; Washington needs to take leadership and act.

Center for Education Reform, May 23, 2017, "Statement by Jeanne Allen, Founder & CEO, Center for Education Reform on the impending official release of the Trump Administration's Fiscal Year 2018 Budget for the US Department of Education, PR Newswire, <http://www.prnewswire.com/news-releases/statement-by-jeanne-allen-founder--ceo-center-for-education-reform-on-the-impending-official-release-of-the-trump-administrations-fiscal-year-2018-budget-for-the-us-department-of-education-300462578.html> (accessed 5/25/17)

**Federal education programs for primary and secondary grades represent only a fraction of total K-12 and supplemental spending – funding programs that, over time, have had mixed reviews. Those who gain from those programs always argue that the funds are „necessary” regardless of their effectiveness.** **Despite nearly forty years of effort by the US Department of Education, we remain A Nation at Risk. Our students are woefully unprepared for modern day challenges locally and globally, in large measure because we persist in funding programs and not students and where and how they learn best. Instead of focusing on budgetary line items, we should be working to redefine Washington’s role in creating paths that lead to education innovation and in carving out opportunities to match each student’s needs with the institutions or learning environments that best suit them.**

### Education System on the Rocks Now

#### STEM education is a growing concern in kindergarten through 12th grade in retention rates, number of enrollees, and graduates.

Bureau of Labor and Statistics, 2015, "STEM Crisis or STEM Surplus? Yes and Yes, U.S. Department of Labor, <https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm> (accessed 6/25/17)

**Numerous reports detail the growing concern of policymakers and industry leaders regarding a shortage in the STEM workforce believed necessary to sustain the U.S. innovation enterprise, global competitiveness, and national security.**[**5**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn5)**Most notable is the National Academies’ report Rising Above the Gathering Storm, which called for improvements in kindergarten through 12th-grade science and mathematics education and increasing the attractiveness of higher education, among other recommendations.**[**6**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn6)**The report highlighted troubling issues in a number of areas: low STEM retention rates, a relative decline in the number of U.S. citizens enrolled in science and engineering graduate school, and lower percentages of STEM graduates than those of other developed countries.** These sentiments were echoed in a 2012 report by the U.S. Congress Joint Economic Committee which stated that the current STEM workforce was falling short of demand in both STEM and non-STEM occupations.[7](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn7) According to the President’s Council of Advisors on Science and Technology, the United States would need to increase its yearly production of undergraduate STEM degrees by 34 percent over current rates to match the demand forecast for STEM professionals.[8](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn8)

#### Former Education Secretary says Congress must protect public education under DeVos.

Dr. John King, Former Secretary of Education, May 18, 2017, "Former U.S. Education Secretary Criticizes State Over CPS Budget Problems," WBEZ Chicago Podcast, <https://www.wbez.org/shows/morning-shift-podcast/former-us-education-secretary-criticizes-state-over-cps-budget-problems/37925ba3-3f52-4e9c-aca4-8960c8095133>

On how CPS’ financial problems could affect the city’s charter school market. King: A lot depends on the specifics of the individual community. Here in Chicago, given the budget constraints, the declining enrollment in many neighborhoods, it’s not surprising the demand for charter growth has slowed.  I also think supply is a challenge. Given the economic conditions, the budget constraints, I think you’re seeing fewer national charter organizations looking at Chicago as a place to come because they’re worried about, “Will there be space? Will there be the right level of per pupil funding to make for a successful school?” On what to expect for education **under DeVos.** King: Y**ou can’t help but look at this budget and see an assault on the American dream. The idea that we’d be better off if we had fewer after-school and summer programs, less professional development for teachers — and it was harder to go to college. That’s preposterous. At the same time, I look to Congress to stand up and protect public education.**

#### Current school course offerings in STEM are insufficient.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**Tombstone isn't alone in its lack of STEM education offerings. More than half of U.S. high schools do not offer calculus, 4 in 10 do not offer physics, more than 1 in 4 do not offer chemistry and more than 1 in 5 do not offer Algebra II, which is considered a gateway class for STEM success in college.**

#### The need for technical skills in math or science is growing, but test scores are not cutting it. Fareed **Zakaria**, columnist for The Washington Post and is the host of “Fareed Zakaria GPS**," March 26,** **2015**, "Why America's Obsession With STEM Education is Dangerous," The Washington Post, <https://www.washingtonpost.com/opinions/why-stem-wont-make-us-successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-9646eea6a4c7_story.html?utm_term=.31581636a414> (Accessed 6/30/17)If Americans are united in any conviction these days, it is that we urgently need to shift the country’s education toward the teaching of specific, technical skills. Every month, it seems, we hear about our children’s bad test scores in math and science — and about new initiatives from companies, universities or foundations to expand STEM courses (science, technology, engineering and math) and deemphasize the humanities. From [President Obama](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.insidehighered.com_news_2014_02_19_professor-2Dart-2Dhistory-2Dreceives-2Dhandwritten-2Dapology-2Dpresident-2Dobama&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=vdIKP-4o8JWs7pEUnEzkkS3_6X0nipXV5ugltjRsE90&e=) on down, public officials have cautioned against pursuing degrees like art history, which are seen as expensive luxuries in today’s world. Republicans want to go several steps further and [defund](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.insidehighered.com_news_2013_01_30_north-2Dcarolina-2Dgovernor-2Djoins-2Dchorus-2Drepublicans-2Dcritical-2Dliberal-2Darts&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=Bhc9HsaOptTmzs_Rqp98XlKEBIUTqDXcSaKq0-OKCo4&e=) these kinds of majors. “Is it a vital interest of the state to have more anthropologists?” [asked](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.insidehighered.com_news_2011_10_12_florida-5Fgovernor-5Fchallenges-5Fidea-5Fof-5Fnon-5Fstem-5Fdegrees&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=FH3DyNj5s4YpdLPvjFVNQacQii9GM3RYbl0WPnKSS6s&e=) Florida’s Gov. Rick Scott. “I don’t think so.” America’s last bipartisan cause is this: A liberal education is irrelevant, and technical training is the new path forward. It is the only way, we are told, to ensure that Americans survive in an age defined by technology and shaped by global competition. The stakes could not be higher.

### Education System Inherency

#### Public high schools are currently insufficiently offer classes like calculus or physics at predominantly African-American schools, putting students at a disadvantage in preparing for a STEM education in college.

White House Initiative on Educational Excellence for African Americans, March 16, 2016, "FACT SHEET: Spurring African-American STEM Degree Completion," White House, <https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion> (accessed 5/25/17)

**Despite educational progress over the past seven years, including climbing graduation rates and shrinking dropout rates, too many African-American students still lack access to the educational resources that offer a fair shot at success. than one-third of public high schools serving predominantly African-American students offer calculus. Only about 40 percent of public high schools serving predominately African-American students offer physics. [** [7](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn07) ] **This lack of access to foundational STEM skills puts African-American students at a significant disadvantage in preparing for advanced STEM courses and careers**. In addition to the resource gaps, African-American students exhibit achievement gaps, often established by the fourth grade and show little change after, according to the Joint Center for Political and Economic Studies. Moreover, by the eighth grade, less than one-third of African-American students are proficient in math and science. [A 2012 study](https://www.google.com/url?q=http://www.oecd.org/unitedstates/PISA-2012-results-US.pdf&sa=U&ved=0ahUKEwi7gOKh_8PLAhXKph4KHUfIBocQFggEMAA&client=internal-uds-cse&usg=AFQjCNFH5XwT-yCSlWkTcu-coqWFyEZwug) amongst 34 industrialized countries belonging to the Organization for Economic Cooperation and Development found that the U.S. ranked 27th on the math exams and 20th on the science exams. [ [8](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn08) ]

#### A lack of funding for Tile IV-A in the education budget means that the future of education is at risk, says former Director of the Ed's office of educational technology.

Sydney Johnson, Assistant Editor for EdSurge Higher Education, May 23, 2017, "No Sign of Edtech In Department of Education’s Full Federal Budget Proposal," EdSurge, <https://www.edsurge.com/news/2017-05-23-no-sign-of-edtech-in-department-of-education-s-full-federal-budget-proposal> (accessed 5/25/17)

**“No money for Title IV, Part A would mean no dedicated investment for supporting teachers using technology to personalize learning, teach computer science or support high-quality online learning options,” Richard Culatta, CEO of the International Society for Technology in Education (ISTE), said in a prepared statement.**

**Culatta, who was formerly the Director of the ED’s Office of Educational Technology, also urged Congress in his statement to fund Title IV-A and its authorized $1.6 billion. “The future of our children is at risk because of shortsighted and uninformed policy decisions,” he wrote.**

#### More must be done to close the gap, integrating STEM where it is not possible now.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

To close the gap in access between communities like Buena and Tombstone, **we must scale proven education programs that work at the local level to effect lasting improvements in student access, engagement and performance in rigorous STEM courses. And we all have a role to play: School boards should review the STEM and AP offerings that exist in their districts, become better attuned to the workforce needs in their community and develop strategies – and approve budgets – that expand student access to high-quality STEM learning. For district superintendents, where not every school can offer a full suite of AP courses, it is often possible for smaller schools to scale up access to a handful of rigorous courses for students. And at the school level, principals must ensure teachers have the training and support needed to successfully teach rigorous STEM curricula.**

#### All students should have access to quality STEM education.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**Parents and students in Buena and Tombstone shop at the same grocery stores and visit the same doctors, but have starkly different academic experiences when it comes to STEM. It's time for us to address this inequity and ensure every student has access to quality, rigorous coursework taught by highly trained and supported teachers. Our national security, economy and technological leadership – as well as our children's futures – depend on it.**

#### The current budget proposal allocates money for charter schools, not public schools.

Shelley Connor, May 19, 2017, "Trump administration education budget proposes $10.6 billion in cuts," World Socialist Website, <https://www.wsws.org/en/articles/2017/05/19/doeb-m19.html> (accessed 5/24/17)

**As the budget makes brutal cuts to public education spending, it allocates $500 million for charter schools—this represents an increase of 50 percent over the current charter school spending by the federal government. Another $250 million will be spent on “Education Innovation and Research Grants,” which would be dedicated for expanding school vouchers for private schools and for studying the impacts of these vouchers. Thus far, the budget does not clarify how much of the $250 million would go towards the studies as opposed to the actual vouchers.**

#### Trump's education budget is an attack on public education.

Shelley Connor, May 19, 2017, "Trump administration education budget proposes $10.6 billion in cuts," World Socialist Website, <https://www.wsws.org/en/articles/2017/05/19/doeb-m19.html> (accessed 5/24/17)

**This budget demonstrates Trump and DeVos’ well-documented disdain for public education.** DeVos has previously characterized federally-funded public education as “arcane” and ineffective; she has also headed an organization, the Acton Institute, that advocated for the repeal of child labor laws. **The Trump administration’s budget proposal is but a first, coordinated attack upon public education while benefiting the privatized school companies, for whom George W. Bush and Barack Obama opened the door, at the expense of quality education for working class children—and most especially for impoverished children**.

#### Current budget proposals show massive budget cuts to education, especially for student enrichment programs like STEM.

