"Educating 21st Century Students: A Close-Up Look at a Successful Career and Technical Center"

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Abstract

Through this paper we try to convey the necessity to provide the workforce with a labor force that is academically and technologically ready to meet the 21st century global demands. We feel this is accomplished by providing the students at MBIT with industry-standard equipment, academic and technology curricula that address what students need to know and be able to do in a competitive national and international arena, and with the employability skills that will foster responsible citizenship, collaboration, creative, and critical thinking. We introduce ways of achieving this through Challenge Based Learning (CBL), effective use of cutting-edge technology, learning through exploration and experiential strategies, differentiated instruction, and the necessity to learn each student's learning style. One of the key attributes and qualities of ensuring success is the faculty's willingness to embrace change and in doing so, fostering what works and discarding what does not. We understand the value of curriculum mapping, aligning academic eligible content with trade area standards and objectives, and in creating robust learning guides filled with technology and academic standards. We broach the importance of front-line management to instill in the faculty the value in establishing trust in their leadership, exercising their right to self-govern, to collaborate in the school's shared vision, and to exercise their freedom to think and contribute to the overall good of the school, the district, and the community. It is through these practices that Middle Bucks Institute of Technology is able to provide the 21st century skills to its students that prepare them for the rigors of higher education and employment.

"Educating 21st Century Students: A Close-Up Look at a Successful Career and Technical Center"

Kathryn Strouse, Director

Every student will need additional preparation that focuses on 21st Century Skills to vie in a global economy. Students entering the workforce of tomorrow will be facing challenges much different than workers of the past. Globalization and new and emerging technologies are only two of the factors presenting challenges for new workforce candidates. These challenges will impact new workers whether they enter the workforce directly after high school or after earning a two or four year degree. Career and Technical Education (CTE) programs are poised to contribute to preparing students with 21st Century Skills via rigorous academics, technical knowledge, and professional development. A new study conducted by the National Research Center for Career and Technical Education (NRCCTE) examined CTE in Pennsylvania (National Research Center for Career and Technical Education, 2010). The study analyzed data on over 21,500 high school graduates to compare concentrators' performance on the National Occupational Competency Testing Institute (NOCTI) workplace readiness with their postsecondary education and early work experiences. The results of the study indicated positive correlation between graduates' technical skill levels as measured by technical skill assessment. Skill levels were positively associated with graduates' grade point average (GPA) and the number of advanced math and science courses passed. Stone (2010) says "this study is an important contribution to our understanding of how CTE adds value to the high school experience of young people" (p. 1).

Career and Technical Education programs contribute significantly to 21st Century readiness by promoting academic skills, employability and technical knowledge, and a foundation in lifelong learning. These principals are the basis of the educational program at Middle Bucks Institute of Technology where the technical programs and pedagogy are integrated to assure students are college or career ready. The core technical curriculum is aligned with Reading, Math and Science academic standards, which reinforce the connection that academic, employability, and technical skills, go hand in hand. Students participate in challenge-based learning activities that promote the 4 C's; critical thinking and problem solving, communication, collaboration, creativity, and innovation.

> Career and Technical educators understand that students deepen their learning by connecting new knowledge to what they already know, by practicing their skills, by putting their knowledge and skills to meaningful use, by working in cooperative teams, by observing and collaborating with experts, and by getting personalized feedback and direction. (Route 21, 2007, para.7).

The ability to make connections between new and already acquired knowledge is an essential component of career and technical education.

The process of preparing for 21st century education at Middle Bucks Institute of Technology began with integrating academic standards with technical programs almost ten years ago. At that time, the school year kicked off with professional development that focused on PSSA Math and Reading eligible content standards and how to integrate them into the CTE programs. Teachers were taught how to develop curriculum maps for each year of their program that aligned technical competencies with the academic standards. The administrators

and teachers worked together to identify the eligible content academic skills that were taught in each technical program through the development of curriculum maps. So as to not overwhelm the teachers with this task, curriculum maps were developed for one year only. Once the curriculum maps were complete, the teachers began to revise their duty and task lists, weekly lesson plans, and learning guides to include academic standards. The curriculum mapping process took three years to complete but it resulted in greater teacher competency in both technical and academic skills in the classroom.

