

# A Deeper Understanding of Technology is Needed for Workforce Readiness – Playing Games, Texting, and Tweets Aren't Enough to Make Students Tech-Savvy

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**Abstract—** Technology skills are critical for workforce readiness and are a key predictor of job success. What does it mean to be workforce ready? To answer this question, definitions of workforce readiness and methods used to measure it are examined. Application of these definitions and methods reveals substantial gaps in the national level of work force readiness. These gaps are manifest when students leave school and persist until they retire from the job market. In the National Evaluation Technology Plan (NETP), the Department of Education proposes five (5) goals to address this deficiency. In this paper, these goals are used to conceptualize solutions to improve teaching and learning outcomes related to workforce and college readiness. Solutions are sought that extend the reach and delivery of educational experiences by leveraging ways youth use technology in their everyday life. The authors share lessons they learned using and teaching technology at the Academy of Information Technology (AITE) High School. AITE is an inter-district public, college preparatory, magnet high school that offers its students a technology-rich learning environment. Its culture and climate fosters innovation that goes beyond the classroom. For example, a collaborative effort with AITE led to the creation of an online learning program – *Best We Can Be* – that engenders learning by facilitating supportive interpersonal networks between students, teachers, mentors, and peers, and by enabling personalized delivery of educational content. Other types of technology based learning experiences – such as robotics clubs – are used to engage students in STEM (Science, Technology, Engineering and Mathematics) disciplines and to encourage exploration of challenging subject matter while developing critical workforce readiness skills.

**Index Terms—** Computers in K-12 education, technology skills and proficiency, college and workforce readiness

## I. ESSENTIAL SKILLS FOR THE 21<sup>ST</sup> CENTURY

STUDENTS need a technology-based education to succeed in the 21<sup>st</sup> century. Research indicates that “proficiency in literacy, numeracy and problem solving in technology rich environments is positively and independently associated with the probability of ... being employed, and with higher wages,” and with higher levels of health and well-being [1]. Numerous studies support the validity of this finding in industrialized

countries around the world [1]-[12].

This section reviews several widely used models of workforce readiness. A common thread is recognition of the importance of technology competency and the role it plays as a predictor of individual success in the labor market. The degree to which its labor pool is technologically proficient is also an indicator of a country’s ability, as a whole, to compete on a global stage.

In 1989, the Department of Labor conducted a large-scale survey of employers in the United States and asked them to identify the most important workforce skills and competencies. The SCANS (Secretaries Commission on Achieving Necessary Skills) model was used to analyze the survey results. As shown in Fig. 1, SCANS identifies three (3) skill types as the *foundation* for workforce readiness [5]:

- **Personal qualities** – personal responsibility, self-esteem, sociability, self-management, integrity, and honesty;
- **Thinking skills** – creativity, decision-making, problem-solving, learning ability, visualization skills, and reasoning ability;
- **Basic skills** – reading, writing, arithmetic and mathematical skills, listening ability, and speaking skills.

Beyond these skills, the following five (5) attributes are identified as essential *competencies*:

- **Resource Utilization** – identifies, organizes, plans, and allocates time, money, material, facilities, and human resources;
- **Interpersonal Skills** – works well with others and as a team member, teaches others, satisfies customer needs, demonstrates leadership, negotiates agreements, and works well with people from diverse backgrounds;
- **Information Utilization** – able to gather, use, organize, interpret, and communicate information, including using a computer;
- **Systems Analysis** – understands complex inter-relationships between social, organizational, and technological systems, and is able to monitor and correct system deficiencies and problems by improving existing systems or by designing new ones;
- **Technological Proficiency** – ability to use a variety of technologies to solve problems, and to select, use, troubleshoot, and maintain technology related software,

hardware, and systems.