Shelley Connor, May 19, 2017, "Trump administration education budget proposes $10.6 billion in cuts," World Socialist Website, <https://www.wsws.org/en/articles/2017/05/19/doeb-m19.html> (accessed 5/24/17)

**In K-12 education funding, 22 programs would be eliminated. Among these are a $1.2 billion program for after school programs. These programs serve almost two million children, most of whom are from poor families. Other cuts include $2.1 billion for teacher training and class-size reduction,** a $12 million program for gifted students, $12 million allocated for Special Olympics programs, a $27 million arts program, $72 million allocated for foreign language and international studies programs, and $65 million allocated to programs for Alaskan and Hawaiian Native populations. **While other programs will continue, their funds will be cut significantly**. Promise Neighborhoods, an initiative designed to support children in impoverished communities, would lose $13 million. An adult literacy program would lose $96 million. Grants for career and technical education would be cut by $168 million; paired with the cuts to college financial aid, such cuts will drastically reduce options for a significant number of students who wish to pursue either a university degree or a career in the skilled trades. **The Trump administration budget also dedicates no money to a fund earmarked for student enrichment and support. This fund assists schools with mental health services, physical education, Advanced Placement courses and Science, Technology, Engineering, and Mathematics (STEM) instruction.** While Congress authorized up to $1.65 billion for the fund, t**he Trump administration has budgeted zero dollars for the fund in the next fiscal year.**

#### More must be done to close the gap, integrating STEM where it is not possible now.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

To close the gap in access between communities like Buena and Tombstone, **we must scale proven education programs that work at the local level to effect lasting improvements in student access, engagement and performance in rigorous STEM courses. And we all have a role to play:**

**School boards should review the STEM and AP offerings that exist in their districts, become better attuned to the workforce needs in their community and develop strategies – and approve budgets – that expand student access to high-quality STEM learning. For district superintendents, where not every school can offer a full suite of AP courses, it is often possible for smaller schools to scale up access to a handful of rigorous courses for students. And at the school level, principals must ensure teachers have the training and support needed to successfully teach rigorous STEM curricula.**

#### Education regulations fail in the status quo; monitoring is insufficient already.

Emma Brown, Reporter for the Washington Post, May 18, 2017, "Government Accountability Office faults Education Department’s oversight of grants," The Washington Post, <https://www.washingtonpost.com/news/education/wp/2017/05/18/gao-faults-education-departments-oversight-of-grants/?utm_term=.69fd1811b5bb> (accessed 5/25/17)

**Each year, the U.S. Education Department distributes billions of dollars in grants to schools, districts, states and nonprofits, and the agency needs to do a better job making sure that it is adequately monitoring whether the money is achieving its intended goals, according to a Government Accountability Office report.** Many grants are doled out over multiple years, and grantees are supposed to show “substantial progress” toward their goals  to receive their next installment of funds. T**he GAO found that in 2015,** during the Obama administration, **department employees did not consistently adhere to protocols for documenting their efforts to monitor grants, making it impossible for outside investigators to determine whether grantees made enough progress to get the money they received. The GAO studied 75 grants worth $272 million that Education awarded in fiscal  2015**, a small sample of the $4 billion in grants distributed to thousands of recipients that year. I**n 69 of those 75 cases, official Education grant files were missing documentation of performance. For instance, grantees’ progress should have been documented in 179 separate reports, but GAO investigators could find only 121 such reports in the official files.,**

### Upward Bound Inherency Extensions

#### In Ohio, the Upward Bound program is crucial to provide free skills and supports services to 100 students.

Susan Tebben, writer, June 10, 2017, "OU Upward Bound On Its Way Out," WOUB, <https://woub.org/2017/06/10/ou-upward-bound-on-its-way-out/>

**The program is completely funded through competitive grants from the Department of Education, and provides at no cost “skills and support services that cultivate resilience, confidence, and preparation for a healthy and successful  transition to a post-secondary institution upon high school graduation,” Pittman wrote. In 2015, the U.S. Department of Education allocated $263 million to the nation’s Upward Bound programs, according to federal documents. More recent numbers were not available. OU’s Upward Bound was funded to serve 90 students, but resources were stretched to provide service for 100, according to Pittman.**

### STEM Workers Needed

#### To remain competitive in science and technology, the US needs at least one million more STEM professionals.

Bureau of Labor and Statistics, 2015, "STEM Crisis or STEM Surplus? Yes and Yes, U.S. Department of Labor, <https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm> (accessed 6/25/17)

**Economic projections point to a need for approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade if the country is to retain its historical preeminence in science and technology.—President’s Council of Advisors on Science and Technology**[**1**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn1) **Unemployment rates within STEM ﬁelds…are often higher than they’ve been in years—a sign that there is a shortage of jobs, not workers.—**Michael Anft

####  By 2024, STEM jobs will grow by 17%, but our students aren't ready for it.

Deborah Levine, Editor of the American Diversity Report, June 18, 2017, "Buying into our STEM Future," Times Free Press, <http://www.timesfreepress.com/news/opinion/columns/story/2017/jun/18/levine-buying-our-stem-future/433575/> (accessed 7/3/17)

**The good news is that between 2014 and 2024, the number of STEM jobs will grow 17 percent, as compared with 12 percent for non-STEM jobs. By 2020, there will be an estimated 1.4 million computer-specialist job openings. The average hourly pay for these jobs can fuel our economic engine: $37.44 compared to $18.68 for all other types of jobs**. **But here's the problem: Students in the U.S. finish 27th in math and 20th in science out of 34 countries. The bad news is that just over a third of all high school grads are ready to take a college-level science course.**

#### STEM jobs are plentiful; there just needs to be a workforce.

Goldy Kamali, founder and CEO of FedScoop, a media company focused on government tech, March 29, 2014, "An Investment in STEM is an Investment in our Future," The Huffington Post, <http://www.huffingtonpost.com/goldy-kamali/an-investment-in-stem-is-_1_b_4675969.html> (accessed 5/24/17)

**There is not a lack of jobs in the aforementioned industries, but rather a lack of qualified individuals to fill the available positions. In non-STEM related fields, there is one job available per 3.8 unemployed people. In stark contrast, there are 1.9 STEM positions available for every one unemployed person. The national unemployment rate lingers at 7 percent as STEM employers look for capable individuals to fill holes in their companies. As we can see from the PISA scores, the U.S. is trailing behind in both science and math. These scores directly reflect upon the lack of qualified individuals available to fill STEM-related occupations. An investment needs to be made in STEM, starting from a young age, and the organizations making these investments need to be recognized.**

#### STEM occupations growing now and projected to grow, and filling these jobs is key to US international competitiveness.

Goldy Kamali, founder and CEO of FedScoop, a media company focused on government tech, March 29, 2014, "An Investment in STEM is an Investment in our Future," The Huffington Post, <http://www.huffingtonpost.com/goldy-kamali/an-investment-in-stem-is-_1_b_4675969.html> (accessed 5/24/17)

**The Department of Commerce has estimated that from 2008-2018, STEM occupations are projected to grow by 17 percent, while non-STEM job prospects are expected to grow by only 9.8 percent. In order for the U.S. to achieve economic growth and remain competitive on an international scale, these jobs must be filled. People employed in STEM fields** are making technological breakthroughs that directly impact our lives: engineers are improving our infrastructure, developing safer bridges and roads across the country; scientists are making advances in health care that bring us closer to eradicating disease; and innovators are consistently changing the way we think about communication. They **are the people who move our country forward and the minds who enable us to remain one of the most progressive nations in the world.**

## Solvency Extensions

### States are Insufficient & STEM Training Necessary

#### Despite efforts at the state levels, the U.S. needs to produce more tech workers while schools aren't producing enough training to meet that requirement.

Dean Hager is CEO of JAMF Software, an Apple device management company, April 26, 2016, "The real reasons behind the tech skills gap," Fortune Insiders, <http://fortune.com/2016/04/27/tech-skills-gap-stem/> (accessed 5/26/17)

**The issue is the teaching of computer science in high schools – or the lack thereof – and how we’re squandering opportunities to better prepare students for an increasingly tech-centric job market.** I**n Florida, the state Senate in February overwhelmingly approved a first-of-its-kind proposal to allow computer coding to fulfill a foreign language requirement in high school.** The bill’s sponsor, Sen. Jeremy Ring, a former Yahoo executive, contended that in a competitive job market, computer skills are as important as speaking another language and that computer coding is a skill more aligned with liberal arts than math or science. **Though the legislation ultimately failed a few weeks later after going nowhere in the Florida House, the bill’s momentum, albeit brief, cast a welcome spotlight on the astonishing lack of computer science in high school curricula and has given hope to those of us who feel creative approaches to address the problem are overdue.** Numbers tell the story of a painful contradiction: **The United States needs many more tech workers, but schools aren’t providing enough training to meet the requirement.**

#### Federal programs like the common core demonstrate a way to ensure students are properly trained in math and science, but states have not obliged.

Brian Kelly, Editor for US News & World Report, September 21, 2012, "The State of STEM and Jobs," US News & World Report, <https://www.usnews.com/news/articles/2012/09/21/the-state-of-stem-and-jobs> (accessed 5/26/17)

**There is a severe shortage of qualified math teachers. The most successful teachers are the ones who were trained the same way they teach: by making math and science real-life, hands-on.**

**There are many more kids who would like to go into STEM careers than generally recognized, but they aren’t properly prepared and mostly drop out.** We have many good examples of schools and programs that succeed, but no consensus on which ones to focus on and scale up to reach all 55 million public school students. Corporations and philanthropies are anxious to find better measures of success. **STEM is a subset of the whole unresolved education reform problem of standards, outcomes, and teacher performance; it’s just that STEM performance is more easily measurable. You either master a given level of math, or you don’t. The new, state-approved Common Core Math and Science Standards are viewed as a very important tool to promote and measure improvement, but there is concern that they will not be fully implemented by many states.**

### Fed Key

#### Federal action is efficient with the Office of Stem in the Department of Education.

White House Initiative on Educational Excellence for African Americans, March 16, 2016, "FACT SHEET: Spurring African-American STEM Degree Completion," White House, <https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion> (accessed 5/25/17)

**Despite many of the STEM education programs called for by the President not being funded by Congress, the Administration has made significant strides to close the access and equity gaps in STEM education. The Department of Education, specifically, created an Office of STEM to help coordinate STEM programs throughout the Department and across our Federal partners. Also, STEM is now a funding priority in over 60 different ED programs—including the Arts—to raise awareness of the need for and interest in strengthening STEM education.**

#### HBCUs effective for assisting students to excel in STEM fields.

White House Initiative on Educational Excellence for African Americans, March 16, 2016, "FACT SHEET: Spurring African-American STEM Degree Completion," White House, <https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion> (accessed 5/25/17)

**For more than a century, HBCUs have been leaders in educating African-American college graduates who excel in their fields. A recent report from the National Science Foundation revealed that 21 of the top 50 institutions for educating African-American graduates who go on to receive their doctorates in science and engineering, are HBCUs. The contributions of HBCUs do not stop there: Even though our nation's HBCUs make up just 3 percent of colleges and universities, they produce 27 percent of African-American students with bachelor's degrees in STEM fields.** In 2011, HBCUs conferred one-fourth of the bachelor's degrees in education awarded to African-Americans. Xavier University, an HBCU, awards more undergraduate degrees in the biological and physical sciences to African-American students than any other university in the nation.[ [2](https://www.ed.gov/news/press-releases/fact-sheet-spurring-african-american-stem-degree-completion#fn02) ] **HBCUs have implemented proven practices to assist students in STEM fields to obtain rich professional experiences, research opportunities, and mentorships; navigate through courses and financial challenges, and drive students to post-baccalaureate success.**

#### STEM education succeeds in an interdisciplinary environment.

 Dr. Matthew Lynch, Professor and Expert on Education Equity, May 24, 2017, "Preparing Graduates to Meet STEM Needs and opportunities," Education Week, <http://blogs.edweek.org/edweek/education_futures/2017/05/preparing_graduates_to_meet_stem_needs_and_opportunities.html> (accessed 5/25/17)

**A successful STEM classroom -- or school -- isn't just about the content; it's about how that content is taught. In fact, a key part of STEM is the interdisciplinary nature of the four subjects. To weave together a rich and meaningful learning environment, it is essential to take advantage of the similarities and interplay of skills and knowledge among science, technology, engineering, and mathematics. Teachers in other disciplines can also benefit from using a STEM approach. Many NISE participants are language arts and social studies teachers who want to integrate STEM strategies into their classrooms and integrate instruction across the curriculum. These "non-stereotypical STEM" teachers are reinforcing students' development of a STEM mindset and strengthening the school's overall STEM culture.**

### Upward Bound solvency extensions

#### Upward Bound has a substantial impact on high school and postsecondary outcomes for certain groups of students.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, <https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf> (accessed 6/15/17)