Innovative learning skills such a critical thinking, creativity, communication, and collaboration are also an intrinsic part of the education program. A report by the Executive Office of the President: Council of Economic Advisers titled *Preparing the Workers of Today for the Jobs of Tomorrow (2009)* says, "Employers value workers who can think critically and solve problems. Many highly paid occupations require workers with good analytic and interactive skills" (p. 2).

The access to state of the art technology is another component for ensuring that students possess 21st Century Skills. The Pennsylvania Department of Education supports this by sponsoring equipment grants to provide funding to purchase equipment that meets industry standards and is used to offer hands on training. The grant supplied 50 percent of the cost to purchase equipment such as a 3-D Printer for the Engineering and Architecture Design programs, a geared head lathe and optical comparator for the Machining Technology program, a plasma cutter and radial band saw for the Welding program and solar and wind trainer for the Electrical program. In addition, the grant also funded a turnkey production switcher for the Multimedia program. The portable live production switcher is designed to easily mix video and

audio while off-site so that the students can produce high quality film productions on location. New digital x-ray equipment not only provides students with the opportunity to stay abreast with current technology advances but will enable them to prepare to earn their x-ray certification upon completion of the Dental Assisting program. All of the equipment purchases were recommended by the Occupational Advisory Committees (OACs) for each program. The OACs are comprised of industry representatives who meet with the program teacher a minimum of twice a year to validate that the curriculum being taught and the equipment in the labs support the industry. There are fifteen to twenty members in each committee with a committee for each technical program. With support from the OAC along with our Executive Council and the Pennsylvania Department of Education, the school was able to equip the classrooms and labs with technology, equipment and tools that foster well-trained and highly skilled workers.

Another component that provides students with 21st Century Skills is professional growth. "Professional and industry organizations in every CTE cluster support educators with professional development and professional learning communities targeted for their career clusters and pathways, making them highly connected to educators' everyday pedagogical practices" (Route 21, 2007,). Career and Technical students participate in student organizations that give them recognition and help them build confidence and skills. These organizations include Skills USA, National Technical Honor Society (NTHS), Health Occupations Students of America (HOSA), Engineering Technical Society, Pennsylvania Builders Association, Future Farmers of America (FFA) and many more. The membership in

these student organizations; "engage students in leadership and skill development, service learning, competitions, conferences and travel opportunities" (Route 21, 2007, p. 21).

Career and Technical schools are strong advocates for 21st Century Skills readiness in a digital age of learning. Developing rigorous academic skills, along with innovation, and technology skills will help the students keep up with the global economy. The ability to acquire these skills will essentially determine if a student is prepared to learn, live, and work in a global society. The key as educators is to ensure that every student possess the knowledge and skills necessary to perform successfully in the 21st Century.

Thomas Viviano, Ph.D., Assistant Director

Kouzes and Posner (2007) list the top four characteristics of admired leaders as: honest, forward looking, inspiring, and competent (p.30, Table 2.1). These are the values and personal traits that have been selected from over seventy-five thousand people from business and industry all over the world. This is found to be true of educational leadership as well. In today's Career and Technical Education (CTE), teachers, staff, parents, students, and all other stakeholders expect these traits from their CTE leaders. Trust is earned through the development of the character and leadership skills of supervisors and their ability to be honest, regardless of consequences, to always be looking at current initiatives and trends in education, to coach, inspire, and instill enthusiasm, and of course demonstrate proficiency and skill in leadership.

CTE principals and supervisors of today should be leaders more than managers. A manager controls people and initiatives but a leader inspires and encourages a collaborative approach. A leader empowers teachers and fosters self-governance (Blase & Blase, 2001). All should share a common vision for their school and all should feel comfortable, free, and safe

enough to question leadership and management in an appropriate manner. Teachers should be given freedom to think and leaders should recognize the value in this. Teachers should be able to express confidence in independent thought, have opportunities to implement their ideas, and leaders should encourage the sharing, discussion, and debate of all of their input (Blase & Blase, 2001).