As noted above, SCANS makes a distinction between foundation skills and competencies – which require higher order knowledge and behavior. Foundation skills are useful in all occupations. For instance, foundation skills are needed to compose a grammatically correct letter, to calculate a bill for a customer, and to conduct one’s self in an ethically and socially responsible manner. Competency reflects a higher level of skill mastery. Competency is the ability to envision a gestalt and possible solutions even if the task at-hand is poorly defined or the available tools or information are lacking and incomplete. For example, computer competency is displayed when students use technology as tools for problem solving and communication; when they create new systems; and when they teach others how to use it. Different levels of competency may be needed for different types of jobs. Proficiency in specific computer skills – such as the ability to send a text message or an email or to create a Word document – does not necessarily equate to a high overall level of technology proficiency – such as that needed to write software code, or to configure and troubleshoot networked computer environments. However, basic computer skills are a fundamental requirement for workforce readiness in a technological society.

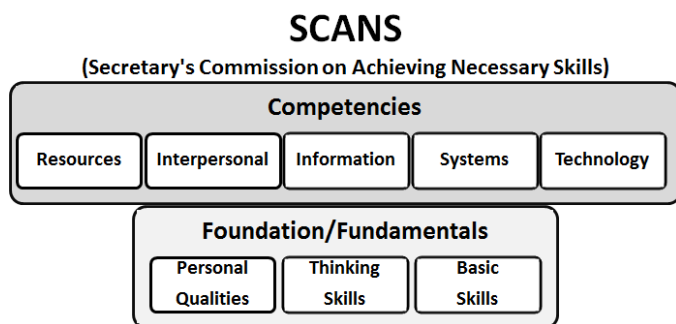


Fig. 1. SCANS Model of Workforce Readiness

The SCANS model is comprehensive and encompasses a broad range of workforce-readiness dimensions. It remains useful and relevant to the current day. Many of the dimensions used in SCANS are present in some form or another in other models of workforce readiness – such as those used by ACT, Educational Testing Services (ETS), National Occupational Competency Testing Institute (NOCTI), and others [7]. For example, the Assessment and Teaching of 21st-Century Skills (ATC21S) categorizes and measures 21st-century skills according to [13]:

- **Ways of thinking** – creativity, critical thinking, problem-solving, decision-making and learning;
- **Ways of working** – communication and collaboration;
- **Tools for working** – information and communications technology (ICT) and information literacy;
- **Skills for living in the world** – citizenship, life and career skills, and personal and social responsibility.

ATC21S attempts to assess how the above skills (which are deemed *conceptual skills*) are used in collaborative problem-

solving and learning within digital environments (which are deemed *practical life skills*) [4], [13].

In comparison to SCANS and ATC21S, The Partnership for 21<sup>st</sup> Century Learning Skills’ learning framework adds dimensions relating to innovation and self-direction. Technology skills play a prominent role in this model, and are categorized with respect to [6]:

- **Information Literacy** – accessing, using, managing, and evaluating information;
- **Media Literacy** – analyzing and creating media products;
- **Information and Communication Technology (ICT) Literacy** – using various kinds of digital technologies and tools, and demonstrating knowledge of relevant ethical and legal issues.

In sum, workforce readiness is defined from an employer perspective, and characterizes how well entrants into the workforce are prepared to meet the demands of the job market. Workforce readiness has many dimensions and may be defined in many ways. Some definitions focus on specific skills needed for specific jobs, while others emphasize broader skill sets, knowledge, and behaviors. Models of workforce readiness differ in emphasis and details, but they generally include technological proficiency as an integral component of their respective assessment methodologies. Technology proficiency is widely recognized as an essential aspect of workforce readiness.

## II. NATIONAL ATTAINMENT OF WORKFORCE READINESS AND TECHNOLOGY PROFICIENCY

The first SCANS report, issued in 1991, found a majority of students in the United States lacked basic workforce readiness and technology skills upon leaving school. As summarized in the report: “Good jobs will increasingly depend on people who can put knowledge to work. What we found was disturbing: more than half of our young people leave school without the knowledge or foundation to find and hold a good job. These young people will pay a very high price. They face the bleak prospect of dead-end work interrupted only by periods of unemployment [5].”