**In particular, Upward Bound consistently showed a positive impact on students who, when applying for the program, did not expect to earn a B.A. degree. Although these students with "lower educational expectations" comprise only about 20 percent of Upward Bound participants, participation in the program increases the total number of academic credits they earn in high school (two credits) as well as AP credits credits (0.7). Most significantly, Upward Bound more than doubles, from 18 to 38 percent, the likelihood that these students will enroll in a four-year college, and improves their early college persistence as measured by total credits earned (11 additional credits).**

#### Upward Bound is crucial for HBCU's.

Kyoka Akers, Writer For The Birmingham Times, June 28, 2017, "Miles College, Area Schools Devastated by Loss of Upward Bound Program," Birmingham Times, <http://www.birminghamtimes.com/2017/06/miles-college-other-schools-devastated-by-loss-of-upward-bound-program/> (accessed 6/30/17)

**Upward Bound is part of the federal TRIO programs, which are outreach and student services programs designed to identify and provide services for individuals from disadvantaged backgrounds. U.S. Rep. Terri Sewell said the program has “provided invaluable resources” to young people across her district since the 1960’s. “It is obviously deeply disturbing that these long serving Upward Bound programs at HBCU’s in Alabama will no longer provide much needed assistance for first-generation college students from underserved communities,” Sewell said. “As a strong advocate of TRIO programs, I believe the Department of Education needs to be held accountable to explain how a disproportionate number of the Upward Bound programs in Alabama that lost their funding were HBCU’s and how we address this disparity.”**

#### Upward bound is crucial to help students in their college prep.

US Department of Education,2017, "Programs: Upward Bound," U.S. Department of Education, <https://www2.ed.gov/programs/trioupbound/index.html> (accessed 6/15/17)

**Upward Bound provides fundamental support to participants in their preparation for college entrance. The program provides opportunities for participants to succeed in their precollege performance and ultimately in their higher education pursuits. Upward Bound serves: high school students from low-income families; and high school students from families in which neither parent holds a bachelor's degree. The goal of Upward Bound is to increase the rate at which participants complete secondary education and enroll in and graduate from institutions of postsecondary education.**

### Generic Solvency Extensions

#### NSF INCLUDES removes barriers to STEM education, creating successful avenues for students; grants have already been dolled out.

Laurel Raymond, Reporter for Think Progress, February 26, 2016, "National Science Foundation Launches Million Dollar Initiative to Improve Diversity in STEM," Think Progress, <https://thinkprogress.org/national-science-foundation-launches-million-dollar-initiative-to-improve-diversity-in-stem-3f2f4183d3e> (accessed 5/26/17)

**How NSF INCLUDES will help remove barriers to STEM access and shore up the ‘leaky pipeline’ of STEM learners remains to be seen. Possibilities could range from offering more science and math AP courses in underserved areas to increasing the diversity of STEM PhD earners. The solicitation says only that projects must have measurable benchmarks of success, will likely involve a broad collaboration across public and private sectors, and must be scalable to a national level. NSF officials expect to receive over 250 proposals from this initial call, 40 of which will ultimately receive the initial round of funding. It’s an investment in the future that has been long-awaited. “The community has been asking us to issue a solicitation for quite a while,”** NSF program officer Bernice Anderson told Science.

#### UBMS students were more driven to obtain post-secondary education as compared to those not enrolled in supplemental services.

Margaret Cahalan and David Goodwin, The Council for Opportunity in Education, June 2014, "Setting the Record Straight: Strong Positive Impacts Found from the National Evaluation of Upward Bound," The Pell Institute for the Study of Opportunity in Higher Education, <http://files.eric.ed.gov/fulltext/ED555877.pdf> (Accessed 6/15/17)

**Instrumental variables regression controlling for selection factors revealed that 75 percent of UB/ UBMS participants entered postsecondary within one year of high school graduation compared to 62 percent of those who received only a less intensive service such as Talent Search, and 45 percent of those who reported no pre-college service receipt (figure 9). PPSS also found that UB/UBMS participants were 3.3 times more likely to obtain a BA in six years when compared to those reporting no participation in college access supplemental services and 1.4 times as likely when compared to those who reported participating in less intensive supplemental services (Figure 10).**

#### Upward Bound increased high school credits earned by students with lower educational expectations.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, <https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf> (accessed 6/15/17)

**For students with lower educational expectations, Upward Bound increased the number of credits earned in the five core academic subjects together by 2.0 credits, and it increased credits earned in two of those subjects individually—math and foreign languages—by 0.5 credits and 0.3 credits, respectively. Upward Bound also increased the number of credits earned in honors and Advanced Placement courses for students with lower expectations.**

## Advantage Extensions

### US Hegemony Extensions – leadership, innovation, etc.

#### STEM education lacking, with the U.S. scoring 21st among its peers.

Fareed Zakaria, columnist for The Washington Post and is the host of “Fareed Zakaria GPS," March 26, 2015, "Why America's Obsession With STEM Education is Dangerous," The Washington Post, <https://www.washingtonpost.com/opinions/why-stem-wont-make-us-successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-9646eea6a4c7_story.html?utm_term=.31581636a414> (Accessed 6/30/17)
**That was appropriate in another era, the technologists argue, but it is dangerous in today’s world. Look at where American kids stand compared with their peers abroad. The most recent international test, conducted in 2012, found that among the 34 members of the Organization for Economic Cooperation and Development, the United States**[**ranked**](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.oecd.org_unitedstates_PISA-2D2012-2Dresults-2DUS.pdf&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=j94JxPhPG2yqzbSEjpibCWs9GIIe29i4sND2sbAbUKw&e=)**27th in math, 20th in science and 17th in reading. If rankings across the three subjects are averaged, the United States comes in 21st, trailing nations such as the Czech Republic, Poland, Slovenia and Estonia.**

#### The STEM shortage affects multiple industries like healthcare, energy production, manufacturing, transportation, and agriculture, more support and drive for further STEM education is crucial.

Brian Kelly, Editor for US News & World Report, September 21, 2012, "The State of STEM and Jobs," US News & World Report, <https://www.usnews.com/news/articles/2012/09/21/the-state-of-stem-and-jobs> (accessed 5/26/17)

**The sweep of industries affected by the STEM skills shortage was revealing, from healthcare, energy production and distribution, and autos to the whole slowly renewing domestic manufacturing area, transportation, and agriculture. “There are no more jobs that require a strong back,”** said Tom Luce, the force behind the successful National Math and Science Initiative. “We have to explain to parents and kids that 30 years ago you could have a living wage job and not be STEM capable. Today that is not possible.” It would be naive to try to oversimplify this intricate problem. But there are some clear next steps. **Broader public awareness is crucial. Public demand for better education and jobs information will drive behavior at all levels.** Creating a message that resonates is essential. The brand marketers have to step forward. “Just Do the Math” might work if a certain shoe company doesn’t mind. “Math Means Money” could have a catchy beat.

#### If the U.S. does not invest in its scientific workforce, it will behind internationally in food security, telecommunications, energy and defense.

Michael Ickowitz, a former ORISE science education project manager, serves as senior manager for international recruitment and market development for the University of New South Wales, 2017, "Investing in the Next Generation of Scientists and Engineers: The Key to Maintaining Global Competitiveness," US Department of Energy ORAU, <https://orise.orau.gov/stem/career-development/how-to-find-research-funding/investing-in-the-next-generation-of-scientists-and-engineers.html>

In other words, **if the United States does not continuously invest in developing a scientific workforce, we are creating an economic and societal environment in which the United States must rely on the rest of the world in areas such as food security, telecommunications, energy, and defense.** Funding scientific workforce development programs is more than just a mechanism to provide real-world research experiences. **It is a crucial economic strategy for ensuring continued global superiority through workforce stability. We have a responsibility to invest in the future of the U.S. scientific workforce so that we can continue to contribute to economic growth and the advancement of society.** The cost of this investment pales in comparison to the cost of not investing, which **creates the risk of falling global influence, competitiveness, risking our prosperity, security, and general well-being.**

#### The U.S. is only 8th in the world for number of researchers employed in R&D.

Michael Ickowitz, a former ORISE science education project manager, serves as senior manager for international recruitment and market development for the University of New South Wales, 2017, "Investing in the Next Generation of Scientists and Engineers: The Key to Maintaining Global Competitiveness," US Department of Energy ORAU, <https://orise.orau.gov/stem/career-development/how-to-find-research-funding/investing-in-the-next-generation-of-scientists-and-engineers.html>

**In terms of global rankings, this places the United States eighth in the world, behind Israel, Finland, South Korea, Canada, Switzerland, Germany, and the United Kingdom. Growth in the number of researchers in R&D per million people grew from 2011 to 2012 at a rate of 0.19 percent, which was eclipsed by the growth of R&D in Israel, South Korea, China, and Germany during that same time. This pattern of being outpaced in the number of researchers in R&D has continued since data collection began in 1996.**

#### The STEM workforce is an important facet of a nation's competitiveness.

David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, all are economists in the Office of the Chief Economist of the U.S. Department of Commerce’s Economics and Statistics Administration, July 2011, "STEM: Good jobs now and for the future," U.S. Department of Commerce, <http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf> (accessed 5/25/17)

**Although still relatively small in number, the STEM workforce has an outsized impact on a nation’s competitiveness, economic growth, and overall standard of living. Analysis of data from the U.S. Census Bureau’s American Community Survey and Current Population Survey provide new insights into the growing STEM workforce that is central to our economic vitality. STEM jobs are the jobs of the future. They are essential for developing our technological innovation and global competitiveness.**

#### There is a demand for qualified researchers and technicians, as the US's competitive edge in the global economy is declining; more STEM education is needed in K-12 education.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**Modern economies have a rising demand for qualified researchers and technicians.** One European initiative declaring STEM education as a major thematic domain is inGenious, organized by the European Coordinating Body in STEM Education through funding from the European Union as a joint initiative of European Schoolnet, the European network consisting of 30 Ministries of Education, in collaboration with the European Roundtable of Industrialists. The initiative released the publication Science, Technology, Engineering and Mathematics Education: Overcoming the challenges in Europe (Joyce & Dzoga, 2011), defining STEM education challenges in Europe and focusing on widening the STEM skills “gap” in European countries as compared to Asian countries. In particular, it noted that Asian STEM students account for about 20% of the student population compared to 2% in Europe. T**he United States has also been examining the status of STEM education. Over the last decade, numerous reports from U.S. business and government organizations have warned that the United States’ competitive edge in the global economy is eroding. These reports, along with a series of bills introduced in Congress and in state legislatures, call for an extensive effort to reform K–12 STEM education, and cultivate the next generation of skilled scientists, engineers, technicians, and science and mathematics educators** (BHEF, 2007; Business Roundtable, 2005; NAS, 2007; NRC, 1996)

#### STEM is an important facet of our lives, for career options, understanding the technological age, and for making decisions.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

Not surprisingly, the attention on STEM has come from all levels in our society, including the White House, in which President Barrack Obama declared, “**Science is more than a school subject, or a periodic table, or the properties of waves. It is an approach to the world, a critical way to understand and explore and engage with the world, and then have the capacity to change the world.”** (1) Many thinkers, including a writer at Science Pioneers, echoed the significance of this statement. The author wrote, “**STEM is important because it pervades every aspect of our lives. STEM is our children’s future – the technological age in which they live, their best career options, and their key to making wise decisions.**” (2) According to Nicole Martin at STEMJOBS, “T**hese STEM disciplines no longer stand alone as separate career fields, and in fact, many real-world situations require problem-solving strategies that include integrated solutions from each of these four fields.**

#### STEM workers are crucial for the US to lead innovation in this competitive global world.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

**As global competition increases, more STEM-literate workers are vital to the U.S. and our ability to lead innovation, increase productivity, and compete effectively in a growing global economy.” (3) As a result, STEM workers are in demand. According to the U. S. Department of Commerce, from 2008 to 2018, STEM occupations are projected to grow at 17 percent, while others are estimated at 9.8 percent.** (4) **Closer to home, a February 19, 2016 article in the Puget Sound Business Journal reported that 90 percent of the 50,000 jobs in the State of Washington that go unfilled in 2017 will require STEM skills. Thus, for the U.S. to achieve economic growth and remain competitive on an international scale, these jobs must be filled.** This situation is, however, challenged by the current reality.

