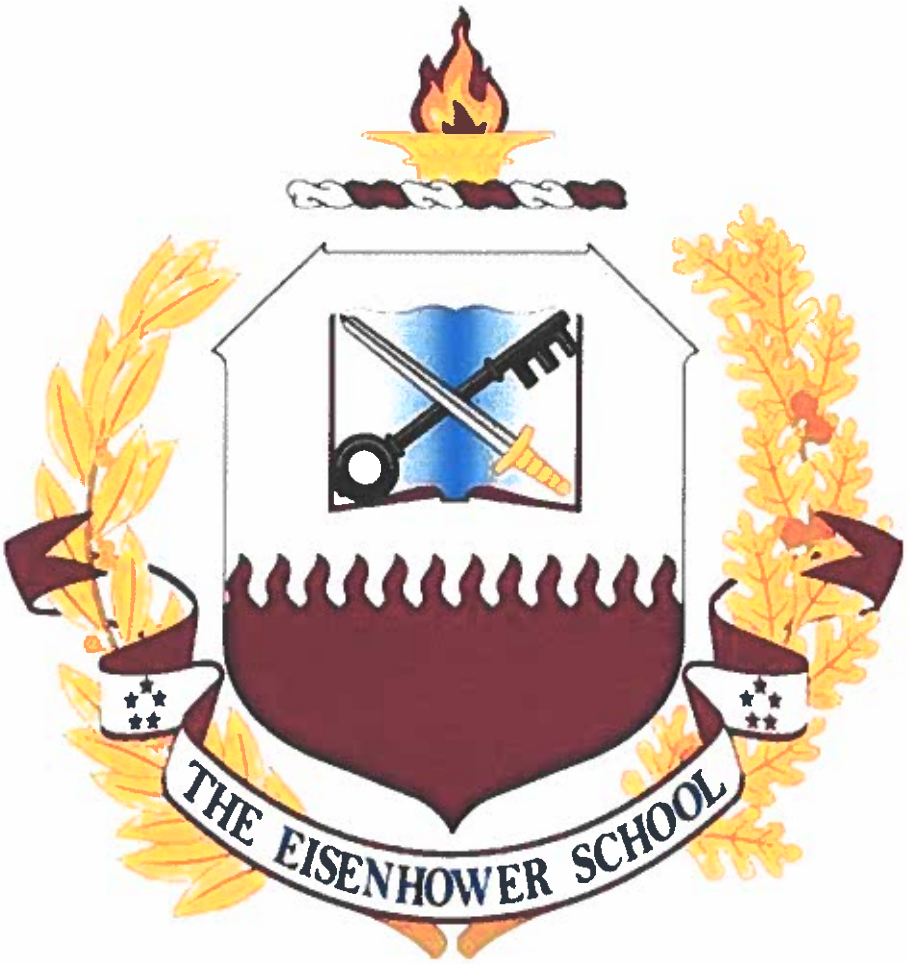
Spring 2018 Industry Study

Final Report

Education



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18-S-2347

EDUCATION 2018

ABSTRACT: America's education industry produces the human capital necessary to both fuel the U.S. economy and strengthen the defense industrial base which enables both the National Security Strategy and National Defense Strategy. One of the most significant challenges within the education industry is meeting current and future labor market demands for qualified and skilled laborers within specific niches. In order to optimize America's educational and economic potential, it is critical to cultivate a workforce with the skills necessary to bolster the defense industrial base while simultaneously encouraging innovation and expertise to fill critical gaps. Recommended policies to address current challenges are listed in priority: (1) strengthen college readiness by promoting STEM (Science, Technology, Engineering, and Mathematics) participation with government agency internships; (2) create Career and Technical Education (CTE) participation incentives; (3) provide industry incentives to partner with CTE institutions to produce qualified and employable individuals; (4) incentivize higher education partnerships to jointly develop training and curricula necessary to meet industry needs; and (5) encourage innovative ideas to improve student outcomes in higher education institutions.

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On Campus Presenters
American Council on Education, Washington, DC
Council of Great City Schools, Washington, DC
Education Testing Service, Washington, DC
American Federation of Teachers, Washington, DC
American Public University System, Washington, DC
Home School Legal Defense Association (HSLDA), Washington, DC
ES Students from FY16/17 ED IS, Washington, DC
KIPP Schools, Washington, DC
Jeff Selingo, Author of *College (Un)Bound*, Washington, DC
American School Counselor Association, Washington, DC
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Field Studies – Domestic
New America Foundation, Washington, DC
U.S. Department of Education, Washington, DC
International Programs U.S. Department of Education, Washington, DC
Potomac Job Corps Center, Washington, DC
Department of Defense Education Activity, Washington, DC
Amidon-Bowen Elementary School, Washington, DC
Education Trust, Washington, DC
National Governors Association, Washington, DC
Montgomery County Public Schools, Rockville, MD
Montgomery County Community College, Rockville, MD
Montgomery County Career and Postsecondary Partnerships, Rockville, MD
Maryland Higher Education Commission, Baltimore, MD
Maryland Department of Education K-12, Baltimore, MD
University of Maryland, College Park, MD
Northern Virginia Community College, Annandale, VA
Mountain View Alternative High School, Centreville, VA
Boston Latin School, Boston, MA
Minuteman Regional High School, Boston, MA
Massachusetts Institute of Technology, Boston, MA
Northeastern University, Boston, MA
Somerville City Public Schools, Somerville, MA
Massachusetts Department of Elementary and Secondary Education, Boston, MA
Massachusetts Department of Higher Education, Boston, MA
Houghton Mifflin Harcourt Inc., Boston, MA
Virtual High School, Inc., Boston, MA
HarvardX, Boston, MA
Tufts University, Medford, MA
Suffolk University, Boston, MA

Field Studies – International
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American Chamber of Commerce, Shanghai, China
Shanghai Academy of Social Sciences, Shanghai, China
Education USA, Shanghai, China
Shanghai United International School, Shanghai, China
Shanghai Technical Institute of Electronics and Information, Shanghai, China
East China Normal University, Shanghai, China
New York University – Shanghai, Shanghai, China
Shanghai Municipal Education Commission, Shanghai, China

INTRODUCTION

The U.S. education industry provides the foundation for American prosperity. Educational institutions offer various degrees, diplomas, and certifications, such as traditional liberal arts bachelor degrees, technical skills certifications, enhancement education, and specialized professional education. The education industry produces America's most valuable product and its greatest asset - human capital, the one asset that is the foundation for all other industries. Investment in America's education industry is essential to achieving National Security objectives of promoting American prosperity and preserving peace through strength for America's competitive advantage. The return on investment from the U.S. education industry is a skilled workforce able to fill shortages in critical industries that enable the nation to strengthen its defense industrial base (DIB).