Research indicates overall levels of literacy and workforce readiness remain largely unchanged since the first SCANS report. The Organization for Economic Cooperation and Development (OECD) recently released results from a large scale international survey it conducted with teens and adults ranging in age from 16 to 65 across 24 countries [1]. The United States ranked below average or near the bottom in every literacy, numeracy, and technology problem solving category. The report highlighted the persistence of wage and proficiency gaps arising from a lack of education and workforce readiness [1]:

“What people know and what they do with what they know has a major impact on their life chances. ... Those with low literacy skills are also more than twice as likely to be unemployed. ... improvements between younger and older

generations are barely apparent. Young people ... are entering a much more demanding labour market, yet they are not much better prepared than those who are retiring.”

ACT has published similar findings. Between 2006 and 2011, it collected data on over 1.8 million high school students who took foundational ACT WorkKeys assessments. These assessments are used to evaluate workforce readiness. ACT reported a majority of examinees “could not demonstrate the required skill level for locating information. This skill involves the ability to locate, synthesize, and use information from workplace graphics such as charts, graphs, tables, forms, flowcharts, diagrams, floor plans, maps, and instrument gauges [11].” In another report released in 2013, ACT revealed that only about one-quarter of the high school seniors who took the ACT college admission test received scores indicative of college or workforce readiness. These results have remained the same over the last four (4) years [14].

According to other data published by the Department of Education [2]:

- **24% of students drop out** of high school, and among Latino and African American students, the drop-out rate is almost 50%;
- **19% of high schools receive failing grades** year after year;
- **8% (about 2,000) of high schools produce about 50% the country’s dropouts** and 75% of the minority dropouts;
- **By 2016, 40% of all new jobs will require some advanced education or training**, and half of the fastest growing top thirty (30) fields require a bachelor’s degree as a minimum entry requirement;
- **Only 39% of high school students go on to earn a two-year or four-year college degree.**

In sum, too many students are dropping out, and too many schools fail to prepare the students who do stay in school to be college and workforce ready. The Secretary of Education, Arne Duncan, has characterized the current state of our education system as “economically unsustainable and morally unacceptable [2].”

### III. NATIONAL EDUCATIONAL TECHNOLOGY PLAN

*“By 2020, America will once again have the highest proportion of college graduates in the world.”* – President Barack Obama, Address to Congress, February 24, 2009

The first National Education Technology Plan (NETP) – *Getting America’s Students Ready for the 21st Century: Meeting the Technology Literacy Challenge* – was released by the United States Department of Education in 1996. The report stressed the importance of fostering student technology literacy in schools, and the need to provide classroom access to computer facilities and the Internet [18].

In 2000, the second NETP was published: *e-Learning– Putting a World-Class Education at the Fingertips of All Children*. This report supported continuance of the goals put forth in the first plan, and encouraged wider dissemination and

use of e-learning and digital content in schools [24].

In 2004, the third NETP was published: *Toward a New Golden Age in American Education: How the Internet, the Law and Today’s Students Are Revolutionizing Expectations*. In preparing the NETP, the Department of Education surveyed 200,000 students in fifty (50) states. The survey revealed widespread student dissatisfaction with the quality and availability of technology instruction and computers in schools. The report acknowledged “we have not realized the promise of technology in education. Essentially, providing the hardware without adequate training in its use ... meant that the great promise of Internet technology was frequently unrealized. Computers, instead of transforming education, were often shunted to a ‘computer room,’ where they were little used and poorly maintained [23].”