### China is gaining on us!

#### The growth of the Chinese education market is a reason for the great interest in Chinese companies, which is all a result of government investment in education.

TAL Education Group, May 24, 2017, "China and the US Look Forward to New Exchanges on Education Following ASU GSV Summit," PR Newswire, <http://www.prnewswire.com/news-releases/china-and-the-us-look-forward-to-new-exchanges-on-education-following-asu-gsv-summit-300463039.html> (accessed 5/25/17)

**The rapid growth of the Chinese education market in recent years was undoubtedly another reason for the great interest in the Chinese companies. Valued at RMB 1.6 trillion in 2015, the industry is expected to grow to RMB 3 trillion by 2020.** Additionally, more than half of all investments were in the early childhood and K12 tutoring markets. **This expansion has been fueled in part by new government policies favorable to the education industry.** TAL Education CSO and general manager of the investment division John Wu also cited increased birthrate (20 million births expected per year from 2016 to 2020), a desire for more diversified education from young parents, and **a rising demand for quality STEAM education as drivers of this trend.** Mr. Wu admitted that both the public sector and private companies like TAL Education struggle to supply enough teachers and services to fill the needs of the voracious market.

#### There exists much interest in the Chinese education system.

TAL Education Group, May 24, 2017, "China and the US Look Forward to New Exchanges on Education Following ASU GSV Summit," PR Newswire, <http://www.prnewswire.com/news-releases/china-and-the-us-look-forward-to-new-exchanges-on-education-following-asu-gsv-summit-300463039.html> (accessed 5/25/17)

**The Chinese companies in attendance received a warm welcome at this year's Summit, partly due to a diverse program selection offered by the EdStars Educational Delegation. Two panels of leading Chinese education companies presented to fully-packed rooms.** Former Yale University president and Coursera CEO Rick Levin joined TAL Education co-founder Liu Yachao and other leading voices in Chinese education in a keynote discussion on US-China education exchange and integration. Attendance at a poolside cocktail reception for Chinese and international edtech enterprises was double expectations. **Many foreign CEOs even learned to use WeChat, China's ubiquitous messaging app, to keep in contact with Chinese companies.**

#### Chinese education companies are creating online classrooms with advanced technology, focusing on STEM initiatives like AI.

TAL Education Group, May 24, 2017, "China and the US Look Forward to New Exchanges on Education Following ASU GSV Summit," PR Newswire, <http://www.prnewswire.com/news-releases/china-and-the-us-look-forward-to-new-exchanges-on-education-following-asu-gsv-summit-300463039.html> (accessed 5/25/17)

**Many of the presentations by companies in the EdStars Educational Delegation also strived to highlight the innovation Chinese enterprises and their capacity as creators of intellectual property**. As part of ASU GSV's Global Program, online education company EEO introduced its flagship product, ClassIn, **a multi-channel interactive online classroom that uses academic as well as behavior data collected from facial recognition software to improve the learning experience. ClassIn's use of advanced technology** was part of a central theme noted at this year's Summit: **the integration of education and cutting-edge science and technology with a focus on AI (artificial intelligence). Several participants said that a learning revolution triggered by big data and technologies like AR and VR is moving from concept to reality, and questions about the possibility of AI replacing teachers were in no short supply.**

#### Chinese education innovators have developed an AI teacher that is more effective than a human teacher, which is indicative of China's growing education market.

TAL Education Group, May 24, 2017, "China and the US Look Forward to New Exchanges on Education Following ASU GSV Summit," PR Newswire, <http://www.prnewswire.com/news-releases/china-and-the-us-look-forward-to-new-exchanges-on-education-following-asu-gsv-summit-300463039.html> (accessed 5/25/17)

On this issue, Wang Yi, CEO of Liulishuo, **"China's leading 'AI+Education' company in language learning,"** said onstage that his company **has developed an AI teacher that is three times more effective than a human teacher.** Dr. Yi asserted that **AI is not meant to replace teachers, but actually allows educators to spend less time doing low value-added work so they can focus more on each student's development. "The Chinese education market is transforming from labor-intensive to capital and technology intensive,**" said Dr. Liu. "With consumption upgrade and the rise of the middle class, the Chinese population's pursuit of education has changed from 'going to school' to 'receiving good schooling,' with a higher requirement for services." Dr. Liu deems that China's education will provide high-quality services for children through technology and global resources integration.

### US. STEM Growth Needed

#### US STEM performance is effective, but remains constant over the last several years.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**Although the United States is generally believed to perform poorly in STEM education**, Gonzalez, & Kuenzi (2012) s**uggest that this negative perception may be due in part to the complex nature of the U.S. educational system and acknowledge that “by some measures, U.S. students appear to be doing quite well,” citing “overall graduate enrolments in science and engineering (S&E) growing 35% over the last decade and enrolments for Hispanic/Latino, American Indian/Alaska Native, and African American students** (all of whom are generally underrepresented in S&E) growing by 65%, 55%, and 50%, respectively” (p. 2). **They further report that the condition of STEM education in the United States could be characterized as having “more or less held constant or improved over the course of the last four years”** (p. 13).

#### US STEM education is key to prepare students for post-secondary education and the 21st century workforce.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

In the United States, school-based factors that positively influence the success of traditionally underrepresented students in K-12 STEM education must include parental involvement and support, availability of bilingual education, culturally relevant pedagogy, early exposure to STEM fields, interest in STEM careers, self-efficacy in STEM subjects, and STEM-related educational opportunities and support programs (Museus, Palmer, Davis, & Maramba, 2011). **In reality, these same factors positively influence the entire student population and ensure 21st Century Workforce Skills are attained: Global Awareness, Creativity and Innovation, Critical Thinking and Problem Solving, Communication and Collaboration, Information Literacy, Media Literacy, Technology literacy, and Life and Career Skills including productivity and accountability, leadership and responsibility. There are three broad goals for K-12 STEM education that are widely accepted in the U.S.: to increase advanced training and careers in STEM fields, to expand the STEM capable workforce, and to increase scientific literacy for all students** (National Research Council, 2011). **In other words, the overarching goal of STEM education in U.S. schools is to prepare all students for post-secondary study and the 21st century workforce.**

#### STEM education needed - International Student Assessment Scores show US towards the bottom of the list.

Goldy Kamali, founder and CEO of FedScoop, a media company focused on government tech, March 29, 2014, "An Investment in STEM is an Investment in our Future," The Huffington Post, <http://www.huffingtonpost.com/goldy-kamali/an-investment-in-stem-is-_1_b_4675969.html> (accessed 5/24/17)

Tomorrow, President **Obama** will deliver his sixth State of the Union address, laying out a legislative agenda for the months, and years, ahead. **In his previous SOTU speeches,** the president has **focused on the importance of STEM education, citing the need to impart the next generation with skills necessary to compete and succeed in the modern workforce. This past December, the Programme for International Student Assessment scores, which measure the aptitude of 15-year-old students worldwide in science, reading and math, were released. Since the last assessment in 2009, U.S. scores remained relatively stagnant in all three subject areas, while other countries slowly crept ahead. Of the 64 nations scored, U.S. students ranked 28th in science, 36th in math and 21st in reading.**

### Diversity ADV Extensions

#### STEM education in a multicultural environment gives students a global perspective.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**Educators must provide students with interdisciplinary, multicultural, and multi-perspective viewpoints to demonstrate how STEM transcends national boundaries providing students a global perspective that links students with a broader STEM community and workforce. High quality STEM education programs provide teachers with opportunities to collaborate with one another in unified efforts aimed at integrating the four subjects into one cohesive means of teaching and learning. It is when this objective is achieved that students gain access to meaningful curricular opportunities promoting critical thinking skills that can be applied to their academic as well as everyday lives.**

#### Few women exist in STEM fields.

Deborah Levine, Editor of the American Diversity Report, June 18, 2017, "Buying into our STEM Future," Times Free Press, <http://www.timesfreepress.com/news/opinion/columns/story/2017/jun/18/levine-buying-our-stem-future/433575/> (accessed 7/3/17)

**In their recent Diversity Report Podcast, Sheila and Priya Boyington focused on the missing gender factor. When choosing a college major, 0.4 percent of high school girls select computer science even though 74 percent of girls express interest in STEM courses in middle school. Not surprisingly, while women are almost 50 percent of our workforce, they held only 25 percent of professional computing jobs in 2015. Even more depressing, the numbers have gotten worse. The percentage of women who earned a technology bachelor's degree in 1985 exceeded those in 2014 by a substantial amount.**

#### People of color are significantly underrepresented in STEM fields.

Deborah Levine, Editor of the American Diversity Report, June 18, 2017, "Buying into our STEM Future," Times Free Press, <http://www.timesfreepress.com/news/opinion/columns/story/2017/jun/18/levine-buying-our-stem-future/433575/> (accessed 7/3/17)

**Dr. Neslihan Alp of the College of Engineering and Computer Science at UTC shared with me in a 2015 interview that the numbers of women entering STEM fields is modest; the number actually graduating in those fields is even smaller. When people of color are factored into the numbers, the result is downright depressing. For example: They make up 35 percent of the college-age population, but only 11 percent of engineering degrees.**

#### STEM occupations are among the top-paying in the nation.

 Dr. Matthew Lynch, Professor and Expert on Education Equity, May 24, 2017, "Preparing Graduates to Meet STEM Needs and opportunities," Education Week, <http://blogs.edweek.org/edweek/education_futures/2017/05/preparing_graduates_to_meet_stem_needs_and_opportunities.html> (accessed 5/25/17)

**At the same time, STEM occupations are, and will continue to be, among the top-paying positions in the nation. In 2013, workers in STEM occupations earned a median annual wage of $76,000 -- compared to a median annual wage of $35,080 for all workers** (Occupational Outlook Quarterly, Spring 2014). **The bottom line is: Career positions in STEM fields are plentiful, financially lucrative, and increasing at a much faster pace than other occupations, yet there are not enough American workers to fill them.**

#### More than ever, a high-quality math and science education is the foundation for opportunity, yet too many students currently live in STEM deserts.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**By 2020, almost two-thirds of all jobs will require post-secondary education or training – education that is supported by the critical thinking and problem-solving skills learned in math and science. In the same period, almost as many jobs will require basic literacy in science, technology, engineering and math. Yet, we as a nation continue with a familiar pattern in which access to high-quality STEM learning is unevenly distributed. Millions of students across the country live in what we call STEM deserts – school communities without access to rigorous and engaging math and science courses.**

#### Research suggests a need to map STEM efforts in Philadelphia, providing a discoverable platform accessible to funders, program providers, and schools

Chris Kimrey, is an MPA candidate at the University of Pennsylvania Fels Institute of Government and editor of the Institute’s publication, Re:CAP, 2017 "Tackling STEM Education Problem in Underserved Philadelphia," Medium, [https://medium.com/@UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b](https://medium.com/%40UofPenn/combining-efforts-tackling-the-stem-education-problem-in-underserved-philadelphia-60f2cb988e4b) (accessed 6/25/17)

**Current data and initial research in the vitality and sustainability of the STEM education ecosystem in Philadelphia indicate a clear need for a centralized mechanism that can ensure the efficacy and viability of long-term collaborative efforts. The status quo does not provide acceptable education options for urban schools but instead contributes to a cycle of stagnant minority accessibility to STEM professions.** There are great people making a difference in the STEM education for children of underserved communities. T**he biggest impediment seems to be a failure to communicate across individual silos of excellence**. The call to action is clear: we are larger and more effective together than any one of us is alone.