The face of Career and Technical Education is changing and it is important that our teachers maintain pace with these changes. "The most successful schools in the country have begun to enhance student learning by replacing teacher-centered didactic instruction with more activity-based, project-oriented methods" (National Board for Professional Teaching Standards website, 2011).

It is the responsibility of front line leadership to mentor, evaluate, coach, and professionally-develop all teachers so that they can foster all that a teacher should know and be able to do in the 21st century CTE. What should a CTE leader expect an educator to know and be able to do? According to the National Board of Professional Teaching Standards (NBPTS), there are 13 standards of accomplished practices for CTE teachers. The teachers are committed to advancing the learning and well-being of all of their students. They do this by knowing their students and their learning styles. Our teachers command a core body of knowledge about their profession and about pedagogy and they draw upon this knowledge to design instruction, facilitate student learning, and assess student progress. The supervisors encourage teachers at MBIT to effectively manage their classroom and laboratory environments in a way that fosters democratic values, to take risks, to love learning, and to embrace diversity. MBIT's teachers have the ability to infuse and integrate academics into their CTE curriculum as is evidenced in our high percentage of students who receive proficient or better on the Pennsylvania Systems of

State Assessments (PSSAs) and the National Occupational Competency Testing Institute (NOCTI) assessment. MBIT's teachers are prompted to use a variety of assessment strategies to meet the needs of all of our students. MBIT's teachers promote citizenship and employability skills by using standardized instruction in personal and professional behavioral-designed curriculum and students are graded for such. MBIT's accomplished CTE teachers develop in their students self-awareness, character, leadership, and civic values and ethics, along with teaching socially acceptable behavior. The teachers are often found reflecting on their teaching, either with colleagues or with administration, and are always looking to analyze and evaluate their teaching practice. All of MBIT's teachers are required to establish collaborative partnerships with local business and industry as well as post-secondary institutions to enrich learning opportunities for our students and to ease transition into the workplace and college. The teachers are encouraged to contribute at least locally to the educational process by staying current with new teaching initiatives for advancement in their field and in the field of pedagogy. It is also necessary for the teachers to sustain family contact to achieve common goals for their students (National Board for Professional Teaching Standards website, 2011).

It is crucial for supervisors to be aware of the trends in business and industry currently and for the future. In 2009, the Executive Office of the President's Council of Economic Advisors constructed a report that examined the workforce for the next 10 years (The White House: Preparing the workforce of today for the jobs of tomorrow, n.d.). There were seven major findings that would be of concern to CTE supervisors and educational leaders in general.

- Healthcare is forecasted to remain a large source of job growth in the labor market

- The decade-long decline in the share of workers that are employed in manufacturing is expected to moderate
- The construction industry is projected to eventually recover and add jobs in the coming decade
- Employers value workers who can think critically and solve problems
- Occupations that employ large shares of workers with post secondary education and training are growing faster than others
- The U.S. post-high school education and training system provides valuable skills to those who complete programs in high-growth fields
- The need is crucial for more effective systems in: a solid early childhood, elementary, and secondary education system that ensures students have strong basic skills; institutions and programs that have goals that are aligned and curricula that are cumulative; close collaboration between training providers and employers to ensure that curricula are aligned with workforce needs; flexible scheduling; appropriate curricula, and financial aid designed to meet the needs of students; incentives for institutions and programs to continually improve and innovate; and accountability for results (The White House: Preparing the workforce of today for the jobs of tomorrow, n.d., pp. i-ii).

Becoming familiar with the aforementioned information will help guide program and curriculum decisions in CTE for the next 10 years Career and Technical Education (CTE) is on track to help fill voids in local industries. Most Health Occupations and Health Sciences programs enrollments are maximized. Strong Welding, Machinist, and Engineering curricula that align

with the forthcoming demands of the manufacturing industry are essential. Building Maintenance programs have sturdy enrollment and curriculum as well all other areas of construction. CTE teachers teach our students to be analytical and problem solvers. Approximately 80 percent of CTE students are going on to some post secondary experience and our teachers are forerunners in academic integration and stress the importance of numeracy and literacy skills in today's workforce.