In 2010, the United States Secretary of Education released the fourth and latest NETP: *Transforming American Education: Learning Powered by Technology*. This report identifies five (5) goals that need to be addressed at a national level to reinvent the educational system [2]:

- 1) **Learning: engage and empower** – students must engage in empowering learning experiences in and out of school to prepare them to be active, creative, knowledgeable, and ethical participants in a globally networked society.
- 2) **Assessment: measure what matters** – technology must be used to measure what matters and assessment data must be used for continuous improvement.
- 3) **Teaching: prepare and connect** - educators must be supported by technology that connects them to data, content, resources, expertise, and learning experiences that enable and inspire more effective teaching for all students.
- 4) **Infrastructure: access and enable** - All students and educators must have access to a comprehensive infrastructure for learning when and where they need it.
- 5) **Productivity: redesign and transform** – all educational levels, processes, and structures should be redesigned to use the power of technology to optimize learning outcomes and improve systemic productivity and efficiency.

The latest NETP report stresses the need to challenge anachronistic assumptions about the structure and delivery of education – assumptions which hinder the country’s ability to address the special needs of its students. It advocates flexible scheduling and online learning to provide continuous, on-demand learning opportunities. Ultimately, the report poses a grand challenge to the fifty states and federal government to work together to build an “integrated end-to-end real-time system for managing learning outcomes and costs across our entire education system at all levels.” The report acknowledges that the country “has a long way to go if we are to see every student complete at least a year of higher education or postsecondary career training. There is no way to achieve this target unless we can dramatically reduce the number of students who leave high school without getting a diploma and/or who are unprepared for postsecondary education [2].”

#### IV. HOW YOUTH USE TECHNOLOGY

In contemplating how to revolutionize the teaching of technology skills, it is helpful to consider how youth are using technology in their everyday life.

The Kaiser Family Foundation recently published a report – *Generation M<sup>2</sup>: Media in the Lives of 8- to 18-Year-Old* – that offers pertinent insights. The report presents results of a survey conducted between October 2008 and May 2009 among a nationally representative sample of students in grades 3-12, and aged 8-18. Major findings include [17]:

- **Large amounts of time are spent viewing entertainment media** – more than 53 hours per week;
- **Most youth own a mobile device** – 66% own cell phones, and 76% own iPods and other MP3 players.
- **Heavy media users report significantly lower grades** than light media users. About half (47%) of heavy media users say they usually get fair or poor grades (mostly Cs or lower), compared to about a quarter (23%) of light users. Heavy users comprise approximately 21% of the young people surveyed. They report watching over sixteen (16) hours of media per day. Light users comprise 17% of the young people surveyed. They report watching less than three (3) hours of media per day.
- **The majority of youth spend over half their time each day in the following activities:** watching TV (4.5 hours), playing music and audio recordings (2.5 hours), texting (1.6 hours), using the computer (1.5 hours), playing video games (1.2 hours), reading print (0.6 hours), and watching movies (0.4 hours).

Statistics published by PewResearch are consistent with these findings, and show growing cell phone and mobile device use among teens and young adults [19].

#### V. USING TECHNOLOGY TO TEACH TECHNOLOGY: A CASE STUDY

This section presents a case study based on personal experiences of the authors and lessons they have learned in their respective roles – as teacher, researcher, program developer, mentor, volunteer, and student – at the Academy of Information Technology and Engineering High School (AITE).

AITE is an inter-district, public, magnet high school located in Stamford, Connecticut. It serves approximately 650 students from western Fairfield County. According to its website, AITE “offers a dynamic college preparatory environment that integrates 21st century learning expectations, world language acquisition, emphasis on global competencies, advanced information technology skills and knowledge, introductory courses in pre-engineering and architecture, and service learning. ... All students and teachers are provided with wireless PC tablet computers that promote inquiry, creativity, and collaboration. Honors, advanced placement, college credit, and virtual high school courses are offered and available to all students [21]”.

#### A. Jeanne Lauer, Teacher, Technology and Business, and Site Coordinator for Virtual High School, AITE

“Contrary to popular opinion, most high school students today aren’t computer geniuses. Most of the incoming freshmen can barely use a computer. We encourage our students to develop technology proficiency in a variety of ways. Every student is given their own laptop, and wireless access to the Internet is available throughout the building. Every student learns technology fundamentals, such as email, Internet search, and word processing software, as a matter of course. Our students participate in a variety of ‘real life experiences’ through labs, hands-on activities, and work-based internships for credit. Our school believes students need freedom to try things that interest them. We offer lots of activities and after-school programs.”