#### Current budget proposals will hurt low-income students.

Scott Jaschik, Editor and Founder of Inside Higher Ed, March 16, 2017, "Trump Seeks Deep Cuts in Education and Science," Inside Higher Ed, <https://www.insidehighered.com/news/2017/03/16/trump-seeks-deep-cuts-education-and-science-programs> (accessed 5/25/17)

**New America, a Washington think tank, released an analysis early this morning that suggests the cuts to work-study and SEOG may help protect Pell spending, although the analysis suggested that Pell may still be vulnerable down the road. The analysis notes that the programs being proposed for cuts or elimination serve low-income students -- with evidence that work-study has a positive impact on graduation rates of the most needy students. "**SEOG recipients’ income levels are comparable to Pell recipients. Seventy-one percent of dependent undergraduate recipients [are] from families making less than $30,000 per year, and 76 percent of independent recipients earn less than $20,000," the analysis says.

#### The National Science Foundation makes it a priority to help women find a career in STEM.

Debora Lima, reporter for South Florida Small Business Journal, May 18, 2017, "Local university to lead nationwide STEM education initiative," South Florida Business Journal, <http://www.bizjournals.com/southflorida/news/2017/05/18/local-university-to-lead-nationwide-stem-education.html> (accessed 5/26/17)

**A cadre of professors and researchers from Miami-based Florida International University and physics-oriented institutions from around the country are joining forces to help promote physics as a career path to young women, thanks to a $3 million grant from the National Science Foundation. The initiative, centered around tasking 16,000 high school teachers with recruiting female students to pursue a physics major in college,** will be led by Zahra Hazari, an associate professor of physics education in FIU’s STEM Transformation Institute and Department of Teaching & Learning. Academics from Texas A&M University, the American Physical Society and the American Association of Physics Teachers will also be part of the initiative.

### Space Advantage Extensions

#### College STEM initiatives working to integrate curriculum so students can join NASA.

Mark Rudin, vice president for research and economic development at Boise State, June 30, 2017, "Idaho college students are nationally competitive and NASA-ready," Idaho Statesmen, <http://www.idahostatesman.com/news/local/education/boise-state-university/article159188369.html> (accessed 7/3/17)

**When the subject of astronauts and space missions comes up, not many people’s thoughts turn to Idaho. But Idaho students are increasingly applying and being accepted to summer internship programs with NASA, thanks to efforts from our state’s universities to strengthen educational relationships with the agency. Higher-education institutions across Idaho are united in efforts to push the boundaries of STEM education into space — and even beyond it. This summer, at least 24 Idaho undergraduate and graduate students were placed in NASA internships.**

#### Idaho is part of NASA Space Grant Consortium, which focuses on STEM's connection to Space education for higher education.

Mark Rudin, vice president for research and economic development at Boise State, June 30, 2017, "Idaho college students are nationally competitive and NASA-ready," Idaho Statesmen, <http://www.idahostatesman.com/news/local/education/boise-state-university/article159188369.html> (accessed 7/3/17)

**Johnson manages the NASA Idaho Space Grant Consortium grant. The money helps students in Idaho carry out research and pursue professional paths in STEM fields, and it helps Idaho researchers collaborate with each other and NASA researchers. This includes funding student internships with NASA, if the agency cannot fully fund an intern otherwise. Universities across Idaho are doing their part to make students NASA competitive. Student teams from the University of Idaho and Northwest Nazarene University recently won grants for NASA’s Undergraduate Student Instrument Projects, which is an opportunity to develop an Earth or space payload to fly on a NASA suborbital vehicle, such as a balloon or suborbital rocket.**

## STEM Education Good Blocks

### STEM Education Good

There are multiple qualities of effective STEM education.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**Elements of Engaging STEM Education Programs High quality STEM education programs and curricula should reflect the following features: · Include rigorous mathematics and science curriculum and instruction; · At a minimum,** (if separate STEM courses are not available in all areas) **integrate technology and engineering into the science and mathematics curriculum; · Promote engineering design and problem solving— (scientific/engineering) the process of identifying a problem, solution innovation, prototype, evaluation, redesign —as a way to develop a practical understanding the designed world; · Promote inquiry—the process of asking questions and conducting investigations—as a way to develop a deep understanding of nature and the designed world** (NSTA 2004); · **Be developed with grade-appropriate materials and encompass hands-on, minds-on, and collaborative approaches to learning; · Address student outcomes and reflect the most current information and understandings in STEM fields; · Provide opportunities to connect STEM educators and their students with the broader STEM community and workforce; · Provide students with interdisciplinary, multicultural, and multiperspective viewpoints to demonstrate how STEM transcends national boundaries providing students a global perspective; · Use appropriate technologies such as modeling, simulation, and distance learning to enhance STEM education learning experiences and investigations; · Be presented through both formal and informal learning experiences; · Present a balance of STEM by offering a relevant context for learning and integrating STEM core content knowledge through strategies such as project-based learning.**

All students should have access to quality STEM education.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**Parents and students in Buena and Tombstone shop at the same grocery stores and visit the same doctors, but have starkly different academic experiences when it comes to STEM. It's time for us to address this inequity and ensure every student has access to quality, rigorous coursework taught by highly trained and supported teachers. Our national security, economy and technological leadership – as well as our children's futures – depend on it.**

STEM education is easy to facilitate, Code.org proves, and more education is necessary.

Goldy Kamali, founder and CEO of FedScoop, a media company focused on government tech, March 29, 2014, "An Investment in STEM is an Investment in our Future," The Huffington Post, <http://www.huffingtonpost.com/goldy-kamali/an-investment-in-stem-is-_1_b_4675969.html> (accessed 5/24/17)

**Last month, the website Code.org launched their first “Hour of Code” project in which students around the world were encouraged to learn an hour of computer coding. In the first three days of the project, over 10 million students worldwide wrote over a quarter of a billion lines of code. Since the project’s launch on December 9th, over 23 million students worldwide have generated almost 750 million lines of code, and over half of those students were young women. This new and innovative approach to computer science helped to capture the imagination of students and teachers worldwide and generated an unprecedented interest in a skill that is vital in so many STEM occupations. Exposure to this kind of varied education can and should happen on a more regular basis.**

Buena High School in Arizona proves the utility of quality STEM education.

Matthew Randazzo, CEO of the National Math and Science Initiative, May 10, 2017, "The US Must Address Disparities in Access to STEM Education," US News and World Report, <https://www.usnews.com/opinion/knowledge-bank/articles/2017-05-10/the-us-must-address-disparities-in-access-to-stem-education> (accessed 5/25/17)

**Consider Buena High School in southeast Arizona, where the Sierra Vista Unified District has the resources and local capacity to engage students in quality STEM teaching and learning. With more than 2,500 students in attendance, Buena's students and teachers have access to rigorous STEM coursework and supports, such as the National Math and Science Initiative's College Readiness Program, made possible through funding from Northrop Grumman and the U.S. Department of Defense. In fact, in 2016, Buena's qualifying scores in AP math and science increased by 650 percent in just one year – one of the largest increases in the country. This access to rigorous STEM learning helps these students** become what I call workforce chameleons: They **gain the critical-thinking skills and work ethic to adapt to the workforce's evolving demand**s.

STEM education is crucial for economic competition in today's global economy, and promoting it within the school districts can create a better system of instruction.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**With the “flattening” of the global economy in the 21st century, the teaching of Science, Technology, Engineering, and Mathematics** (STEM) **has taken on new importance as economic competition has become truly global. STEM** education has evolved into a meta-discipline, an integrated effort that removes the traditional barriers between these subjects, and instead **focuses on innovation and the applied process of designing solutions to complex contextual problems using current tools and technologies**. Engaging students in high quality STEM education requires programs to include rigorous curriculum, instruction, and assessment, integrate technology and engineering into the science and mathematics curriculum, and also promote scientific inquiry and the engineering design process. **All students must be a part of the STEM vision, and all teachers must be provided with the proper professional development opportunities preparing them to guide all their students toward acquiring STEM literacy. By focusing on student engagement, educators from institutions of higher education and K-12 schools can work together to develop pedagogical models that provide rigorous, well-rounded education and outstanding STEM instruction.**

STEM education is crucial for a literate society.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

Bybee (2013) clearly articulates that t**he overall purpose of STEM education is to further develop a STEM literate society. His definition of “STEM literacy” refers to an individual’s**: · **Knowledge, attitudes, and skills to identify questions and problems in life situations, explain the natural and designed world, and draw evidence-based conclusions about STEM-related issues. · Understanding of the characteristic features of STEM disciplines as forms of human knowledge, inquiry and design; · Awareness of how STEM disciplines shape our material, intellectual, and cultural environments; and · Willingness to engage in STEM-related issues and with the ideas of science, technology, engineering and mathematics as a constructive, concerned, and reflective citizen.”** (p.101).

### STEM Growing Exponentially

STEM needs and opportunities in education and the workplace continue to expand exponentially in the United States.

 Dr. Matthew Lynch, Professor and Expert on Education Equity, May 24, 2017, "Preparing Graduates to Meet STEM Needs and opportunities," Education Week, <http://blogs.edweek.org/edweek/education_futures/2017/05/preparing_graduates_to_meet_stem_needs_and_opportunities.html> (accessed 5/25/17)

**In the past 16 years, STEM jobs increased by 26 percent compared to six percent across all occupations. Meanwhile, the comparatively low rates of STEM graduates require U.S. employers to rely on skilled foreign workers. The reality to be confronted is that educators** -- and I include myself here -- **are not yet developing the workforce needed to fill our country's STEM needs today or in the future. As a result, our graduates are not prepared to grasp the many STEM opportunities available to them.**

STEM jobs exist; training is necessary to fill them with a pipeline of qualified STEM graduates.

Moses Lee, MJ Murdock Charitable Trust , March 2016, "Why STEM matters to all of us?" MJ Murdock Charitable Trust, <http://murdocktrust.org/wp-content/uploads/2016/07/Why-STEM-matters-to-all-of-us-from-Moses-longer-version-FINAL-final.pdf> (accessed 5/25/17)

**In an article published by the U.S. News & World Reports in 2012, it examined the problem of why, at a time of high unemployment, there were so many jobs that went unfilled. The answer was simple. American workers lacked the necessary skills for those jobs, which required training in STEM fields.** (5) **This situation is exacerbated by a weak performance of U.S. students in many academic surveys**. For example, in a 2013 survey, American students’ scores remained relatively stagnant in math, science, and reading, while other countries slowly crept ahead. Of the 64 nations scored, U.S. students ranked 28th in science, 36th in math and 21st in reading. (6) **Thus, to maintain our competitiveness as a global leader it is paramount for the U.S. to build a pipeline of qualified STEM graduates.**

STEM occupations have lower unemployment rates than other fields in addition to higher earnings.

David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, all are economists in the Office of the Chief Economist of the U.S. Department of Commerce’s Economics and Statistics Administration, July 2011, "STEM: Good jobs now and for the future," U.S. Department of Commerce, <http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf> (accessed 5/25/17)

**In addition to higher earnings, workers in STEM occupations on average experience lower unemployment rates than workers in other fields** (see Figure 3).10 **The unemployment rate for STEM workers rose from 1.8 percent in 2007 to 5.5 percent in 2009 before easing to 5.3 percent in 2010. The unemployment rate for non-STEM workers rose from 4.8 percent in 2007 to 9.5 percent in 2009 and then continued to increase to almost 10 percent in 2010.** STEM workers, however, are not totally immune to economic downturns, as STEM joblessness did increase during the last two recessions. Some of the difference in unemployment rates between STEM and non-STEM workers reflects differences in educational attainment.

### STEM Key to the Economy

A nation's research infrastructure and innovation are key to economic health.

Michael Ickowitz, a former ORISE science education project manager, serves as senior manager for international recruitment and market development for the University of New South Wales, 2017, "Investing in the Next Generation of Scientists and Engineers: The Key to Maintaining Global Competitiveness," US Department of Energy ORAU, <https://orise.orau.gov/stem/career-development/how-to-find-research-funding/investing-in-the-next-generation-of-scientists-and-engineers.html>

The notion that **a nation’s research infrastructure and resulting innovation can influence its economic health** is not new. It has long been held that t**he competition between nations to innovate creates often dynamic economic growth because innovations can enter the system at any time and from anywhere, causing hegemonic influence of nations to rise and fall. It is important that the U.S. remain competitive in this regard because it is likely that nations other than the U.S. will in fact innovate more quickly in proportion with their population. According to the United Nations Educational, Scientific and Cultural Organization’s Institute for Statistics, the U.S. had 4,018 researchers employed in R&D per million people in 2012—the most recent year available for U.S. data.**

### STEM Employment Good

STEM workers experience less unemployment as they are more educated.