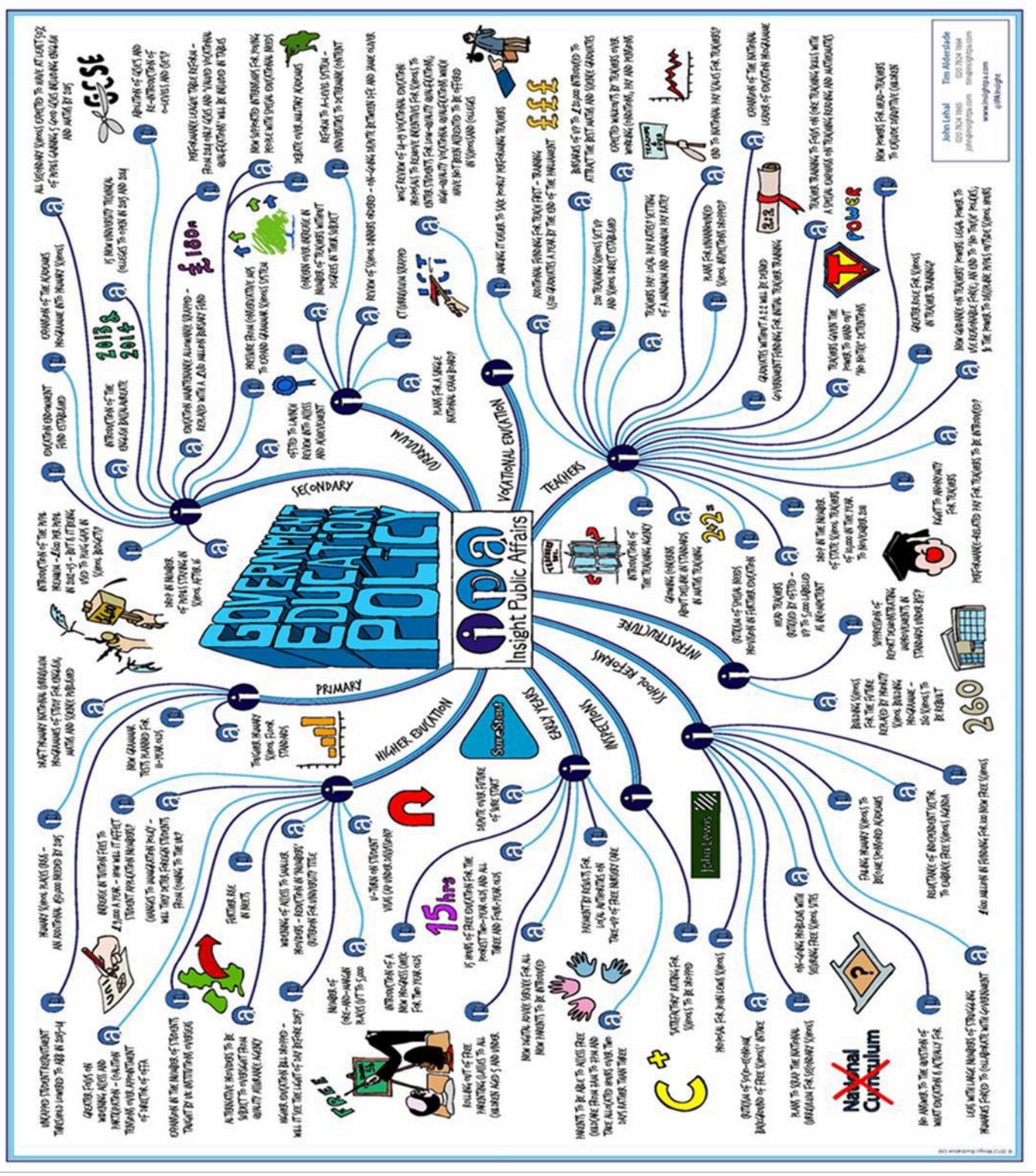
The U.S. education industry is a multifaceted, decentralized system made up of layers intended to support the local school system. The ultimate goal of the education system is to produce career ready workers that meet current and future demands of the labor market. In the December 2017 National Security Strategy (NSS), President Donald Trump indicated that in order to promote prosperity we must make "support[ing] education and apprenticeship programs" a priority.[1] President Trump further stated, "The Administration is dedicated to rejuvenating the U.S. economy [by] unleashing the potential of all Americans."[2] Moreover, securing a healthy DIB is critical to U.S. National Security. In other words, a strong and effective education system is critical to revitalizing the economy and securing a robust DIB. A strong education system provides a pathway to unleashing American human potential by growing critical skills necessary to maintain and renew the DIB through innovation and expertise. Accordingly, education is the foundation of a secure and prosperous economy. Ultimately, "economic security is national security."[3]

This paper examines the education industry, its current conditions, challenges and future outlook. It focuses on improving the output of the education industry, specifically in higher education, to support labor market demands and National Security objectives that will ultimately renew the U.S. economy and promote a U.S. competitive advantage in the 21st century knowledge-based economy. Proposed policy recommendations seek to achieve educational outcomes that support these objectives. The paper concludes with short essays discussing other education industry challenges and proposed solutions.

INDUSTRY DEFINED

The education industry consists of public and private instruction through pre-kindergarten, primary, secondary, and post-secondary institutions. Each level of instruction produces an output of human capital to potentially supply the next stage. The education industry also includes supporting sectors such as textbooks, curriculum development, transportation and technology, however those surrounding markets are not the focus of this essay. ***Figure 1: Education Industry*** provides an overview of the complex education industry and the links between Government, each sector in Education and how each relates to Policy.[4]

Figure 1: The Education Industry



Pre-Kindergarten

Pre-kindergarten, also known as pre-K, includes organized educational experiences for children ages three to five.[5] Typically, early childhood learning institutions offer instruction to these age groups in preparation for compulsory education.[6] Programs aim to develop early math, reading and interpersonal skills and activities to prepare learners for kindergarten.[7] In the 2016-17 academic year, over 1.5 million children were enrolled in state-funded pre-K programs, including more than 1.3 million 4-year-olds—nearly one-third of all 4-year-olds in the country.[8] This is a 30% increase (approximately 500,000 children) from a decade ago.[9] Sixty programs across 43 states and the District of Columbia provide state funded pre-K programs.[10] Private pre-K institutions are also available and are not limited by state curricula standards, but usually demand high fees to attend.[11]

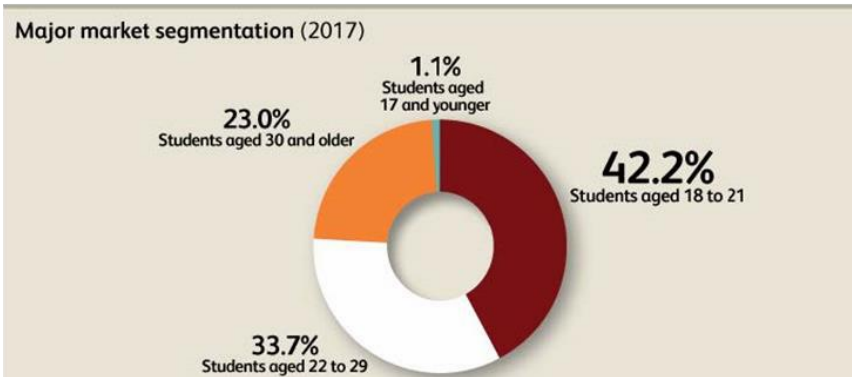
Primary and Secondary Education

Primary and secondary education includes kindergarten (K) and 1st through 12th grades. This is also known as K-12, which describes publicly and privately supported school grades prior to post-secondary programs. Primary education is normally the range of Kindergarten through 8th Grade, while Secondary education refers to high school programs that cover 9th through 12th grades. There are several types of K-12 education including public, private, charter schools, and informal funding schools, homeschooling, virtual and blended schools which all depend on various sources of support. Public schools depend primarily on local, state, and federal government funds, while private schools are usually supported by tuition payments and other nonpublic sources such as religious organizations, endowments, grants, and charitable donations.[12] Each type of school offers innovative approaches to delivering primary and secondary education. Charter schools operate with more flexibility than regular public schools and enjoy freedom from some of the regulations imposed upon typical public schools. Virtual and blended programs are designed using a formal approach to education involving full (Virtual High School) or partial online delivery (Blended with a Brick and Mortar School) of content. By leveraging the internet, students receive a personalized learning experience, but maintain some element of control over time, place, and path of learning.[13] Homeschooling is also an option utilized more around the country and the world, in which parents choose to educate their children at home instead of sending them to a traditional public or private school; homeschooling enjoys many of the same benefits as a virtual or blended school program.[14]

Post-Secondary –Higher Education

Post-secondary education, also known as higher education, includes traditional colleges and universities as well as community colleges, career and technical education (CTE), and Massive Open Online Courses (MOOCs). In 2017, there were 4,358 accredited degree granting post-secondary institutions in the United States, with 19,841,014 enrolled students."[15] They ranged in size from small schools of less than 100 students, to the University of Central Florida, the largest single university campus in the United States, with over 60,000 students.[16] U.S. post-secondary institutions are broadly divided into public (37%), private non-profit (39%) and private for profit institutions (24%).[17] The vast majority of students attend public institutions (74%), with private non-profits accounting for most of the remaining enrollment (21%), and for