> Among all the riches a nation may possess, its people—its human resources, its human capital—is the most important. The value of this human resource depends not on size, however, but on the occupational and intellectual skills its members possess. At least in this regard, history is clear: A large "unskilled" population is a detriment to economic national growth and to a high standard of living. (Gray & Herr, 1998, p. 41)

It is CTE's mission to provide a rigorous and integrated CTE curriculum in meeting future demands that will be bestowed upon us in light of the baby boomers upcoming eminent retirement. Along with a massive retirement from the baby boomers, 53 percent of workers in the manufacturing industry are graying. The graying population represents those workers between the ages of 42 and 64 (Readers Digest, 2010, p. 161).

John Fala, Public Safety Teacher

Successful Student-Tailored Learning: Embracing Change

Despite adverse economic times and mounting student needs, Middle Bucks Institute of Technology (MBIT) continues to produce results that meet or exceed state requirements, address the demands of the local workforce and prepare students for the future. In addition to its focus

on top-notch education and training, MBIT integrates a "make-it-happen" approach to education. The primary goal at MBIT is preparing students for 21st century employment and the post-secondary demands placed on them. Achieving this goal requires incorporating experiential, contextual and constructive learning theories into the dynamic classroom setting. Although the student-centered goals and the overall educational system goals remain steady, the mechanisms to achieve these goals change and evolve continuously.

One of the major keys to success is identifying new ideas, technologies and teaching methodologies that dovetail with the current and future needs of the student—and not only embracing these new approaches, but following through with actual implementation. Despite extensive discussions, meetings, and in-services, efforts to propel change often become stalled in the planning phase. Transitioning from the planning stage to the actual implementation stage requires the flexibility to adapt, the courage to persist, the willingness to venture outside the comfort zone, as well as the support of key departments and committees within the school.

The teachers and administrators at MBIT have a shared vision for excellence and are committed to taking the steps necessary to realize this vision. Another successfully adapted school-wide philosophy at MBIT is the recognition that every student has an individual style of learning. Meeting the needs of the 21st century learners involves tailoring the teaching approach to the individual student's learning style, rather than employing an approach that is familiar or comfortable. It also involves effective integration of available visual, auditory, and kinesthetic resources and technologies into classroom discussions and work-simulated projects.

At MBIT, the director surveys and analyzes local job market trends and integrates innovative career programs that respond to these trends. The front-line supervisors seek out and apply for grants that help supply the labs with state-of-the-art equipment. The professional

development team explores, plans and facilitates new initiatives and teaching strategies to share with the teachers at in-services. Furthermore, the teachers at MBIT are resolved to welcoming change, stepping outside their comfort zone, and overcoming challenges—and they strive to maintain this focus every day, in every class, with every student. The administrative team also plays an essential role in encouraging teachers to recommend and foster new ideas, discussing integration strategies openly and troubleshooting challenges that may arise. Even ideas that may not work as planned are perceived by the administrative team, as well as others at MBIT, as an opportunity to learn, improve and try again.

In Career/Technical Education (CTE), the Occupational Advisory Committees (OAC) is instrumental in fostering a student-tailored approach to teaching and preparing students for future career opportunities. Comprised of high-standing local professionals representative of key technical fields, the OAC yields substantial rewards for students, teachers and the entire school staff. By equipping teachers with an awareness and understanding of the needs of future employers, the OAC helps teachers stay ahead of the curriculum and integrate changes accordingly. The importance of formulating a current, forward-thinking OAC cannot be overstated; nor can the leadership roles of the OAC members be underestimated.

It is vital for CTE instructors to identify and build a core network of professionals in their given field and work closely with them as integral members of their programs. Guest lectures, job-site visits, work-based projects, field training, and employment opportunities are some of the many ways an OAC keeps students and instructors interested in, and invested in, the educational experience. Aside from their powerful impact as mentors to the students, members of an OAC committee are a tremendous resource for teachers, in some cases, becoming long-standing professional and/or personal acquaintances.