David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, all are economists in the Office of the Chief Economist of the U.S. Department of Commerce’s Economics and Statistics Administration, July 2011, "STEM: Good jobs now and for the future," U.S. Department of Commerce, <http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf> (accessed 5/25/17)

**On balance, workers with a higher educational level tend to experience lower unemployment, and STEM workers tend to be better educated.** Looking at workers with a bachelor’s degree or graduate degree, one finds less of a difference in unemployment rates between STEM and non-STEM workers than for those with less education. During the latest recession, the unemployment rate for college-educated STEM workers edged above the non-STEM rate in 2009, but the rate for both groups converged to 4.7 percent in 2010 (see Figure 4). While **college-educated STEM workers were less likely to be jobless than other workers during the latter part of the last two economic expansions,** they were more likely to be jobless during and after the 2001 recession. The decrease in the demand for information technology workers following the Y2K efforts and the crash of the Internet dot-com bubble likely played a role.

STEM workers seek educational attainment.

David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, all are economists in the Office of the Chief Economist of the U.S. Department of Commerce’s Economics and Statistics Administration, July 2011, "STEM: Good jobs now and for the future," U.S. Department of Commerce, <http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf> (accessed 5/25/17)

**One of the more distinguishing characteristics of STEM workers is their educational attainment. More than two-thirds (68 percent) of STEM workers have a bachelor’s degree or higher, compared to just under one-third (31 percent) of other workers age 16 and over** (see Figure 5). Among the four STEM occupational groups, the physical and life sciences have the highest-educated workforce, with nearly 40 percent holding a graduate degree – about double the share for computer, math and engineering jobs. **Nonetheless, because STEM includes professionals as well as first-tier support jobs, we find that a number of STEM workers have less than a four-year college degree; nearly one-quarter (23 percent) have completed an associate degree or at least some college, and 9 percent have a high school diploma or less. So while it is certainly true that the majority of STEM workers tend to have at least a bachelor’s degree, opportunities also exist for STEM workers with lower education levels.** The greatest advancements in our society from medicine to mechanics have come from the minds of those interested in or studied in the areas of STEM.

STEM workers are not only desirable, but a STEM degree has proven benefits.

David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, all are economists in the Office of the Chief Economist of the U.S. Department of Commerce’s Economics and Statistics Administration, July 2011, "STEM: Good jobs now and for the future," U.S. Department of Commerce, <http://www.esa.doc.gov/sites/default/files/stemfinalyjuly14_1.pdf> (accessed 5/25/17)

**These factors make STEM workers highly desirable to companies developing or operating on the technological forefront and extremely important to the U.S. economy, as competitive businesses are the foundation of a competitive economy. As this analysis highlights, STEM jobs should also be highly desirable to American workers. Regardless of educational attainment, entering a STEM profession is associated with higher earnings and reduced joblessness. For college graduates, there is a payoff in choosing to pursue a STEM degree, and for America’s workers, an even greater payoff in choosing a STEM career.**

STEM graduates earn the highest overall salaries, with salaries of 65,000/year.

Patricia Cohen, national economy reporter for the New York Times, February 21, 2016, "A Rising Call to Promote STEM Education and Cut Liberal Arts Funding," The New York Times, <https://www.nytimes.com/2016/02/22/business/a-rising-call-to-promote-stem-education-and-cut-liberal-arts-funding.html> (accessed 5/25/17)

**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.

### Computer Science Is the Future

Computer science has a need for computer science students, as 51% of all STEM jobs by 2018 will be in computer science-related fields.

Dean Hager is CEO of JAMF Software, an Apple device management company, April 26, 2016, "The real reasons behind the tech skills gap," Fortune Insiders, <http://fortune.com/2016/04/27/tech-skills-gap-stem/> (accessed 5/26/17)

Nine in 10 parents want their child to study computer science, but **only one in four schools teach computer programming**, according to the organization behind Computer Science Education Week, an annual program dedicated to inspiring K-12 students to take interest in computer science. **There are currently 607,708 open computing jobs nationwide, but only 42,969 computer science students graduated into the workforce last year**, says org, a non-profit dedicated to expanding access to computer science. **By 2018, 51% of all Science, Technology, Engineering, and Math (STEM) jobs are projected to be in computer science-related fields, according to the White House. The federal government alone needs an additional 10,000 IT and cybersecurity professionals, and the private sector needs many more. “Computer science is not only important for the tech sector,” says a White House fact sheet, “but also for a growing number of industries, including transportation, healthcare, education, and financial services, that are using software to transform their products and services. In fact, more than two-thirds of all tech jobs are outside the tech sector.”**

Computing occupations are in high demand, pay well, but do not have the necessary students to fill the career needs; state regulations inhibit this.

Dean Hager is CEO of JAMF Software, an Apple device management company, April 26, 2016, "The real reasons behind the tech skills gap," Fortune Insiders, <http://fortune.com/2016/04/27/tech-skills-gap-stem/> (accessed 5/26/17)

**With coders (A.K.A. computer programmers) in such high demand, you’d think it would be obvious to “start ‘em young” and put high school students on a path to a rewarding career. And yet, according to Computer Science Education Week, computer science classes don’t count toward math or science high school graduation requirements in 22 states, including Colorado, Massachusetts and Pennsylvania. It is no wonder that computing occupations are among the highest-paying jobs for new graduates, fewer than 3% of college students graduate with a degree in computer science.**

## 2AC Blocks

### 2AC STATES CP

#### Obama's Council of Advisors on Science and Technology said that the there must be more Federal coordination and leadership on STEM education in cooperation with the states.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**In 2010, President Obama’s Council of Advisors on Science and Technology (PCAST) prepared an extensive report providing a two-pronged strategy for improving K-12 STEM education: Prepare and inspire the next generation of students. The five overarching recommendations contained in this report include (1) improve Federal coordination and leadership on STEM education; (2) support the state-led movement to ensure that the Nation adopts a common baseline for what students learn in STEM;** (3) cultivate, recruit, and reward STEM teachers that prepare and inspire students; (4) create STEM-related experiences that excite and interest students of all backgrounds; and (5) support states and school districts in their efforts to transform schools into vibrant STEM learning environments (President’s Council of Advisors on Science and Technology, 2010). \

### 2AC Humanities

#### STEM Curriculum supports humanities education.

G. W. Thielman, Engineer and patent attorney, June 2, 2015, "Liberal Arts are Dead; Long Live STEM," The Federalist, <http://thefederalist.com/2015/06/02/the-liberal-arts-are-dead-long-live-stem/> (accessed 6/25/17)

**STEM curricula have been critiqued for supposedly neglecting the humanities, but students who major in STEM obtain more credit hours in languages, arts, and human interaction than their humanities counterparts obtain in scientific fields.** Rhodes College professor Loretta Jackson-Hayes has explained the benefit of liberal arts for STEM students, but liberal-arts students could likewise benefit from cross-training in the more exacting disciplines. **We observed The New Atlantis Students who pursue STEM majors are also better at the humanities than liberal-arts majors are at the sciences.** Harvard University professor of government Harvey Mansfield in, “Science students do well in non-science courses, but non-science students have difficulty in science courses. Slaves of exactness find it easier to adjust to the inexact, though they may be disdainful of it, than those who think in the realm of the inexact when confronted with the exact.” Perhaps envy subtly contributes to liberal arts defensiveness against STEM.

#### In coursework, humanities are generally waning at the college level.

G. W. Thielman, Engineer and patent attorney, June 2, 2015, "Liberal Arts are Dead; Long Live STEM," The Federalist, <http://thefederalist.com/2015/06/02/the-liberal-arts-are-dead-long-live-stem/> (accessed 6/25/17)

Even on fundamental coursework, however, differences emerge among the respective disciplines. Freshman engineering students, for example, attend an essential core set of courses that includes calculus, physics, and chemistry. Should we assume that English majors still peruse Shakespeare and Chaucer? Probably not. Do philosophy majors read Aristotle, David Hume, or Friedrich Nietzsche any more? Do sociologists study Plato, Voltaire, or James Madison? A**s University of Notre Dame professor Patrick Deneen noted, “The humanities today seem to be waning in presence and power in the modern university in large part because of their solipsistic irrelevance, which has predictably increased students’ uninterest in them.”**

#### Science Is Better for Society than the Arts, and promoting the latter leads to a multitude of problems.

G. W. Thielman, Engineer and patent attorney, June 2, 2015, "Liberal Arts are Dead; Long Live STEM," The Federalist, <http://thefederalist.com/2015/06/02/the-liberal-arts-are-dead-long-live-stem/> (accessed 6/25/17)

**Meanwhile, public officials and business leaders have bemoaned a shortage of STEM training that is supposed to ensure future innovation. Despite entities such as the National Academy of Science trumpeting this alleged deficiency, for almost two decades a relatively consistent 16 percent of bachelor degrees have been awarded in natural science, mathematics, computer science, and engineering, according to the National Center for Education Statistics. Critics of the STEM push contend that companies petition for additional temporary H-1B visas while present holders of STEM credentials outnumber related positions, leading to stagnating salaries.**

#### A transition from liberal arts to natural sciences or related fields would constitute a boon to society at large.

G. W. Thielman, Engineer and patent attorney, June 2, 2015, "Liberal Arts are Dead; Long Live STEM," The Federalist, <http://thefederalist.com/2015/06/02/the-liberal-arts-are-dead-long-live-stem/> (accessed 6/25/17)

**Although STEM graduates enjoy somewhat better marketability than those in humanities, human resource departments treat them as commodities with one- to two-decade shelf life, which discourages interest in STEM; so many instead embark on alternate vocations. STEM majors’ often-daunting academic requirements, for which many high schools have not prepared most high-school graduates, also reduces college enrollments in these fields. Nonetheless, the size of the science and engineering (S&E) labor force has stalled for the past decade, further depressing enrollment in these endeavors.**

####  Science is killing the humanities in our school systems.

James Banks, editor at Humane Pursuits, February 24, 2014, "How the Death of Humanities Will Kill Science," Humane Pursuits, <http://humanepursuits.com/how-the-death-of-the-humanities-will-kill-science/> (accessed 6/25/17)

**Science**[**is killing**](http://humanepursuits.com/how-science-killed-the-humanities/)**the humanities**—I [was not the first](http://www.thenewatlantis.com/publications/science-and-the-decline-of-the-liberal-arts) to argue this point and I probably will not be the last either. America’s leaders are hastening the death, both by [the priorities they set](http://www.whitehouse.gov/blog/2013/03/18/new-steps-meet-president-s-goal-preparing-100000-stem-teachers)and the [political appointments that they make](http://www.weeklystandard.com/keyword/National-Endowment-for-the-Humanities). W**hile many scholars will probably lament the passing of the humanities and some will probably cry “Philistine” with every dollar that the National Endowment for the Arts loses, some have already begun to stoically accept the argument that the humanities are not worth saving. In a representative piece,**[**John Ellis writes of the decline**](http://www.mindingthecampus.com/originals/2010/11/defend_the_humanitiesa_slogan.html)**: Freshman core courses that gave an overview of the achievements of Western culture were . . . abolished almost everywhere, mandatory courses in this nation’s history and institutions went too, and literature departments even stopped requiring that Shakespeare be an essential part of the English literature major. Even when formerly mandatory courses are still offered as options, they are often presented through the lens of a jaundiced view of our cultural past that tends to discourage further study.** Ellis identifies a real trend, even though it is not entirely fair—reading Shakespeare might not be required as an English lit major, but the English lit major who graduates without having read Shakespeare will have had to performed a near Herculean task to avoid Hamlet, Othello or Macbeth