Figure 2: Market Segmentation



private for profit institutions representing only a small percentage of overall enrollments (5%).[18] As indicated in ***Figure 2: Market Segmentation***, approximately 57% of students enrolled in a college or university are over the age of 22 and not likely recent high school graduates. Although designed as four-year programs, most students are not able to complete their degrees within this timeframe. In 2015, 40% of new entering students graduated within four years. For public institutions, 35% reached this goal. Private non-profit institutions fair better with a 53% graduation rate, while for-profit schools only achieved an 18.7% rate. Over 1,000,000 foreigners attend U.S. universities.[19] Approximately 75% of international students come from Asian countries.[20] The foreign student population provides diversity as well as a financial boost for the schools "generating more than a $32 billion annual trade surplus…. (with) education (as) one of our (U.S.) most robust export sectors strengthening our overall economy."[21]

Community colleges and other two-year programs also represent an important component of U.S. higher education. In 2015, over 1,000,000 students earned Associates Degrees, many in STEM fields. Likewise, career and technical education (CTE) has traditionally played an important role in U.S. education at both the secondary and post-secondary levels. "CTE provides students with the academic and technical skills, knowledge and training necessary to succeed in future careers and to become lifelong learners."[22] Approximately 12.5 million high school and college students are enrolled in CTE across the nation; of that total, 7.5 million are secondary level CTE participants.[23] In addition to CTE, colleges and universities, also offer Continuing Education (CE). The world economy has become increasingly dependent upon a highly-educated workforce that recognizes the need for lifelong learning in order to keep up with advancing technology and global competition.[24] CE programs or courses are one way to strengthen the advancement of the workforce and present multiple educational pathways to professional, intellectual, and creative development, with the internet being the most common delivery tool of CE.[25] During a recent industry visit, the head of HR for Boeing noted that most large companies conduct corporate education, also part of CE.

Other internet-based learning for higher education are MOOCs - distance-learning courses offered by many universities and open to anyone who registers. MOOCs offer the option of studying a particular subject in-depth without the constraints of the traditional college course.[26] Most are free or require a small registration fee and are self-paced learning experiences with different levels of proof required for completion of the course.[27] Presently, there are over 250+ MOOC based credentials available through companies such as those depicted in ***Figure 3: MOOCs Available***, companies partner with leading colleges, universities and institutions to offer

online courses in multiple areas of study or enhanced professional skills.[28]

Figure 3: Massive Open Online Courses Available

	Credentials	College Credit	Degrees
Coursera	✓	✓	✓
EdX	✓	✓	x
FutureLearn	✓	✓	✓
Udacity	✓	x	✓
Kadenze	✓	✓	x

Source: https://www.class-central.com/report/mooc-trends-credit-credentials-degrees/

Continuing education is required in over 50 professions, including nursing, teaching, accounting, social services, and real estate to meet professional standards for certification maintenance or relicensing. [29] Research shows that firms in the information technology industry who offer workforce development opportunities or continued learning access prosper from higher employee retention rates and increased competitive positioning. [30] Other benefits derived from obtaining additional education courses include assisting the workforce in completing specialized training to qualify for certain jobs, increasing one's marketability, and incorporating ways to develop new skills or knowledge.[31] The U.S. higher education system is generally considered the best in the world; one reason for this is the variety of types of higher education institutions available to meet the needs of a great majority of U.S. citizens interested in pursuing an opportunity to improve their status in society. These types include traditional colleges and universities, community colleges, CTE, corporate education or using distance learning to pursue additional educational opportunities.

CURRENT CONDITIONS

As already noted, there is a skills gap between education career ready output (students entering the job market) and labor market demands. Consequently, there is increasing concern that the primary and secondary education sectors are currently not well-positioned to sustain the growing U.S. economy or support the nation's NSS objectives. In order to close this gap, the education industry must be supported in all sectors, with a particular focus on the higher education sector.

Pre-Kindergarten, Primary and Secondary Education

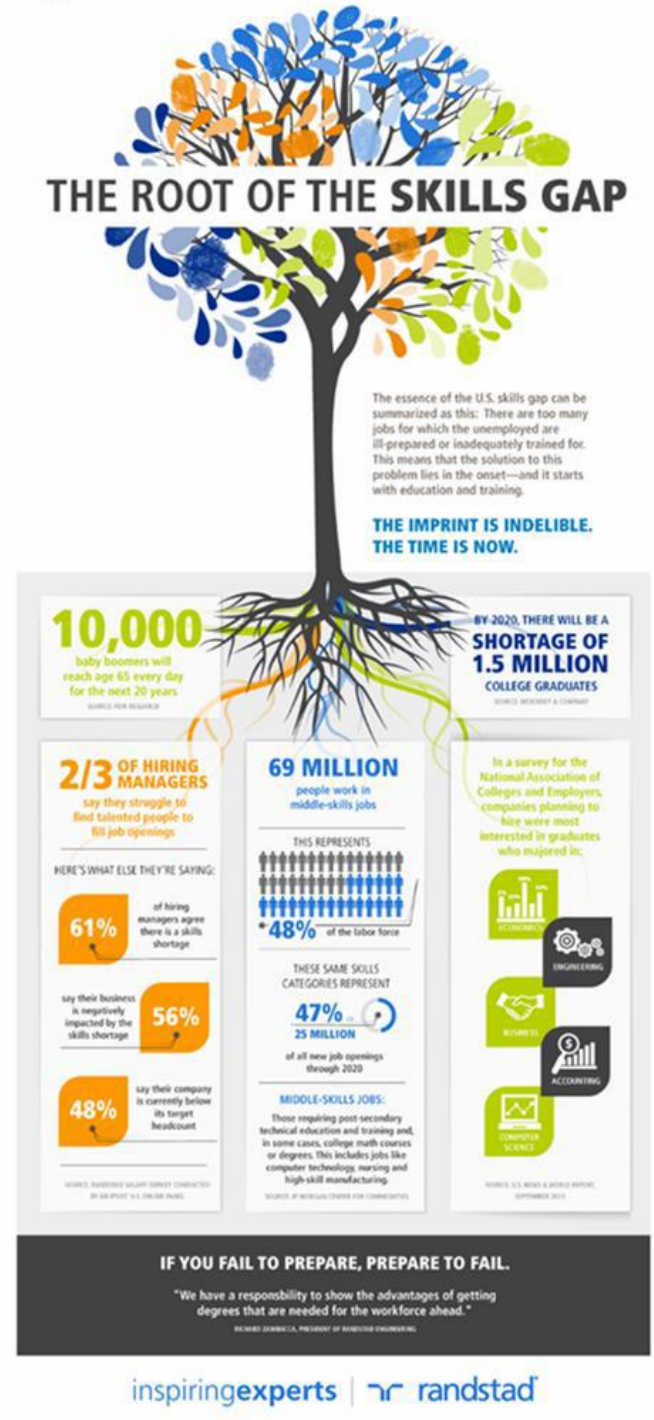
The U.S. is realizing the importance of Pre-K education and its link to how students perform in the succeeding sectors of the education industry. A *US News and World Report* article noted that:

> What other countries know – and what we're (U.S.) just catching on to – is that early childhood education can yield a high return on investment. Most prominently, Nobel Laureate James Heckman has shown that early childhood investments improve cognitive development; build the so-called soft skills – such as motivation and self-control – that children need for lifelong success; and reduce the social costs associated with fighting crime and poverty.[32]

Focusing on Pre-K may improve U.S. performance in both the primary and secondary education sectors where America is not yielding desired student outcomes. For K-12 learners, a Pew Study based on the Program for International Student Assessment (PISA) scores from 2015 identified

the United States as ranked 38th in mathematics, and 24th in science out of 71 countries.[33] Consequently, when the cohort of 15-year-olds who took the PISA in 2015 become the backbone of the nation's workforce, U.S. economic power and national security may be at risk as this future workforce may not be adequately equipped to fulfill our economic or national security needs. Although the focus of this paper is on higher education, it is necessary to highlight critical education industry shortfalls across the entire education sector to show that the challenges are not just in the higher education sector. Some challenges include: improving teacher effectiveness, teacher preparation, STEM enrollments and pre-K expansion. These and other challenges are resulting in substandard performance on international assessments within the K-12 sector.