- **Key Lessons:** 1) Students learn by doing and through active hands-on participation, 2) Students need freedom to try things that interest them, 3) Students need varied and early exposure to technology to develop proficiency.

#### B. Daniel Lapinski, 9<sup>th</sup> grader, AITE

“At my school, we receive laptops that greatly aid our schoolwork. In fact, some students actually come to AITE just so that they can receive a laptop! In today’s world, there are still families who don’t have computers or a way to access the Internet. We have access to the Internet any time during class so we can research topics and do work without going to a computer lab. We learn to use our computers to conduct various types of experiments. One example of this is LoggerPro, a plug with a metal stick that can record temperatures and graph them on our computer. Our school uses eChalk, so teachers can post homework assignments and instructions for students. eChalk lets students and teachers communicate with one another and the community 24/7, via the web, email and safe social networking. I am interested in biomedical science, zoology, computers, and technology. Prosthetics, cochlear implants, pacemakers, insulin pumps, and many other implants are things that can drastically change a disabled person’s life for the better. Computers and technology are also very interesting to me. I like learning about the ways computers are programmed and how software and hardware works. I am glad I have opportunities at AITE to experiment with technology.”

- **Key Lessons:** 1) Technology can help students learn by increasing their efficiency and effectiveness in accessing and processing information, 2) Technology can significantly improve communications between teachers and students, 3) Learning technology can help students visualize their own possible career pathways in technology-driven fields of the future.

#### C. Garret Sampel, 11<sup>th</sup> Grader, AITE, and Student President of Cyber Robotics, Inc.

“I became interested in robotics as a middle school student. I have always loved computers and mechanical engineering. I found robotics encompassed both fields. When I learned that AITE had a robotics club, I decided to join it. In fact, this was

a major factor in my decision to go to AITE in the first place. I am taking an AP Computer Science course and an Introduction to Networking course that will allow me to get a CompTIA A+ certification. AITE offers one introductory course in robotics.

Robotics has made me a better person and helped me gain skills I probably would not have gotten otherwise. I see myself working with robots for the rest of my life and want to share my passion with anyone I can. I would love to go to college and study Robotic Engineering, a relatively new field, and develop robots like ASIMO in Japan or Valkrie, NASA's newest humanoid, or else I might go into Aerospace Engineering, which I have loved since I was little.

I am Student President of Cyber Robotics, Inc., a 501(c)(3) organization which is committed to promoting an interest in and knowledge of science, engineering, computers, math, and technology curriculums. Our student roster is between 20-50 students. We have an 'everyone is welcome to join' policy. One thing that makes Cyber Robotics different from other clubs is that everything and every goal of Cyber Robotics is completely the will of the students. There are no adults in charge – just students harnessing their potential. The instructors in Cyber Robotics are the students. We teach each other everything we know. If there is something that none of us know about, we ask someone to learn about it or go to an adult who may know the answer.

There are lots of benefits to being in the robotics club. Being a team member can lead to internships and jobs. Two of our members have gotten scholarships to Worcester Polytechnic Institute (WPI), the college that developed the Java API's (Application Programming Interfaces) used by the FIRST (For Inspiration and Recognition of Science and Technology) robotics competition. We also have students that have gotten their first paying job working as a mentor teaching other students about robots.

We help each other learn. If a member does not understand something in school they can learn it in the club. We help team members learn different concepts, like physics, by showing them how to use their knowledge in the real world. This is a problem some people face in school – they learn and learn but they never utilize what they learn in real world situations. Lectures are informative, but there are cases when there is no substitute for real world experience. Our robotics club works as a team so once a problem is solved – everyone understands how it was resolved. It is a great feeling of accomplishment when you reach your goals. It makes you want to learn more!"