Of course, high-quality education demands developing curriculum maps, incorporating PSSA Math, Reading, and Science anchors into Pennsylvania Department of Education-approved curriculum and staying current on technical knowledge. It also involves going above and beyond, with a steadfast willingness to remain open minded and persistent toward incorporating the actions to meet the changing students' needs. Furthermore, assessing the individual student's needs and doing the utmost to motivate and inspire each student is the key to making a difference. After all, inspiration is an essential ingredient for integrating novel ideas and technologies. Igniting the student's desire to learn and excel sets the stage for an enjoyable and rewarding educational continuum. The more students learn and excel, the more invested and confident they become in the learning experience, and the hungrier they become to build on their existing knowledge base.

One of the adages often shared with teachers and students is that "100% of the assignments not started ever get finished." Success lies in the willingness to seek, identify and utilize all available resources and work within a good model. Once the model is in place, the key is to meet the challenges and then implement and sustain the strategies and goals outlined in the model, or the only thing you are left with is a good model. You can evaluate the model, you can wait to see what others do about it, you can have a meeting to discuss it, or you can talk about it, but are you willing to do it? Making it happen involves the commitment, necessary action steps and ongoing follow-up and follow-through of all key departments within the school. Specific roles and action steps must be communicated clearly to those responsible, and the appropriate systems, processes, and advisory committees must be in place to support teachers and others to achieve meeting the needs of the individual student.

The journey can be challenging, the process may induce stress, and at times, even fear. It is essential to go beyond the gearing-up phase and put even more effort and resources into the implementation phase than the planning phase. Nevertheless, embracing student-tailored ideas and technologies and ultimately integrating them is not only rewarding, but it also achieves proven, concrete results toward helping students pave their 21st century career path.

Christopher Tully, Multimedia Teacher

Demonstrating the planning, preparation, leadership and willingness necessary to ready our students for their future, it is necessary to provide a learning environment that provokes students to think beyond the classroom walls. Students must use the ubiquitous access to technology to curate their own learning and use the classroom experiences and my instruction to facilitate their mastery of the content. To infuse this type of learning environment, it is necessary to integrate the NETS•S (the national educational technology standards) into the curriculum and allow students to effectively learn to be successful in the digital world.

As a CTE instructor, one should implement the latest technology in the classroom. Most recently, MBIT has purchased iPad 2s for deployment in the classroom. For this reason, we are often asked about the effective use of technology and how others can use technology to better teach their students 21st century skills. However, the core standards of 21st century skills do not directly reflect the use of technology. The standards relate more to the development of skills to assist the students in being independent and learning how to learn with so much information at their fingertips. The technology is just the conduit used to get them there.

The technology standards promote classroom transformation by ensuring that digital-age students are empowered to learn, live, and work successfully today and tomorrow (International

Society for Technology in Education, 2010). The NETS•S standards address the following criteria: creativity and innovation, communication and collaboration, research, critical thinking, problem solving, decision-making, concepts and technology operations.

Through the use of a blended learning environment, teachers have been able to cultivate a classroom environment that meets these standards, as well as leverages the access students have to the technology. Students complete a highly rigorous technical sequence of courses over a three year period related specifically to the field of multimedia. Students are provided with a balance of classroom theory instruction/discussion and online learning activities that enhance their technical skills. In addition, the students meet the requirements of their core academic standards in reading, writing, mathematics, science and technology as they are integrated and applied in ways that are meaningful to the students and relevant to their career paths.

Through the use of effective classroom management techniques and the effective use of technology, students find purpose in their learning. They see the benefits of acquiring new information because it becomes personal, since what they are leaning relates to their interests, hobbies, and future career goals. The students in the Multimedia Technology Program at MBIT understand the importance of not only learning the material, but mastering it.

The innovation in this style of teaching requires the understanding of several teaching methods and the ability to know when to implement, restructure, and refocus the instruction. Within the environment in the classroom, many of the key components of blended, curated, competency-based, project-based and most recently, challenge based learning, are implemented. In competency-based learning, students are taught using differentiated instruction. Differentiated instruction is an instructional concept that maximizes learning for ALL students—regardless of skill level or background. (Differentiated Instruction, 2011). It permits students with various

learning styles and academic abilities to work to their strengths and use the most effective strategies to learn. This is implemented in my classroom by using a concept called universal design.