Figure 4: The Root of the Problem



Higher Education: STEM and the Skills Gap

A beacon in the American Education system continues to be within the Higher Education sector which is delineated into three sub-categories: (1) Career and Technical Education (CTE); (2) Community Colleges, and (3) Traditional Colleges. Although a bright light with a huge international presence, U.S. institutions of higher learning are not meeting America's economic human capital needs, especially in the area of Science, Technology, Engineering, and Math (STEM). As depicted in ***Figure 4: The Root of the Problem,*** a *Business Roundtable* study identified a skills gap through a survey of CEOs. More than half of the companies surveyed reported that skills shortages are a significant problem, and of these companies' more than 200,000 current U.S job openings, about 60% require basic STEM literacy, while 42% require advanced STEM knowledge. The study further indicated that nearly half of all job openings through 2020 (about 25 million jobs) are "middle skill jobs" that require post-secondary education and training, and in some cases college level math or

degrees.[34] This skills gap must be filled in order to attain the 2017 National Security Strategy goals of rejuvenating the U.S. economy as well as renewing America's competitive advantage through innovation in economic and defense capabilities.

As the U.S. seeks talented professionals for the DIB, universities represent the pipeline for the highly skilled engineers, designers, and developers of the future. In 2015, 667,919 degrees in Science, Technology, Engineering, and Math (STEM) fields were conferred at all levels of education, including 28,101 PhDs."[35] Thousands of students study STEM at the highest graduate level with 322,376 (47%) students enrolled in STEM programs.[36] However, a shortage of STEM professionals still persists currently which makes it problematic that the higher education sector will be able to support a growing DIB.

Traditional Colleges continue to be the mainstream post-secondary education track for the majority of learners, despite that "some 30 million jobs in the United States that pay an average of $55,000 per year don't require bachelor's degrees."[37] High school graduates have been effectively encouraged to pursue bachelor's degrees while high-paying jobs requiring shorter and less expensive training go unfilled. This trend has a direct impact on the economy and national security.[38] There are both benefits and drawbacks to pursuing a college degree. Individual and collective benefits are too immense to list, but include a wider world view, increased critical thought among the voting public, and more specifically, a more highly skilled and productive workforce. Moreover, studies show lifetime earnings between bachelor degree holders and non-holders is 76% higher for those with the degree (about 1$ million more).[39]

On the other hand, colleges come with costs as student debt is a significant issue for American college students and graduates. From 2005 to 2015, the cumulative student debt in America increased from $364 million to $1.19 trillion dollars. This is a more than a 300% increase in total debt over these 10 years.[40] During this same time frame, the United States Government debt increased by about 225% from $7.9 to $18.1 trillion dollars.[41] Current total student debt lies somewhere between $1.3 to $1.5 Trillion. At the individual level, the average student loan debt in 2015 was $35,000 per student and is likely higher than $40,000 now based on simple extrapolation of the existing data.[42] Furthermore, former Secretary of Education, Dr. William Bennett explains in his book, *Is College Worth It*, that "half of all college graduates in 2010-2011 were unemployed or dramatically underemployed."[43] He expects college costs and prices to rise and continue to rise at rates far above the rate of inflation which in many cases makes college a poor investment. In breaking out the costs of college, Bennett determined that tuition, room, and board for the 2010-2011 academic year at a public institution cost $13,297, while the same at private universities cost $31,395.[44] Consequently, the high cost of college in the United States presents an additional barrier to prospective American college students, which limits the current degree holding population to about 40% of all Americans.[45] The shortage of U.S. STEM qualified workers leaves American companies with little choice but to outsource their most advanced, and highest paying positions to foreigners. More and more countries around the world are focusing their efforts on education. During a field study to Shanghai, China, a U.S. Consulate General representative from the American Citizen Service Division indicated that currently one third of all student visas, or approximately 300,000 student visas, have been issued to Chinese students.[46] Additionally, a prominent University of Texas researcher cites that about half of all engineering doctoral degrees are awarded to non-U.S. citizens which may result in unfavorable national security implications.[47]

Mr. Jeff Selingo, a life-long journalist and researcher on higher education in the United States, recently published two books that chronicle the troubles of college in America citing

examples such as the associated problems concerning employability of college graduates, student debt, the college prestige race and the exponential growth of tuition and fees, as well as the impact of technology on the future of higher education. These areas are clearly problems or near term disruptions that the higher education industry in America must mitigate. As depicted in ***Figure 4: The Root of the Problem***, by 2020 there will be a shortage of 1.5 million college graduates to fill jobs in specific fields.[48] The NSS directs both manufacturing and infrastructure as priorities for improvement; this is likely the motivator behind many of the predicted labor market deficiencies.

During a recent visit with a defense industry company, the Chief of Human Resources stated that his company currently expects to fill roughly 12k STEM-related jobs annually. With only 2.5k college students graduating with degrees qualified to work in these positions, the company will not be able to fill its vacancies with U.S. citizen college graduates in the foreseeable future. So where can such workers be cultivated? Mitigating current skills gaps and labor market deficiencies are key to sustaining the United States' eminence in the world – both economically and as a world super power that can project and protect its national security interests.

CHALLENGES

U.S. post-secondary education challenges do not fall in line with those typical of other industries. Rather than define them in leadership, diplomatic, economic, political, government-industry interaction or contextual terms, post-secondary education challenges are better captured in terms of access and relevance. In other words, to ensure a robust U.S. economy, which is necessary for national security, the education industry must ensure sufficient numbers of people have access to the relevant education opportunities needed to fill jobs critical to national security and American prosperity.

The accessibility challenge is multi-faceted which includes the critical issue of affordability. Specifically, gaining access through college acceptance, as well as completing college can be a significant challenge for many Americans. While post-secondary education as a whole does not currently face demand problems, access must be evaluated through the lens of the U.S. economy and national security.[49] Post-secondary institutions simply filling classrooms does not ensure students enter and complete the training or degrees with suitable skills needed in the labor market. A *New York Times* article published in June of 2017 noted recent efforts to hold for-profit universities accountable:

> The Obama administration pushed through sweeping regulatory changes after hundreds of for-profit colleges were accused of widespread fraud and subsequently collapsed, leaving their enrolled students with huge debts and no degrees. The failure of two mammoth chains, Corinthian Colleges and ITT Technical Institutes, capped years of complaints that some career-training colleges took advantage of veterans and other nontraditional students, using deceptive marketing and illegal recruitment practices.[50]

Great socioeconomic disparities remain among students who seek and complete post-secondary education.[51] Lower income students are much more likely to leave college without a degree.[52] Inadequate access to post-secondary education has significant implications with regard to looming shortages in workers needed to fill STEM career fields and skilled technical jobs.[53]

Like access, the challenge of relevance has several contributing factors. Leadership, economics and government-industry interaction all play a role in ensuring education is relevant to economic demands and national security needs. As noted above in the Current Conditions

section, there is a growing disparity between the skills the current U.S. higher education system provides and the skills U.S. industry needs. The current business model for higher education is not conducive to the innovation and change required to adapt to the dynamic demands of the U.S. workplace.[54] Consequently, the U.S. higher education system must adapt and produce more workers with the skills needed to support the expanding knowledge-based economy. Failure to do so will stagnate both the education industry and U.S. economic base as a whole and ultimately risk any competitive advantage efforts. Such stagnation would have direct detrimental effects on the U.S. economy and national security.