- **Key Lessons:** 1) When directed towards a common goal, technology experiences can help students develop soft skills – such as helping others, teamwork, collaboration, and group research; 2) Peers can teach each other difficult subject matter and learning strategies; 3) Schools can encourage learning after-hours by supporting clubs and activities that develop technology and work readiness skills.

*D. Teresa Piliouras, Founder; Raymond Yu, Vice-President; Kristin Villanueva, Educational Evaluation Specialist Volunteer; and Yingxin Chen, Educational Evaluation Specialist Volunteer, at Best We Can Be, Inc.*

"*Best We Can Be* is an online 'anytime, anywhere, anyone' learning program conceived as an outgrowth of collaboration with AITE administrators and teachers. AITE, like many schools, is faced with tight budgets, union restrictions, implementing of Common Core standards, and meeting No Child Left Behind (NCLB) 'Adequate Yearly Progress' performance requirements. This makes it difficult to respond to student and parent requests for enriched learning opportunities beyond the normal curriculum and school day. *Best We Can Be* was designed to help address this challenge.

The goal of *Best We Can Be* is to give students exposure to diverse learning experiences, and opportunities to interact with experts and mentors, in a variety of disciplines, especially those in STEM (Science, Technology, Engineering, and Mathematics). It is intended to help students forge the connection between their high school studies and future college and career path, and to develop critical skill sets. Many high school students have a limited view of how their educational path may lead to prospective careers. Even students with definitive ideas about their future career are likely to have incomplete and unrealistic notions of what is entailed. *Best We Can Be* is designed to minimize student fears and anxiety when learning new things, especially esoteric topics (e.g., bioinformatics, machine learning, statistics, and so on).

*Best We Can Be* is offered as an after-school, in-school, and summer school program. Some students prefer meeting in a classroom with a teacher as moderator, but many others tell us they appreciate the flexibility of an anytime, anywhere, anyone online program. It allows them to partake of program activities whenever they feel like it (for example, when they are ready for productive learning) – while on vacation, traveling, at home, or when they have a free period at school.

*Best We Can Be* hosts live, interactive Webinars with featured guests who lead students through hands-on activities. Sessions are recorded and can be replayed. Speakers and activities are chosen based on school-wide student surveys, and suggestions from teachers, school administrators, and subject matter experts. The learning experience is supported by mentors who work with each student online to make sure no one is left behind or left out. *Best We Can Be* is supported largely through the efforts of hundreds of volunteers who are motivated to develop their own personal skills (e.g., presentation, research, etc.) and to give back to the community and world at large.

A secure, online Learning Management System (LMS) is available "24 X 7" to organize speaker recordings and notes, activity guides, videos, learning resources, student work portfolios, and self-assessment tools. The Webinars and LMS are accessible via Internet-enabled computers, laptops, and other mobile devices, including smartphones.

Students are asked to give feedback every time they participate in online activities and use program materials. The LMS automates collection and analysis of data gathered on student goals, study habits, attitudes, proficiencies, interests, and learning progress. The feedback is used to: 1) ensure students have positive experiences in the program and trigger intervention if they are not; 2) implement continuous quality improvement based on student feedback; 3) and encourage students to take responsibility for verbalizing and managing their own learning needs.

- **Key Lessons:** 1) The world provides a vast reservoir of talent from which to draw. Many highly qualified and talented people are willing to donate their time to help students, 2) The Learning Management System (LMS) facilitates on-going assessment of learning outcomes, performance benchmarks, and system use. This provides quantifiable, real-time insights that can be leveraged in a Customer (i.e., Student) Relationship Management strategy for continuous system improvement, 3) Student feedback is invaluable in designing and evaluating the program. Students provide lots of suggestions about what they want to learn. This helps us create productive, engaging learning activities.