#### The sciences are killing humanities now, but tomorrow, that death will then kill science too.

James Banks, editor at Humane Pursuits, February 24, 2014, "How the Death of Humanities Will Kill Science," Humane Pursuits, <http://humanepursuits.com/how-the-death-of-the-humanities-will-kill-science/> (accessed 6/25/17)

**Today we might see the sciences are killing the humanities, but tomorrow we will find out that the death of the humanities will kill the sciences too.** I did not fully appreciate that the humanities were a necessary supplement to the sciences until a few years ago. It happened **at a conference on STEM** (science, technology, engineering and mathematics) **education where America’s foremost experts on the subject came together to wring their hands over how doomed we all were because there “weren’t enough students interested in scien**ce.” Some of the speakers had impressive credentials: one of the speakers was [Dean Kamen](http://en.wikipedia.org/wiki/Dean_Kamen), the man who invented the Segway; another was [Bill Nye, the Science Guy](http://en.wikipedia.org/wiki/Bill_Nye). Nonetheless, as I participated in the focus groups, I got a sense that **America’s science educators were strangely disconnected from the way that people live and think. Most of the policy recommendations that they came up with sounded platitudinous: “We need to change the cultural image people have of the nerdy scientist.” Some of the policies or initiatives proposed were even less realistic: An American version of Doctor Who perhaps? But, more broadly, the problem with these events is their objective of “maintaining the pipeline” to help  bring about the replacements for today’s current STEM employees.  As the administrators and officials lamented how “American kids were not interested in the science jobs we have for them**” I could not help but be reminded of a passage in Heart of Darkness that William Deresiewicz [originally called my attention to](http://theamericanscholar.org/solitude-and-leadership/#.Un5_H-I4khI):

# STEM AFFIRMATIVE 1NC ANSWERS

## The AFF Can’t Solve

### Program Review Lacking

#### Programs like upward bound have not had evaluations in too long to justify funding

Andrew Kreighbaum, federal policy reporter for Inside Higher Ed, March 28, 2017, "Cutting College Prep," Inside Higher Ed, <https://www.insidehighered.com/news/2017/03/28/questions-about-efficacy-college-prep-programs-white-house-vows-evidence-based-cuts> (accessed 6/25/17)

**The White House budget proposal released this month would make significant cuts to college-prep programs for low-income and first-generation students but promises to do so guided by evidence of which ones are effective. The problem, higher ed policy analysts and researchers say, is that there has been little in the way of comprehensive evaluations of the programs under the umbrella of TRIO and Gear Up in more than a decade. And supporters of such services say if the Trump administration is interested in re-evaluating those programs, officials should do so before cutting funding across the board.**

### Teachers Insufficient

#### US leadership is due to STEM, but now few pursue STEM and teachers are ill prepared to teach it.

U.S. Department of Education, 2016, "Science, Technology, Engineering and Math: Education for Global Leadership," <https://www.ed.gov/stem> (accessed 5/25/17)

**The United States has developed as a global leader, in large part, through the genius and hard work of its scientists, engineers, and innovators. In a world that’s becoming increasingly complex, where success is driven not only by what you know, but by what you can do with what you know, it’s more important than ever for our youth to be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM. Yet today, few American students pursue expertise in STEM fields—and we have an inadequate pipeline of teachers skilled in those subjects**. That’s why President Obama has set a priority of increasing the number of students and teachers who are proficient in these vital fields.

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#### STEM education integration is best suited when educators can use STEM programs with innovative and instructional tools, creating a culture of STEM learning as a meta-discipline.

T. J. Kennedy, Ph.D., President Elect, ICASE; Professor of Bilingual, ESL, STEM Education and Executive Director, Office of International Programs, University of Texas at Tyler, and M.R. L. Odell, Ph.D., Professor of STEM Education and Vice President for Research and Technology Transfer, University of Texas at Tyler, 2017, "Engaging Students In STEM Education," Science Education International, <http://files.eric.ed.gov/fulltext/EJ1044508.pdf> (accessed 5/24/17)

**Curricula that engages students in STEM promotes instructional strategies that challenge students to innovate and invent. This indicates students have to apply the science and mathematics knowledge they learn to an engineering problem and utilize technology in finding a solution.** In this approach, students are required to demonstrate their understanding of STEM disciplines in a work-based, contextual environment. **To do this, teachers must be able to offers standards-based STEM programs that use innovative instructional tools. That is to say that if teachers are prepared and have the tools, STEM can promote applied and collaborative learning. Technology has to be integrated into the culture, curriculum, teaching strategies and daily operations of classrooms to enhance learning and provide relevance. It is at this point that STEM becomes a meta-discipline and needs to be delivered to students in an interdisciplinary manner, within the constraints of the national/state course guidelines.**

#### The DoEd's Race to the Top program implements effective STEM education that also trains teachers to be effective innovators.

U.S. Department of Education, 2016, "Science, Technology, Engineering and Math: Education for Global Leadership," <https://www.ed.gov/stem> (accessed 5/25/17)

**The Department’s Race to the Top-District program supports educators in providing students with more personalized learning—in which the pace of and approach to instruction are uniquely tailored to meet students’ individual needs and interests—often supported by innovative technologies. STEM teachers across the country also are receiving resources, support, training, and development through programs like Investing in Innovation (i3), the Teacher Incentive Fund, the Math and Science Partnerships program, Teachers for a Competitive Tomorrow, and the Teacher Quality Partnerships program.**

## STEM Kills Humanities

#### Critical thinking is an important skill that is a precursor to learning the skills in STEM.

Fareed Zakaria, columnist for The Washington Post and is the host of “Fareed Zakaria GPS," March 26, 2015, "Why America's Obsession With STEM Education is Dangerous," The Washington Post, <https://www.washingtonpost.com/opinions/why-stem-wont-make-us-successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-9646eea6a4c7_story.html?utm_term=.31581636a414> (Accessed 6/30/17)

**Critical thinking is, in the end, the only way to protect American jobs.** David Autor, the MIT economist who has most carefully studied the impact of technology and globalization on labor,[writes](http://www.kc.frb.org/publicat/sympos/2014/093014.pdf)that **“human tasks that have proved most amenable to computerization are those that follow explicit, codifiable procedures — such as multiplication — where computers now vastly exceed human labor in speed, quality, accuracy, and cost efficiency. Tasks that have proved most vexing to automate are those that demand flexibility, judgment, and common sense — skills that we understand only tacitly — for example, developing a hypothesis or organizing a closet.”** In 2013, two Oxford scholars conducted [a comprehensive study](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.oxfordmartin.ox.ac.uk_downloads_academic_The-5FFuture-5Fof-5FEmployment.pdf&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=3fPRlguGszif0VDCVzVP6V58iJVaXTG3R6gh-znDIhU&e=) on employment and found that, **for workers to avoid the computerization of their jobs, “they will have to acquire creative and social skills.**" **This doesn’t in any way detract from the need for training in technology, but it does suggest that as we work with computers (which is really the future of all work), the most valuable skills will be the ones that are uniquely human, that computers cannot quite figure out — yet. And for those jobs, and that life, you could not do better than to follow your passion, engage with a breadth of material in both science and the humanities, and perhaps above all, study the human condition.**

#### WE ought value a liberal education instead of a STEM based education.

Fareed Zakaria, columnist for The Washington Post and is the host of “Fareed Zakaria GPS," March 26, 2015, "Why America's Obsession With STEM Education is Dangerous," The Washington Post, <https://www.washingtonpost.com/opinions/why-stem-wont-make-us-successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-9646eea6a4c7_story.html?utm_term=.31581636a414> (Accessed 6/30/17)
**One final reason to value a liberal education lies in its roots. For most of human history, all education was skills-based. Hunters, farmers and warriors taught their young to hunt, farm and fight. But about 2,500 years ago, that changed in Greece, which began to experiment with a new form of government: democracy. This innovation in government required an innovation in education. Basic skills for sustenance were no longer sufficient. Citizens also had to learn how to manage their own societies and practice self-government. They still do.**

#### New study shows that critical thinking skills learned in humanities is crucial for understanding the difference between science and pseudoscience.

Anne Collins McLaughlin et al, Explicitly Teaching Critical Thinking Skills in a History Course, *Science & Education* (2017).

**A recent study by North Carolina State University researchers finds that teaching critical thinking skills in a humanities course significantly reduces student beliefs in "pseudoscience" that is unsupported by facts. "Given the national discussion of 'fake news,' it's clear that critical thinking - and classes that teach critical thinking - are more important than ever,"** says Anne McLaughlin, an associate professor of psychology at NC State and co-author of a paper describing the work. **"Fundamentally, we wanted to assess how intentional you have to be when teaching students critical thinking," says Alicia McGill, an assistant professor of history at NC State and co-author of the paper. "We also wanted to explore how humanities classes can play a role and whether one can assess the extent to which critical thinking instruction actually results in improved critical thinking by students. "This may be especially timely, because humanities courses give students tools they can use to assess qualitative data and sort through political rhetoric,"** McGill says. **"Humanities also offer us historical and cultural perspective that allow us to put current events into context."** For this study, the researchers worked with 117 students in three different classes. Fifty-nine students were enrolled in a psychology research methods course, which taught statistics and study design, but did not specifically address critical thinking. The other 58 students were enrolled in one of two courses on historical frauds and mysteries - one of which included honors students, many of whom were majors in science, engineering and mathematics disciplines. The psychology class served as a [control group](https://phys.org/tags/control%2Bgroup/). The two history courses incorporated instruction explicitly designed to cultivate critical thinking skills. For example, students in the history courses were taught how to identify logical fallacies - statements that violate logical arguments, such as non sequiturs. At the beginning of the semester, students in all three courses took a baseline assessment of their beliefs in pseudoscientific claims. The assessment used a scale from 1 ("I don't believe at all.") to 7 ("I strongly believe."). Some of the topics in the assessment, such as belief in Atlantis, were later addressed in the "historical frauds" course. Other topics, such as the belief that 9/11 was an "inside job," were never addressed in the course. This allowed the researchers to determine the extent to which changes in [student](https://phys.org/tags/student/) beliefs stemmed from specific facts discussed in class, versus changes in a student's critical thinking skills. At the end of the semester, students took the pseudoscience assessment again. **The control group students did not change their beliefs - but students in both history courses had lower beliefs in pseudoscience by the end of the semester.** S**tudents in the history course for honors students decreased the most in their pseudoscientific beliefs; on average, student beliefs dropped an entire point on the**[**belief**](https://phys.org/tags/belief/)**scale for topics covered in class, and by 0.5 points on topics not covered in class. There were similar, but less pronounced, changes in the non-honors course. "The change we see in these students is important, because beliefs are notoriously hard to change," says McLaughlin. "And seeing students apply critical thinking skills to areas not covered in class is particularly significant and heartening."** "It's also important to note that these results stem from taking only one class," McGill says. "Consistent efforts to teach critical thinking across multiple classes may well have more pronounced effects. **"This drives home the importance of teaching critical thinking, and the essential role that humanities can play in that process,"** McGill says. "This is something that NC State is actively promoting as part of a universitywide focus on critical thinking development." The paper, "Explicitly teaching [critical thinking](https://phys.org/tags/critical%2Bthinking/) skills in a history course," was published March 20 in the journal Science & Education.