GOVERNMENT ROLES AND POLICY RECOMMENDATIONS

The success of our national security strategy starts with setting clear goals and policies as a government. Historically, the federal government has considered education to be a state and local responsibility, supported by the 10th amendment of the Constitution.[55] While the Constitution has prevented the federal government from taking a centralized planning and execution role, it has not prevented government from playing an increasingly active role in shaping and influencing education efforts, especially in the post-World War II era.[56] According to a current senior advisor to the U.S. Secretary of Education, the federal government's role in education is financial preparation for higher education, ensuring equal access to higher education, and data collection and analyses of educational factors.[57] The foundation of current federal policies are largely (although not exclusively) based on laws Congressional subcommittees develop and Congress passes as reauthorizations of the Elementary and Secondary Education Act (ESEA) and the Higher Education Act (HEA) of 1965. Since its establishment under President Carter, the task of the Department of Education (ED) has been to enforce and regulate those laws and policies. While Congress and ED are the major players in Federal education policy, there are a variety of other agencies that can actively support education in America including other cabinet-level departments, the National Science Foundation, the National Governors Association, and NASA. Moving forward, it will be critical for the various government stakeholders to coordinate efforts into a unified plan which is unfortunately where education strategies often fall apart. Developing polices to achieve shared goals is always a contentious debate, making implementation of long-term education strategies difficult. This dichotomy is evident in the current debate to reauthorize the HEA.[58] President Trump's recent education executive order to decrease federal involvement in primary and secondary education is another example of the political back and forth of education policy.[59] The following five issues and corresponding policy recommendations are identified, designed and prioritized to provide a long-term strategic approach to improving the U.S. education industry.

Policy Recommendations

#1. Strengthen College Readiness through a "STEM Corps" model. Government leadership should make a concerted effort in secondary schools to produce College and Career-Ready graduates. The goal of STEM Corps related policies is to establish a government foundation that promotes participation in STEM-related curriculums and incentivizes college completion, specifically for students at high risk of not graduating high school. For example, offering paid internships in government agencies to qualified and exceptional STEM students on track to earn a post-secondary degree or accreditation could incentivize college completion.

Figure 5 : Solving the Skills Gap

During the Obama administration, there was push to promote STEM through formation of the Committee on STEM Education (CoSTEM) with members from 13 separate agencies. The purpose of the committee was multi-faceted but focused on improving STEM instruction and participation, especially in underserved populations.[60] Reinstituting policies mandating federal agency collaboration ensured a unified approach to addressing STEM labor deficits and related challenges. Such policy would also exercise a whole of government investment when revamping directives that influence federal hiring and incentivization programs. One of the most important aspects of this program would include face-to-face mentoring with students, especially those from underserved populations. A small-scale example of such a program includes Teen-Tech which provides useful certifications along with extracurricular mentoring to prepare students for college in Hillsborough County, Florida. Even small-scale programs can have significant impacts. For example, "in 2014 alone, [Teen-Tech] Computer Mentors provided services for 78 students in the STEM Corps High School Program and students completed 10 technology projects for other non-profit organizations ranging from website and application development to video production." [61]

Figure 5: Solving the Skills Gap depicts the model addressing both the educational challenges of access and relevance as it creates a pathway to STEM-related study that can be

uniformly regulated across the nation while also seeking to decrease the widening skill gaps in areas of needed expertise. Although Teen-Tech is only a miniature version of what a federalized STEM Corps program could be, such a program facilitated on a national scale could exponentially increase the opportunity for future innovation and establish an important return on investment for the whole of government, our DIB, and thus America's posterity.

#2. Create Post-Secondary CTE Applicant Incentives. The American DIB is facing a growing deficit in middle-skills labor. [62] Likewise, as the NSS looks to upgrade American infrastructure there will be an increasing need for CTE development. To address this shortfall, government can implement policies that promote programs to restructure public school CTE enrollments. Incentives for training are critical to CTE program interest. Equally critical are licensure and certifications that facilitate employability and job placement commensurate with needed areas of expertise (welding, electrical, plumbing, etc.).

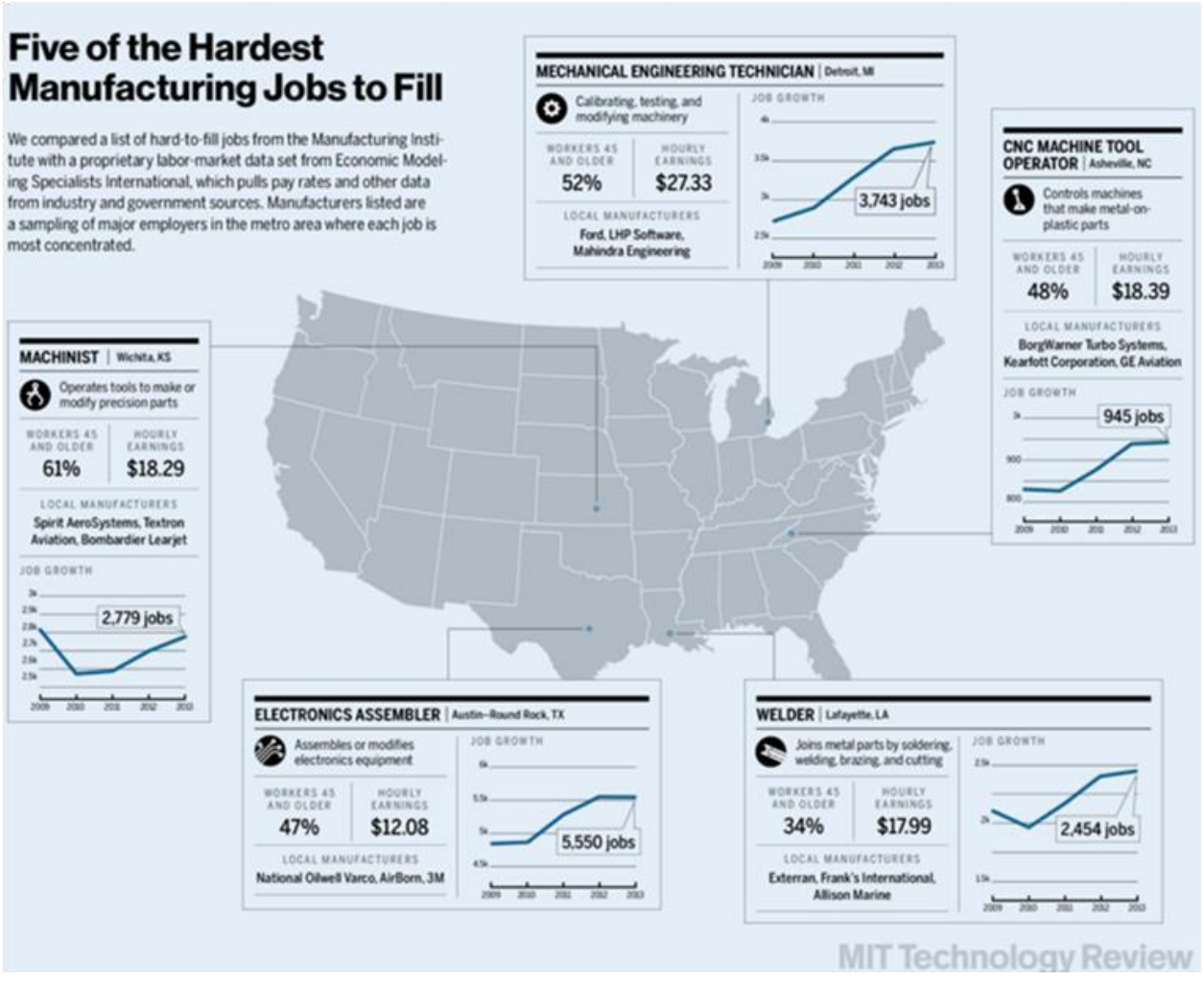
To bridge the widening gap between existing jobs and a competent supply of labor, federal, state, and local governments need to fund instructional resources and pathways to trade accreditations. The labor gap is truly global in scope; countries throughout the world are implementing similar policy interventions. China is also facing a middle-skills labor deficit according to the Shanghai Academy of Social Science (SASS) as well as the Shanghai Municipal Education Commission (ShMEC).[63] Both the SASS and the ShMEC are involved in informing and creating policies for the Chinese government. In response to a national mandate to address the middle skills deficit, Shanghai government officials are attempting to adjust the largest indigenous workforce by emphasizing vocational training. Specifically, they look to attract potential vocational learners as young as junior high school to attend vocational high schools to meet their growing middle-skills labor demands. [64] These are structured government programs and policy reforms designed to institute pathways for CTE training and accreditation. In the U.S., states are emphasizing similar CTE policy and funding reforms. In 2015 alone, 39 states instituted 125 new laws, policies or regulations relating to CTE, many of which increased state funding for such programs. Montana, for example, doubled the annual statewide appropriation for secondary CTE and Nevada tripled its funding for the same.[65] Similarly, increasing accessibility to vocational high schools and providing greater tuition assistance or access to grants for CTE higher education will help close the labor skills gap currently impacting the DIB and likely to impact future U.S. infrastructure upgrade plans.[66] Current initiatives to extend the Federal Pell Grant to CTE should also be a priority.[67] Extending current Pell Grant benefits to include CTE would streamline access to post-secondary CTE and more immediately address the labor skills gap. Such a policy could encourage students to apply and commit to careers in technical fields and complete a CTE curriculum. Post-secondary CTE applicant incentives can directly address challenges by providing access to relevant training and education consistent with industry workforce demands.