*E. Holly Robillard, BS candidate in Chemical Engineering and Applied Mathematics, University of Connecticut, and e-Learning Volunteer at Best We Can Be, Inc.*

“Being a volunteer for *Best We Can Be* has given me the opportunity to share my knowledge of chemical engineering with younger students in Connecticut and around the world. This past summer, I had a wonderful time speaking *virtually* with high school students about chemical engineering and how I got interested in the field. I also shared my recommendations to help them start preparing for college. In addition, I prepared an activity for the students to show them some significant, everyday inventions made by engineers. As a presenter, I felt as if I were having an intimate, one-on-one conversation with each person present. The environment we create at *Best We Can Be* is open, inviting, and non-judgmental, and students feel free to ask questions. This experience has helped me realize that virtual interactions can be conducive to learning because of the absence of peer pressure.

At *Best We Can Be*, we work hard to develop presentations and activities that expose students to careers they may never have considered and which may be a fit with their talents. For lack of time, resources, and knowledge, many STEM fields go unexplored in classroom settings. We try to help every student make better, more informed decisions about their future.

*Best We Can Be's* online platform allows students to participate across a wide geographic and demographic range. We bring together students of different backgrounds who might not otherwise have the chance to interact. It also makes it easier for me to be a volunteer. Being able to make a presentation from the comfort of my own home makes volunteering far easier to fit into my busy life.”

- **Key Lessons:** 1) Virtual learning environments have some advantages over physical meeting places – they

make it easier to reach larger and more diverse audiences; 2) It is important to foster a respectful and non-judgmental online culture so students feel free to express themselves and ask questions, 3) Virtual mentoring is a satisfying and time efficient way of helping others.

*F. Michael Berson, 11<sup>th</sup> Grader at Pierrepont High School, and e-Learning Volunteer at Best We Can Be, Inc.*

“I’m a high school student. Technology does not play a huge part in my school life. In most of my classes, my teachers accept handwritten assignments. However there are some classes where computers are necessary. For example, in my Chinese class, most of my assignments are practice essays for the Chinese AP, or lengthy translations of texts my class is studying. The nature of the Chinese language is such that typing the characters on a computer is much faster and easier than writing them by hand. Therefore, my teacher has us type our papers and email them to him; then he corrects the documents and emails them back. To a non-native learner, Chinese characters are unwieldy to write, learn, remember, and, especially, to look up. Before I discovered the Internet and smartphone character dictionaries, I had to look up words in a physical dictionary. This was a long and convoluted process. Thanks to a free character app I found for my phone, a look-up process that used to take 10 minutes now takes seconds.

But generally, my school does not rely heavily on technology. Primarily, the student interacts with the teacher, textbook, and blackboard. We students often lament about certain practical matters: the sheer weight and cost of textbooks for five subjects, and difficulties communicating information about events within the school to the student body and to parents, and arranging class schedules. My school's personal, ‘hand-made’ approach can cause frustration on a practical, organizational level, but it is very effective in providing me with a quality education.

I have learned about technology in an educational context from my volunteer experience at *Best We Can Be*. Putting together a presentation comparing Western and Chinese government philosophies is probably the most entirely computer-based project I have ever done. Working for *Best We Can Be* and working for my schoolteachers has produced a sort of cognitive dissonance in my perspective that I hadn't realized I had until I started thinking about this topic. At my school, the focus on computers is minimal. Until recently, I thought attempts to use technology in school settings were gimmicky and misdirected. But, after being involved with *Best We Can Be*, I found myself writing a PowerPoint presentation and doing a large part of my research on the Internet. The dissonance lies in the fact that very often, technology in the classrooms *has* been inefficient or faddish. In my previous encounters with technology in the classroom, the implementation was not thoroughly thought out. For example, my 6<sup>th</sup> grade Spanish class (at a different school) acquired copies of Rosetta Stone, a language learning software, for the school laptops. The class devolved into everyone loading

Rosetta Stone onto their laptops, and doing the same basic vocabulary drills every class. We relied upon our fluent Spanish-speaking teacher to help us figure out how to use the computer program rather than taking advantage of her actual skill in the subject. The difference with my PowerPoint for *Best We Can Be* is that the goal is the content. The PowerPoint presentation *happens to be the way to convey that content most effectively to many people.*

I don't have much specialized knowledge about education technology. All I have is experience as a student in schools where educators are still trying to figure out the role it should play. The National Educational Technology Plan (NETP) expresses hope for fundamental change in our education system. I don't know what the fundamental change is going to be. I do think that, if it happens, it will be much deeper than the implementation of one technology or another. I think it will be more of a change in mindset than a change in tools. But the tools themselves also need to reflect this change in mindset. They definitely should become more usable, but also be less in the way."