#### A focus on STEM dismisses broad-based learning and disallows for true innovation, Steve Jobs explains.

Fareed Zakaria, columnist for The Washington Post and is the host of “Fareed Zakaria GPS," March 26, 2015, "Why America's Obsession With STEM Education is Dangerous," The Washington Post, <https://www.washingtonpost.com/opinions/why-stem-wont-make-us-successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-9646eea6a4c7_story.html?utm_term=.31581636a414> (Accessed 6/30/17

)**This dismissal of broad-based learning, however, comes from a fundamental misreading of the facts — and puts America on a dangerously narrow path for the future. The United States has led the world in economic dynamism, innovation and entrepreneurship thanks to exactly the kind of teaching we are now told to defenestrate. A broad general education helps foster critical thinking and creativity. Exposure to a variety of fields produces synergy and cross fertilization. Yes, science and technology are crucial components of this education, but so are English and philosophy. When unveiling a new edition of the iPad, Steve Jobs**[**explained**](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.wired.com_2011_08_apple-2Dliberal-2Darts_&d=BQMGaQ&c=RAhzPLrCAq19eJdrcQiUVEwFYoMRqGDAXQ_puw5tYjg&r=mc0JjKrzQmOj70VdswFYXbkxIjkILfV5oA16bO5I0Lk&m=LuEUCI5lYZzngK8fvVoCOLQ9ff93pEw4nS4glzs6bc0&s=zvt2ViZ2gBjldocip2a762vSnBXiG8Cslkh4zY0NiHo&e=)**that “it’s in Apple’s DNA that technology alone is not enough — that it’s technology married with liberal arts, married with the humanities, that yields us the result that makes our hearts sing.” Innovation is not simply a technical matter but rather one of understanding how people and societies work, what they need and want. America will not dominate the 21st century by making cheaper computer chips but instead by constantly reimagining how computers and other new technologies interact with human beings.**

## STEM Focus Bad in Fight Against Terrorism

#### A focus on STEM will keep the US Ill prepared to deal with terrorism, 9/11 proves.

Jack Miles, Contributor to the Huffington Post, 2017, "Why are we losing in the Middle East? Too much STEM, not enough humanities," Huffington Post, <http://www.huffingtonpost.com/jack-miles/middle-east-stem-humanities_b_7109536.html>>

**Science, technology, engineering and mathematics (STEM) are enriching in many ways, but a society whose higher education has been narrowed to those subjects is a society headed for trouble. Nowhere is this more glaringly true than in the case of America’s response to** Islamist **terrorism since 9/11. American leaders might have avoided a series of horrific mistakes if they had relied a bit more on the humanities and a bit less on the STEM. The 9/11 attack occurred at a time when American confidence had never been higher in the superiority of our economy, our polity and our technologically-advanced military. Against all this, al Qaeda’s killers brought only suicidal bravado, fanatical religion, organizational patience and ultra low-tech box cutters. In the aftermath, our national response was and remains heavily STEM-centered.** At home, we have deployed advanced computer technology and the mathematics of big data processing to massively increase security surveillance of our own population. Abroad, we have combined surveillance technology with the engineering of drone aircraft in an attempt to defeat terrorism by killing off the key terrorists directly

#### STEM does not prepare the U.S. to deal with terrorism abroad.

Jack Miles, Contributor to the Huffington Post, 2017, "Why are we losing in the Middle East? Too much STEM, not enough humanities," Huffington Post, <http://www.huffingtonpost.com/jack-miles/middle-east-stem-humanities_b_7109536.html>>

**The Obama administration quietly retired GWOT, but after a few early signs of attention to the enemy’s religious ideology, the administration has defaulted to the tired and unproven**[**premise that**](http://www.mediaite.com/tv/state-dept-spokeswoman-marie-harf-we-cant-beat-isis-just-by-killing-them/)**better economic opportunity will suffice to win the war of ideas. This is to broaden STEM only far enough to include economics. History and religion are only rarely brought into American foreign policy or rhetoric. Meanwhile, ISIS is**[**recruiting with**](http://www.nbcnews.com/storyline/isis-terror/isis-numbers-foreign-fighter-total-keeps-growing-n314731)**growing success even in the West. Something crucial is clearly escaping our policy makers, and it is not going to be forthcoming from either STEM or economics.**

## Federal Gov’t Not Key

#### The Federal Government is not key for STEM funding.

George Leef, Contributor to Forbes, June 6, 2015, "True or False, America Desperately Needs More STEM Workers," Forbes, <https://www.forbes.com/sites/georgeleef/2014/06/06/true-or-false-america-desperately-needs-more-stem-workers/2/#48d563b119ac> (accessed 6/25/17)

**The right conclusion, I believe, is that we don’t need educational central planning. Long before government got involved in higher education, Americans were great at science and technology, coming up with new ideas and using knowledge developed elsewhere to brilliant effect.**

**A laissez-faire approach toward scientific research, technology and the training of STEM workers would work fine. If individual firms or industries think they need more talent, let them deal with that on their own, perhaps using human capital contracts to induce and train the best workers.** Moreover, taking the federal government out of the equation would smooth or even eliminate the cyclical problem that Teitelbaum has identified.

## A/2 Upward Bound & Case ADV

#### Upward Bound has limited overall impact on students' academic preparation for college.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, <https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf> (accessed 6/15/17)

**Although Upward Bound slightly increases the number of math credits earned (0.2 credits), the program has no impact on credits earned in other academic areas, total high school credits, Advanced Placement (AP) course-taking, high school graduation or grade point average.**

#### Upward Bound had limited or no effects on total high school credits or grades.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, <https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf> (accessed 6/15/17)

**Upward Bound had no effect on total credits and a small effect on credits earned in high school math. The program increased the number of math credits earned by 0.2 credits; that is, about one in five students completed an additional high school math course because of their exposure to Upward Bound. Upward Bound had no effect on credits earned in science, English, social studies or foreign language courses. Also, the program had no effect on honors and Advanced Placement credits, grades earned in high school or high school graduation. •**

#### Upward Bound had no effect on enrollment at postsecondary institutions.

Policy & Program Studies Service, 2004, "The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection," U.S. Department of Education, <https://www2.ed.gov/rschstat/eval/highered/upward/upward-3rd-report.pdf> (accessed 6/15/17)

**Upward Bound had no effect on enrollment at postsecondary institutions or postsecondary credits earned by students overall; it may have increased enrollment in four-year colleges by about six (6) percentage points but the evidence is not statistically conclusive. Increased enrollment at four-year colleges appears to be offset by reduced enrollment in two-year colleges.**

#### STEM is not key to global leadership.

George Leef, Contributor to Forbes, June 6, 2015, "True or False, America Desperately Needs More STEM Workers," Forbes, <https://www.forbes.com/sites/georgeleef/2014/06/06/true-or-false-america-desperately-needs-more-stem-workers/2/#48d563b119ac> (accessed 6/25/17)

Sharp as his book is, I wish Teitelbaum had taken his skepticism a bit further and questioned the dubious notion of national “leadership” in STEM**. Nations cannot get ahead by beating others in the number of STEM workers they have because scientific knowledge isn’t confined by national borders. The belief that we need to need to lead the world in STEM (**or in college graduates generally, as Obama has also said) **is a throwback to mercantilism. Mercantilists of old thought that countries prospered by amassing the most gold, while our new mercantilists seem to believe that prosperity comes from having the greatest number of workers trained in STEM. What matters, however, is not the number of workers with that (or any other) training, but instead freedom to make the best use of knowledge of all kinds, no matter where it originates. In that regard, the declining level of economic freedom in the U.S. is a matter of vastly greater importance than the number of STEM workers we have. There’s the real crisis.**

#### Many that have a STEM Degree do not even work in STEM occupations.

Bureau of Labor and Statistics, 2015, "STEM Crisis or STEM Surplus? Yes and Yes, U.S. Department of Labor, <https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm> (accessed 6/25/17)

**Looking at the STEM labor market, Salzman and colleagues concluded that, for every two students graduating with a U.S. STEM degree, only one is employed in STEM and that 32 percent of computer science graduates not employed in information technology attributed their situation to a lack of available jobs.**[**11**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn11)**In 2014, the U.S. Census Bureau reported that 74 percent of those who have a bachelor’s degree in a STEM major are not employed in STEM occupations.**[**12**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn12)

## A STEM Surplus Exists, Not STEM Crisis

#### The US is facing a STEM surplus in the status quo.

George Leef, Contributor to Forbes, June 6, 2015, "True or False, America Desperately Needs More STEM Workers," Forbes, <https://www.forbes.com/sites/georgeleef/2014/06/06/true-or-false-america-desperately-needs-more-stem-workers/2/#48d563b119ac> (accessed 6/25/17)

**Far from “falling behind,”** Teitelbaum shows that **the U.S. currently has a surplus of people with STEM education. After surveying the research, he writes that America “produces far more science and engineering graduates annually than there are S&E job openings—the only disagreement is whether it is 100 percent or 200 percent more.”** Nevertheless, many Americans instinctively believe that there is something special about science, engineering and technology. They drive progress. We might have too many lawyers or baristas or interior designers, but we can’t have too many STEM workers.

#### There is not a current lack of STEM positions or shortage of scientists now.

Bureau of Labor and Statistics, 2015, "STEM Crisis or STEM Surplus? Yes and Yes, U.S. Department of Labor, <https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm> (accessed 6/25/17)

There are, however, many who hold a different view. For example, **Michael S. Teitelbaum, vice president of the Sloan Foundation, opined that there are no general shortages of scientists and engineers.**[**9**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn9)**He went even further, to state that there is evidence suggesting surpluses: there are significantly more science and engineering graduates in the United States than attractive positions available in the workforce. Similarly, B. Lindsay Lowell and Harold Salzman have pointed to the disproportionate percentage of bachelor’s degree STEM holders not employed in STEM occupations.**[**10**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn10)

#### The Taxicap queuing problem shows there is not a STEM crisis now in fields like Academia.

Bureau of Labor and Statistics, 2015, "STEM Crisis or STEM Surplus? Yes and Yes, U.S. Department of Labor, <https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm> (accessed 6/25/17)

The taxicab queuing problem was first documented in the literature by David George Kendall.[13](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn13) **According to the taxicab queuing metaphor, each taxi–passenger system represents a narrow segment of the STEM employment system. Employers or job positions can be thought of as a finite number of taxicabs, and STEM workers can be thought of as a stream of would-be passengers. We have employers searching for employees, analogous to a queue of taxis waiting for passengers, and another queue of STEM workers searching for jobs, similar to how passengers wait for taxis. If the number of employers searching for employees is greater than the number of STEM workers, we have a queue of taxis, which manifests itself in the real world as a STEM shortage. If the number of STEM workers is greater than the number of employers, we have a queue of STEM workers, meaning that there is a STEM surplus.** If the number of employers and the number of STEM workers are equal, we have a momentary match between supply and demand and there is no queue. This queuing theory framework provides a novel approach to looking at the STEM labor market and the STEM crisis-versus-surplus conundrum. The demand and supply of STEM workers vary by market and location in much the same way that the demand and supply of taxicabs and passengers do. Just as there are separate lines for taxicabs that accept credit cards versus ones that do not, there are distinct lines for each type of STEM occupation. The demand for workers with doctorates in mechanical engineering is different from the demand for those with bachelor’s degrees in mechanical engineering, and the supply of workers with doctorates in the biomedical sciences is different from the supply of those with doctorates in physics. There are also spatial differences. A queue of waiting taxis may be a common sight at an airport, but outside a hotel it may be more common to see a queue of waiting passengers. Analogously, the demand for petroleum engineers in Texas is different from the demand for petroleum engineers in Massachusetts. The upshot is that there may not be a STEM “crisis” in all job categories, but instead just in select ones at certain degree levels and in certain locations. Our findings here are consistent with many others in the literature. In 2007, Michael S. Teitelbaum highlighted the poor prospects for recent doctorates and postdocs.[22](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn22) Similarly, the RAND Corporation pointed out that the length of postbaccalaureate study for the biosciences has increased considerably, from between 7 and 8 years to between 9 and 12, and that many are unable to secure stable employment with tenure until their late thirties.[23](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn23) This finding was substantiated in a National Research Council report, Bridges to Independence, which focused on the poor state of biomedical research careers and urged immediate reform to enhance the quality of training and to foster opportunities for young researchers to conduct independent research.[24](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn24) Although this academic surplus began in the biosciences, it has now extended to encompass many STEM fields, such as astronomy, meteorology, and high-energy physics.[25](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn25) **Thus, in the academic employment sector, we find no evidence of any shortages. To the contrary, it appears that the mismatch is between an oversupply of Ph.D.’s desiring an academic career and the relative paucity of tenure-track faculty positions.**[**26**](https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm#_edn26)**Although the degree of mismatch varies according to discipline, we have long queues of Ph.D.’s competing for nearly all STEM-related faculty positions.**