#3. Provide Industry Incentives for CTE Investment. The federal government should incentivize industry partners who directly sponsor or invest in post-secondary CTE programs. One way to provide such incentives is by implementing a new provision within the Federal Acquisition Regulation for prime contractor status. Special preferences are apportioned within existing provisions for corporations whose governing structures meet or conform to the definition of specific profiles; Native American or minority owned businesses are examples of such criteria.[68] The recommended policy would also offer similar considerations to industry

partners who commit to educational funding or offer CTE apprenticeships. One challenge with implementing this policy would be how to fairly award government funding without showing favoritism to any particular company. Industry leaders would then have direct access to trained workers which would help bolster the DIB and other critical labor markets. Implementing CTE incentive policies would not only address some education accessibility challenges (possibly opening doors for minorities and women), but also ensure the education industry is providing relevant training as it relates to building the workforce. An MIT Technology Review study showed that manufacturing jobs are one of the largest fields that remain gapped in the United States.[69]

Recommendations #2 and #3 both address the challenges the U.S. workforce faces in specific career and technical fields such as manufacturing as illustrated in **Figure 6: Manufacturing Matters.** An article published on *thenotebook.org* discussed the increasing importance of CTE and the limited number of educational institutions stating that "Advanced manufacturing jobs are lucrative and in demand. Ben Franklin High hopes to fill that need with new CTE specializations."[70] Why not implement policy that creates incentives for Industry leaders to partner with schools like Ben Franklin?

Figure 6: Manufacturing Matters



#4. Incentivize Partnerships between Higher Education and Government. Policy efforts should encourage increased partnerships between higher education institutions, government agencies (beyond the Department of Education), and the industrial base, to better understand the skills gaps and to develop more effective pathways to school completion and critical skills attainment. Higher education institutions are becoming increasingly aware of the value of industry partnerships seeking to provide relevant training for unfilled jobs. Community colleges have a strong history of succeeding in industry partnerships at the local level as they partner with local businesses to develop curricula that are critical to local economies. [71] Larger businesses could certainly see similar benefits by partnering with state schools in critical areas to develop pathways that lead to graduation and jobs. For example, Northeastern University in Boston, Massachusetts implemented a co-op program that partners with local companies and combines classroom study with full-time employment. The program is an experiential learning model which is focused on experiencing an industry, teaming with co-workers, and problem solving all while gaining work-life experience that assist students in exploring and understanding the world. Similarly, government agencies could partner with students in high school as well as college, thus playing a huge role in improving college and career readiness, especially in programs critical to national security. The National Science Foundation's Industry-University Cooperative Research Centers Program helps link universities, industry, and government for scientific research opportunities. The program ensures mutually beneficial partnerships are established to expand innovation.[72] Federal policy would promote establishment of similar systems that take advantage of existing co-op education programs to allow not just industry, but also government agencies to hire and help educate the next generation of workers.

Regardless of the level, federal and state policies could utilize grants in order to incentivize partnerships between government agencies and educational institutions. As noted previously, Pell Grants have been one of the largest tools of federal policy to try to improve higher education graduation rates. Between 2000 and 2015, over $300 billion in Pell Grants were awarded, however only 40% of recipients graduated. [73] Finding new paths to college completion, not just access, is critical to developing the workforce this country needs to succeed in a global economy. Education and government partnerships could also benefit from the use of Pell or similar grants to fund students who are conducting government research or working with government agencies.

#5. Encourage innovation in higher education institutions. As technology changes every aspect of education, schools are forced to innovate as they seek to improve both access and curriculum relevancy. Arizona State University is leading the pack as U.S. News and World Report's "Most Innovative School" for 2018.[74] Michael Crow, the president of ASU, outlined some of their tactics and successes at the National Governors Association Winter Meeting, including a modification of traditional tools such as professor tenure and a complete reorganization of their school structure. After merging several engineering programs and developing a fully accredited online degree program, ASU increased their student population over 260% in nine years. More importantly, they increased freshman retention rate from 68% to 90% and saw a 95% improvement in the four-year graduation rate.[75]

Innovation in higher education may take many forms, of course. Some schools seek to improve the quality of the facilities while others seek to redesign degree programs to make them more accessible. What works for one school may not work for another. Successful innovation, however, may require tearing down some sacred strongholds that stand in the way of progress.

Government leaders at all levels should encourage schools to be innovative, to disrupt the status quo to achieve greater results without sacrificing quality. Unfortunately, much of the innovation happening right now is in spite of federal policy, rather than because of it.[76] As Stuart Butler of the Brookings Institute states, "The system needs much more than tweaks in financing or regulation; it requires an entirely different business model."[77] Large schools such as ASU have the financial capacity to balance the risk of innovation while smaller schools might find that risk to be too great. However, with the right policies in place, federal and state governments could promote innovation.

The federal government's 2009 financial stimulus package included a DE program titled Investing in Innovation (i3). Grants were awarded with the expectation to raise matching funds to help "test-drive and scale up" new ideas.[78] Expanding i3 into higher education could have a dramatically positive effect on innovation. Previous policies that attempted to drive innovation from the top, unfortunately ended up stifling it by creating unintended consequences. As a recent task force report stated, "Rather than impeding institutional productivity and innovation, federal regulation ought to be facilitating it."[79] The policy would (1) mandate defining a goal and then supporting innovation from the bottom up to positively implement change and (2) provide a financial stimulus designed to fund innovative ideas and hopefully improve student outcomes at higher education institutions. Funding would come from reallocation of money from aid and grant programs that have been limited in their ability to achieve higher graduation rates. In 2012, the six-year graduation rate nationally was 59%.[80] This is only 4% higher than in 1996 and shows no increase since 2006. [81] It is time to redirect this funding to support innovation at higher education institutions which will hopefully yield outcomes similar to ASU who simultaneously tackled challenges such as access and retention.

OUTLOOK

As outlined in the recommended policies, the focus of the education industry should be to address the current shortfalls within the workforce in STEM and in other career and technical fields. The U.S. Department of Education reports that there will be 68 percent more job openings in infrastructure-related fields in the next five years than there are people training to fill them.[82] Additionally, over the next decade, 10 million jobs will be added to the labor market and it is highly likely a high school degree, but not necessarily a college degree, will be required to fill those jobs.[83] Likewise, a Society for Human Resource Management analysis of Bureau of Labor Statistics reported that Information Technology and Health Care jobs are in high demand with a projected growth of between 30-50% over 8 years. A key factor in the growing demand for tech jobs is a shortage of qualified candidates.[84] Considering the requirements for a technologically advanced workforce that influences the outcomes of global competition for economic security in the 21st Century, the future of the United States, its economic power and national security may be at risk. If implemented, the recommended policies will assist with creating opportunities for students, industry and government to work together in order to optimize America's true potential as a nation. Policy recommendations need to cover every sector in the education industry, starting with Pre-K. However, in order to address the skills gap, the five policy recommendations focus on secondary and post-secondary (higher) education which will help create a crew of skilled labors able to work in currently unfilled jobs.