Universal design is an approach to designing environments and products so they can be used by the widest range of users without adaptation (The Access Center: Improving Outcomes for all students k-8, 2004). In education, "curriculum needs to be flexible and presented in multiple formats in order for it to be accessible and appropriate for students with diverse backgrounds, learning styles and abilities" (The Access Center, 2004). In the Multimedia Technology class at MBIT, universal design is applied to ensure that every student is provided the same accommodations as those required in the Individual Education Plans of others. "At its most basic level, universal design for education seeks to ensure that all students have the option of learning from instructional materials and practices that suit their abilities and learning styles in settings and facilities that can accommodate their various needs" (The Access Center, 2004).

Because every student is provided with opportunities to succeed, they are held to high standards and expectations. It is explained to students the importance of coming to school, having a good work ethic, managing their time, adapting to the environment and working productively both in a group as well as independently. As students develop these skills, they become socially aware of other students in the class, and without prompting or direction, assist or help motivate them.

As a result, the students are exceeding on state and national standardized career and technical testing. As a Career and Technical Center, students are required to take a national competency exam. The students in the Multimedia program are required to take the National Occupation Competency Testing Institute (NOCTI) Audio/Visual Communications Assessment.

Over the past eight years, all students have scored proficient and all but three have scored advanced. The average score in this program is 27.2 percent above the national average and 19.2 percent above the state average (See figures 1 and 2).

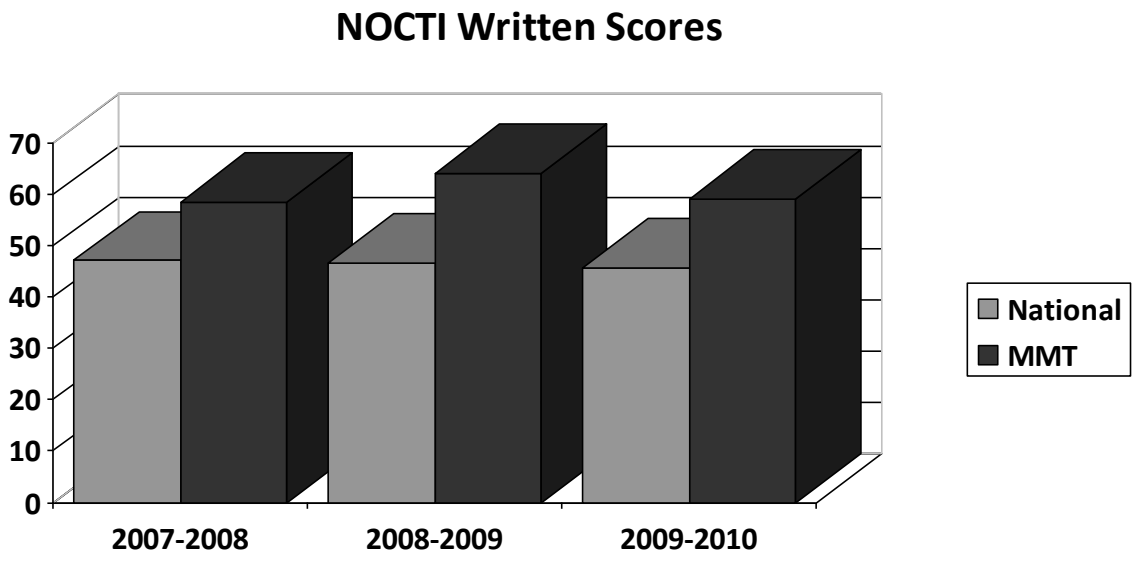

Figure 1. MMT = Multimedia Program. This figure compares the local NOCTI results for the written portion of the NOCTI exam with the results of those high school seniors across the nation that took the exam same exam