- **Key Lessons:** 1) Technology should be viewed from the perspective of how it can be used as a learning tool. It should not be the goal in and of itself, 2) Technology can hinder learning if it is used inappropriately, 3) Transformation of the educational system will require a significant change in mindset at many schools.

#### G. Maigh Attre, 11<sup>th</sup> Grader at AITE High School

"I may live in Connecticut, but I compete on the global stage. One of the commonalities I share with my international competitors is technology -- especially the Internet. How I utilize and customize the resources I have available is what gives me the advantage. My school plays a large role in my success. I am put in direct contact with technology everyday through school infrastructure such as take-home laptops, vast suites of software, and smart boards. My school provides many other resources on top of equipment -- such as the school Intranet for secure virtual classroom interaction, a comprehensive technology education, and extended courses and study selections from a variety of sources. One specific program is *Best We Can Be*, an exclusively online STEM program that connects me with professionals in the field. It allows me to learn more about STEM disciplines and helps me explore career options. All these resources are supported by my teachers who safely guide me through the complex world of technology. However, it is up to me to take advantage of these assets. Technology helps make education more public *and* more individualized. I have more access to knowledge than any other previous generation, and I also have more choice. For me, the choice is STEM."

- **Key Lessons:** 1) Technology proficiency confers a competitive edge to students competing on a global stage, 2) Despite the advantages of technology, it is up to the student to make the most of them, 3) Supportive teachers and a safe learning environment help students achieve their potential using and learning technology.

## VI. CONCLUSION

Formidable challenges lie ahead for the nation as it seeks to overhaul the educational system and make the changes needed to prepare students for the world that awaits them. Even the most daunting journey must begin with the first step. The NETP has put forth a map to guide the journey. The map contains these five (5) elements:

1. Engage and empower student learning;
2. Measure and assess what matters;
3. Prepare and connect educators and students with the technology and resources needed to enable effective teaching to all students;
4. Enable access to infrastructure for learning when and where it is needed;
5. Redesign and transform educational levels, processes, and structures to optimize learning outcomes and improve systemic productivity and efficiency.

Many students are occupied in non-productive technology-based activities that consume the better half of each day. It is a challenge to channel student behaviors towards more meaningful pursuits. Programs like *Best We Can Be* can give students alternatives to wasting time in activities that do little to develop useful skills.

The case study presented in this paper provides evidence that progress can and is being made towards realizing NETP goals. AITE's success in graduating college and workforce ready students can be attributed in large part to its adoption of best practices. It provides a technology-rich immersion experience for its students, and encourages hands-on, experiential learning. Perhaps more importantly, the school has developed a culture and climate that fosters innovation beyond the classroom. AITE administrators and teachers are willing to try new things. AITE is very successful in engaging community and outside resources that extend the repertoire of learning experiences it can offer its students. This approach is reminiscent of supply chain management, which is used to optimize delivery of products and services in other industries. AITE demonstrates advantages of a technology-rich learning environment, and the accessibility of technology and Internet-based resources available for free or low cost to any school.

The NETP is a call to action to schools, states, and the federal government to set in motion changes needed to achieve systemic productivity and efficiency improvements in our country's educational system. The inertia of deeply embedded educational structures, culture and centuries old practices must be overcome. In the 21<sup>st</sup> century, schools must embrace a mindset that seeks to weed out practices that hinder student achievement while cultivating those that promote it. Thus, a final lesson learned is that the willingness to change and to put forth the effort to change is the ultimate impetus for transformation.

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