As evident in other countries, such as China, focusing on education will yield results that not only maximize human capital, but also contribute to strengthening other industries,

improving the U.S. economy and bolstering the defense industrial base. An education-focused America will yield an outlook that will improve with every graduating class of college and CTE students while simultaneously embracing an innovative environment through partnerships.

Table 1: Policy Recommendation Links outlines the linkages for each policy recommendation and how the recommendation addresses challenges and current conditions in the education industry.

Current Condition	Policy Recommendation	Access for all & Relevance (Challenges -Two Themes)	Specific Challenge the policy addresses	Outlook if policy is implemented
Workforce skills gaps – particularly unfilled jobs in the STEM field	*#1. Strengthen College Readiness through a "STEM Corps" model.*	Access – for all students interested Relevance – addresses skills gaps	Increases college completion rates; Supports NDS, NSS through strengthening DIB & economy	Pathway to employment, recruiting a cadre of STEM workers
Expensive to run and access CTE programs; limited number of current programs	*#2. Create Post-Secondary CTE Applicant Incentives.*	Relevance – addresses skills gaps not requiring a 4-year degree	Supports NDS, NSS through strengthening DIB & economy	Closes the skills/labor gaps, streamlines access to CTE
Little to no incentives	*#3. Provide Industry Incentives for CTE Investment* (with focus on underserved populations – privatized - ie – job corps)	Access – open industry doors to those who cannot afford it otherwise Relevance – addresses skills gaps not requiring a 4-year degree	Supports NDS, NSS through strengthening DIB & economy	Lightens the burden off the community & higher education institutions
Limited	*#4. Incentivize Partnerships for Success* (with schools and government agencies - internships and apprenticeships)	Access – for all interested Relevance – increases government involvement and focus on education	Increases affordability; Addresses skills gaps; Increases college completion; Supports NDS and NSS through strengthening DIB and economy	Increased co-ops that create career-ready graduates
Emergence of a knowledge-based economy; current business model for higher education institutions may be stifling innovation	*#5. Encourage innovation in higher education institutions.*	Access – for all interested Relevance – improves all industries and DIB	Support NDS, NSS by improving U.S. competitive advantage and allowing U.S. to remain a global leader as a knowledge-based global economy emerges	Increasing innovation in schools

Table 1: Policy Recommendation Links

CONCLUSION

In order to attain objectives outlined in both the NSS and NDS, it is necessary to implement policies focused on improving the nation's most important asset – human capital. The key to improving this asset is through providing access to relevant training and certifications that will optimize the performance of America's workforce. Critical to national security is the ability to cultivate a workforce with the skills necessary to bolster the defense industrial base while simultaneously encouraging innovation and expertise to fill critical gaps. As discussed in detail in the preceding pages, recommended policies to improve current conditions and address challenges of access and relevance are to: (1) strengthen college readiness by promoting STEM (Science, Technology, Engineering, and Mathematics participation with government agency internships); (2) create Career and Technical Education (CTE) participation incentives; (3) provide industry incentives to partner with CTE schools to produce qualified and employable

individuals; (4) incentivize higher education partnerships to jointly develop training and curricula necessary to meet industry needs; and (5) encourage innovative ideas to improve student outcomes in higher education institutions. Some of the short essays following the conclusion highlight and amplify the challenges as outlined above; other essays identify challenges that are specific to certain sectors of the education industry or that span across the educational spectrum. Each of the essays offer policy recommendations that seek to improve the U.S. education industry on every level.

From Pre-K to Continuing Education, the U.S. must focus on constant improvement of the education industry by implementing policy that aims to improve student outcomes and address labor market gaps through access and relevant training. An article entitled, "Defense Industrial Base: American Competitiveness Perspective Paper" expertly summed up the need to emphasize education in America. The article distinctly details the integral role of America's education industry in support of national security stating that:

> ….gauging America's strength is not a matter of orders of battle. As the drama around sequestration and the country's fiscal policy shows, other crucial elements such as the national debt, an efficient and responsive political process, a **productive education system** and a viable defense industrial base are all part of what will make America strong in the coming decades.[85]

SHORT ESSAYS ON INDUSTRY CHALLENGES AND SOLUTIONS

HIGHER EDUCATION POLICY

The evolution of federal higher education policy includes focal shifts from support for institutions and teachers, to improving access and affordability, and more recently to increasing accountability. Unfortunately, while we have seen some successes, we have struggled to adequately address the major issues of higher education. Some of the biggest challenges include a lack of a cogent federal strategy, poor oversight by the Department of Education, and the sheer complexity and volume of regulations. Following are three recommendations for improving higher education in the U.S.:

First, the Dept of Education should author a national education strategy that encourages increased centralization of higher education within states. The Massachusetts example of a state secondary education board could provide a good model of balanced centralized and decentralized policies. Second, it should be a major goal of education policy to incentivize innovative efforts at schools. Expanding the Department of Education's "Investing in Innovation" program into higher education could promote innovation from the bottom-up. Finally, policy efforts should encourage higher education institutions to partner with government agencies, the industrial base, and each other, to attack various issues and encourage college completion. Policy and funding legislation should incentivize these collaborative partnerships.

STUDENT DEBT AND NATIONAL SECURITY

The United States is in a student debt crisis. With a cumulative student loan debt of $1.3T, a figure that rivals the gross domestic products of industrialized nations such as Australia and Spain, the borrowing required to finance higher education in the U.S. is threatening not only to slow the economy but have a significant impact on national security.

This debt burden, now weighing heavily on generations of young Americans, also affects national security indirectly by making higher education less affordable and thus less accessible to

all but the wealthiest students. Decreased access and affordability of higher education is already contributing to a shortage of skilled workers necessary to support and innovate the DIB. Left unmitigated, the education industry will continue to under-produce and this workforce gap will continue to grow. Three policy recommendations to help solve the student debt crisis at both the student and national level are:

1. Employer Relief of Student Debt: The least invasive policy recommendation, this plan is based on tax incentives for employers that offer student loan repayment as part of their employee compensation plan. This action may also be a potential recruiting tool for employers.
2. Streamlined Income-Based Repayment Plans: Intended to become the default repayment program, this transparent and easy to understand plan involves income-contingent repayments based on earnings, forgiveness upon retirement or death, and no penalties for early repayment.
3. Tuition Caps: This current practice of both the United Kingdom and Australia would be the most economically disruptive, forcing public colleges to focus less on "prestige maximization" (i.e., funding grandiose student unions and climbing walls) and more upon educating students.

High levels of student debt cause direct competition for consumption of other goods which contribute nearly two-thirds of the nation's Gross Domestic Product (GDP) and bolster the U.S. economy. While the U.S. student debt crisis may not be the financial time bomb proposed by some, it poses an insidious and significant risk to the U.S. national security acting as an anchor that weighs down individual borrowers and U.S. economy in toto.

PRESERVE ACCESS TO FOREIGN STUDENTS

In 2016, foreign students spent $39.4 billion on U.S. education, generating a $32 billion U.S. trade surplus.[86] They directly support 150,000 U.S. jobs and indirectly support 300,000 more.[87] They come from 231 countries, 77% in Asia, and 42% study STEM. The majority of foreign students come from these top five countries: China, India, South Korea, Saudi Arabia and Canada. They attend these top schools: New York University, University of Southern California, Northeastern, Colombia and Arizona State University. They pay full tuition with little financial aid and are the most lucrative students for the schools. We need policy and positive public statements to preserve this important sector and attract the brightest students to join our strategic labor force.