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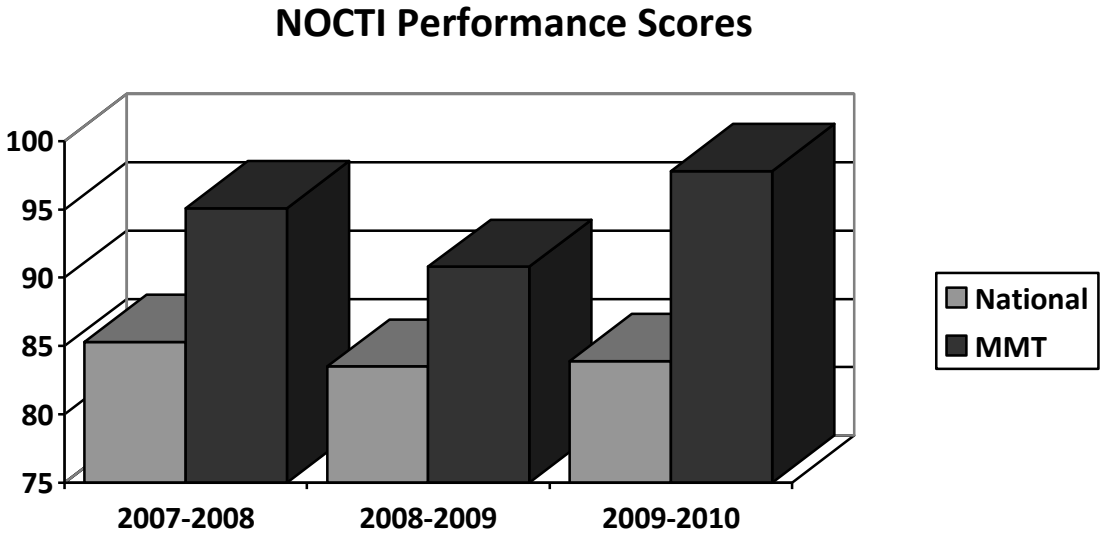

Figure 2. MMT = Multimedia Program. This figure compares the local NOCTI results for the performance portion of the NOCTI exam with the results of those high school seniors across the nation that took the exam same exam

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With the access the students have to technology, the opportunities to acquire new information are endless. The students manage themselves and their own learning experiences by implementing wikis, blogs, forums and social networks. A real world environment should be created in classrooms where students play an active role in their learning and are provided with the means to access additional information at home. This is completed by implementing challenge based learning.

> Challenge Based Learning is an engaging multidisciplinary approach to teaching and learning that encourages students to leverage the technology they use in their daily lives to solve real-world problems. Challenge Based Learning is collaborative and hands-on, asking students to work with other students, their teachers, and experts in their communities and around the world to develop

> deeper knowledge of the subjects students are studying, accept and solve challenges, take action, share their experience, and enter into a global discussion about important issues. (Apple Inc., 2009).

By combining the strategies of universal access, competency-based and challenge based education in a differentiated learning environment, students should be assessed based on their personal strengths and weaknesses, and not by comparing one to another. This is done by allowing the students to find their own personal outcome to learning by expressing themselves the way they know best.

We believe the main characteristic that sets these students apart from their peers is that they take responsibility for their learning. A classroom environment should be developed where students are held accountable for their learning. Because of the classroom structure, the students hold themselves accountable for their work, becoming self-directed and socially-responsible.

Although 21st century learning can be defined as effective teaching with technology, it would be remiss not to mention the profound impact it has on the learning environment when implemented correctly. As mentioned above, the multimedia students are using blogs, forums, and social media outside the classroom to curate their learning. Their theories are then discussed in class with others as they balance what they have learned individually with the information they learn from their peers and their teacher. This blended style engages the students in classroom discussions and eliminates the traditional classroom lectures.

This classroom environment and implementation of these strategies are constantly evolving. The success that has been experienced as a classroom teacher is directly related to collaboration with the students in the learning process. A teacher learns as much from them as they do from the teacher. The more one includes them in the teaching and dissemination of

knowledge, the more we, as a team, foster creativity and innovation, communication and collaboration, research, critical thinking, problem solving, decision-making, concepts and technology operations.

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