Foreign competitors are aggressively recruiting foreign students. For example, Canada saw a 20% foreign student increase in 2017. Meanwhile, the number of F1 student visas, dropped by 19.3% in FY2017. Significant declines included China (-31.1%), India (-38%), Mexico (-50%) and Muslim Majority countries (-25%). The following policy recommendations offer solutions to increasing the foreign student population in U.S. higher education. First, provide graduating foreign students an opportunity to directly apply for multi-year U.S. work permits. Target both key sectors where our labor force cannot meet the need (e.g. STEM) and also for the most extraordinary students. Second, focus on security screening by rescinding all policies banning certain nationalities. Concentrate on screening the individual characteristics of potential visitors and visa applicants. This sends a positive message that the U.S. is open and welcoming. This will increase interest in enrolling into U.S. universities from impacted countries and from those who considered the policies anti-religious or racist. Finally, rescind the proposed

50% budget cuts to the Department of State's Bureau of Education and Cultural Affairs and Education USA. These branches operate 425 student advising centers in 175 countries. Publicize this move and the above changes to immigration law through high level messaging making it clear that the United States is once again "Open For Business" in the education world.

VOCATIONAL EDUCATION AND THE MIDDLE SKILLS GAP

The United States is failing to produce an educated and trained workforce uniquely qualified to fill "middle skills" jobs. This shortage of middle skills workers is prevalent within the U.S. DIB, increasing risk to national security. The term "middle skills" (relative to both jobs and workforce) is used to describe those that generally require some significant education, including post-secondary technical education and training, but less than a bachelor's degree.[88] Though vocational education experienced success in the U.S. through much of the 20th century, social stigma, concerns over academic preparation of students, and funding cuts have taken their toll to undermine the quality and quantity of students graduating from such programs.[89]

A long-term, collaborative effort by government, industry, and society is required to make sustained improvements to vocational education, increasingly referred to as career and technical education or CTE. Several states, including Massachusetts, are leading the way in CTE reform and their successes should be examined for broader implementation nation-wide, with priority given to two areas: reforming academics and increasing collaboration. Because of the deep relationship between book learning and hands-on projects, state governments and local education agencies must continue to reform vocational education by integrating curricula to teach trades alongside traditional academic subjects. Additionally, at the federal level, Congress and the White House must work together to reauthorize and increase funding for The Carl D. Perkins Career and Technical Education Act, which provides critical funding to education agencies at the State and lower levels. Steps must be taken to better balance the provisioning of this human capital across that spectrum, and in particular to fill the current gap of middle-skills workers required of the defense industrial base.

SAVING AMERICA'S EDUCATION SYSTEM

Is America's education system in trouble? The answer to this question is evident in the growing number of countries outperforming the United States on the most respected comparisons of student achievement, while at the same time spending less on education per student. Two areas of focus needed to save America's education system are: improving leadership in the education industry and investing in teachers.

Almost 9% of the U.S. GDP is spent on education. It is the second largest market behind healthcare in the United States. However, our public schools are struggling, and instead of working to strengthen them the U.S. has allowed alternatives such as homeschooling, charter/private schools, and online education to overtake the priority of sustaining a good public-school education. A range of socio-economic factors impede progress of our public-school system. School districts with higher income tax levels have more resources for their schools. Likewise, a school is only as good as its teachers. There are on average 3.6 million well-educated teachers in America's public schools, but nearly 30% of public and private school teachers leave the profession within five years of starting, with low pay, limited opportunities, and lack of respect topping the list of reasons why they leave so quickly.[90]

The U.S. education industry needs to do a better job developing and sustaining its leadership. Education agency leaders must be developed and enabled to take control and make the changes because our nation's future depends on our next generation of educated citizens. Likewise, across the U.S. schools are challenged to recruit and retain teachers. The U.S. needs to grow teachers and create a positive brand image for educators like other professions. A two-tier system, similar to the G.I. Bill for the military, could enable this change. Tier 1 of a proposed Teacher Reform Act would give scholarships to students attending colleges with strong education schools with a 5-year commitment to teaching. Tier 2 would not only pay for undergrad but graduate school in a six-year program.

Our National Defense Strategy states, as it has for generations, "free men and women will fight with skill and valor to protect us."[91] To ensure these basic freedoms, we must have the education to create the men and women that will fight and defend our nation as proud citizens as well as meet the needs of the U.S. DIB and economy as a whole.

TEACHERS MUST BE REVERED

In the United States, the Education Industry is second to only the healthcare industry in terms of percentage of Gross Domestic Product.[92] The education industry is unique because it provides the baseline for all other industries. Therefore, the education industry is vital to the United States, its industrial base, and its National Security.

Effectiveness of the teaching workforce and ultimately, the teacher, is the central node of the education industry.[93] Considering the importance of the Education Industry to U.S. National Security, it is necessary to strengthen the central node around which this industry operates. The key to elevating the teaching profession in U.S. society starts with developing policies and national priorities that encourage: 1) raising the standard to enter the profession of teaching; 2) standardization of teacher certifications within and among states to create a professional pipeline; and 3) a movement to "rebrand" the teacher image to a more "wholistic" view of the profession based on communication and innovation.

"If you look at South Korea, Singapore, Finland, teaching has been given status, teachers are treated well, paid well and so much professional development has gone behind them," said Vikas Pota, CEO of the Varkey Foundation. Government will, he says, is 99% of the reason for this.[94] As Finland did in 1945, the United States should prioritize education in America in order to spark a much-needed change in the way the country views education and those who choose to join the profession of teaching. As realized in countries where education is at the forefront of government policy, the education industry is vital to all other facets of society to include, but not limited to, sustaining the country's industrial base, training workers in all other industries and creating collaborative environments to remain at the leading edge of innovation. There is no other industry or profession as vital to U.S. National Security. "Teaching creates all other professions."[95]

EFFECTIVELY TEACHING AMERICA'S CHILDREN WITH TECHNOLOGY

School resource constraints limit the potential for effective teaching because not all of the best learning tools, planning methodologies and materials are equally distributed. There is unequal access to a uniform American standard of education due to the uneven distribution of American wealth which feeds municipal tax bases unequally, ultimately disproportionately

funding school districts. It is as though there is a conception that teachers, in order to perform the core elements of their occupation, only require a lesson plan and a chalk board. However, as the information age becomes entrenched in the various mechanisms that perpetuate everyday life on earth, technology and the sciences that drive this revolution are becoming more of a necessity for advancing student performance; a level of performance our future workforce will need so that they may develop and advance the next innovation generation.

Recommendations for increasing access to information technology to reform primary and secondary education include incentivization, the offering of grants, and or entering into direct contract with DIB corporations to institute cost sharing partnerships with state and or local governments that subsidize education-based technologies and data analytics platforms. Leveraging the full complement of American industrial-might will provide the resources necessary to establish equity of access to technology for use by our public-schools, leading to improved instruction methodologies and resulting in better student assessments. When we effectively employ technology in the classroom, teachers will have the time and latitude to scale their instruction to meet the individual needs of our diverse population, and we can promote competency in the standard of our education nationwide.

By targeting the very root of the issue with smart resourcing strategies designed to influence the socioemotional power of effective face-to-face teaching, directly impacting where students and teachers live and learn at the point of instruction, we deliver equity of access and sustain a standard of competency.

SCHOOL SECURITY

There are more than 50 million future leaders who are educated in our 110,000 public schools. It is critical these future leaders have a safe and secure learning environment to adequately develop skills necessary to meet economic and societal needs. The National Center for Education Statistics, which is a joint venture between the Departments of Education and Justice, report that in the 2014-15 school year, "a total of 20 of the 1,168 homicides of school-age youth (ages 5–18) occurred at school. During the same period, there were 9 suicides of school-age youth at school, compared with 1,785 total suicides of school-age youth that occurred in calendar year 2014."[96] Relatively speaking, these numbers are not alarming, however the same study noted that 79% of schools reported incidences of violence, crime or theft that occurred in their institutions, while more than 33% of schools reported at least one violent crime to authorities.[97]

The United States government can incentivize school safety programs by enabling the funding of evidence-based programs that build social-emotional intelligence to bolster student confidence in positive relationships. By implementing Social Emotional learning principals and targeted improvements to school safety technology, school boards across the nation may not absolutely prevent every targeted shooting, but in making improvements, we can doing so create a better educated and more well-rounded and productive society of workers who will lead our nation's success well into the future.

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