A Perspective of the Current Needs of Technology in the Public School System
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Vital Areas of Technology Preparation

The most vital areas of preparation that need to be addressed by public-school budgets and curriculum and instruction is two-fold. First, there needs to be a focus on procuring the most up to date technology in order to prepare students for the future and the workforce. Second, students need to be instructed beginning in kindergarten, like their suburban peers, on how to operate a computer and type using a keyboard. Banister and Fischer (2010) write:

> In the area of technology, school district personnel must make choices concerning the purchase of hardware and software, what type of networking systems to provide, what type of access to the Internet will teachers and students have, and, based on this study's findings, what ongoing professional development and technology support will be provided to the instructional professionals at the point of instructional use (p. 8).

After years of observation and instruction, it has become apparent that many urban students lack a working knowledge of basic computer skills. Students must be instructed in typing and keyboarding skills and the basic use of word processing

and spreadsheets. When students advance to a level where they are conducting research, they must learn to navigate research on the internet. It is important that they learn the most effective ways to search for the answers they seek and distinguish between reliable and unreliable internet sources. In their research, Hess and Leal (2001) found that:

> The role of technology in schools and classrooms is rapidly becoming one of the most pressing and widely discussed issues in contemporary education policy [...] Computer illiteracy has been dubbed the new illiteracy and this has fostered a strong desire to equip schools with the equipment and faculty necessary to produce technologically proficient students [...] On a less promising note, concerns about a "digital divide" between black and white and rich and poor have become a staple of the discussions about educational technology. Some researchers express concerns that the cost and complexity of the new technologies may accentuate inequities that already beset American education. [...] There is particular concern about the equity implications of educational technology in urban areas, where minorities and low-income populations already face serious educational disadvantages as they seek to enter the new economy (pp. 765-766).

The necessary instruction cannot take place without the proper equipment for both the teacher and the students. It is imperative that students have these skills so that they can be successful in the future.

The IT equipment that should be supplied in support of the CIT curriculum should be:

- A SmartBoard and projector
- Laptops or IPads with up to date technology
- A charging station that is functional
- An internet infrastructure that is reliable and can handle the amount of daily use it will experience
- A program like Google Docs that allows students and teachers to communicate in real time while writing papers and completing projects

Programs like Google Docs have been viewed as an extremely important piece of software in a student's CIT curriculum. According to Buczynski and Mathews (2016):

> A mobile learning environment is about access to content, peers, experts, portfolio content, credible resources no matter the time of day or location. Mobile learning technology encompasses cell phones, cameras, music players, tablets, iPods, iPads, and laptop or any device, which is used in conjunction with wireless 4G/3G connectivity. Cloud technology is the enabler of "smart" mobility. With access to the cloud, all files are housed on the Internet rather than being stored either on classroom computers or individual hard drives. This allows accessibility to project materials and all data sources for revision and collaboration without regard to time or place. As a matter of fact, this is one of the most powerful aspects of mobile learning technology. It unlocks the school door and opens the learning experience to a wider domain. With asynchronous access to content comes potential for self-- actuation, spontaneous and/or recursive learning (p. 37).

In order for CIT in Public Schools to work successfully, all components must come together and work as one. Missing pieces of technology will cause the entire system to crumble. As a result, the students that are served will be unprepared for the 21st-century workforce.

Recommended Methods of Technology Instruction

Computer illiteracy is a major problem facing public schools. Hess and Leal (2001) have written that "Computer illiteracy has been dubbed the new illiteracy and this has fostered a strong desire to equip schools with the equipment and faculty necessary to produce technologically proficient students" (pp. 765-766). In order to combat computer illiteracy, students must learn typing and keyboarding, word processing and spreadsheets, and internet research skills.

Typing and keyboarding skills must be taught from a young age. Carver and Todd (2016) found that:

> In addition to answering the research questions, the teachers' journals provided some suggestions that might make the use of the blogging software even more effective. Teachers indicated that when using the online tool, it was more effective if students had strong keyboarding skills. Students who had less well-developed typing skills, found the software to be difficult to use (p. 126).

Students that do not possess a strong typing skill foundation start at a disadvantage. As the study above shows, the students who had a difficult time typing found the software that they were using to be more difficult than peers who had strong typing

skills. It is imperative that typing instruction be one of the foundational blocks of CIT instruction.

Before a student can read, multiple software programs exist to aid in letter recognition and pre-reading letter blends. Two such programs are ABC Mouse and Lexia, however many exist and could be implemented. As students develop reading and writing competency, programs such as Typesy.com and TypingMaster will help them develop proficiency with the keyboard. After an introduction, these programs can become self-directed centers during literacy blocks or center time.

Word processing and spreadsheets are the next step in developing computer literacy. The three major suites, Microsoft Office, iWorks, and Google Suite, share many of the same functions and work the same way. As long as there is a consistent program used students will gain the required skills. Students must receive direct instruction in the use of these programs. The instruction must be delivered by a trained teacher. When some proficiency is displayed, the skills should be integrated into classroom instruction. Most suites allow for collaboration and can be used to facilitate group work and teacher/student conferencing.

Part of developing critical thinking and problem-solving skills is learning to conduct research and authenticate sources. Students must receive direct instruction in navigating search engines, particularly search modifiers to help them find the

information for which they are looking. Students must also be taught how to authenticate the information they discover. This skill must be taught by knowledgeable teachers who are familiar with both technology and research. This instruction should take the form of direct instruction followed by interactive practice such as web quests.

In addition to these important instructional practices, students should also be regularly exposed to technology during their daily instruction. Schacter (1999) investigated the impact of technology on student achievement. He found:

> These studies show that in over 700 empirical research studies, in the study of the entire state of West Virginia, in a national sample of fourth- and eighth-grade students, and in an analysis of newer educational technologies that students with access to (a) computer assisted instruction, or (b) integrated learning systems technology, or (c) simulations and software that teaches higher order thinking, or (d) collaborative networked technologies, or (e) design and programming technologies, show positive gains in achievement on researcher constructed tests, standardized tests, and national tests (p. 9).

Exposure to technology in many forms helps accustom students to its many varied uses, beyond entertainment.

Computer programs and instruction are vital components to CIT instruction. It is important that students receive access to these programs and instruction at a young age. By doing so, educators can help to ensure that students will be prepared for a successful future.

Beneficial Technological Instructional Activities and Events

Utilizing technology in the classroom for everyday learning is a vital tool for helping students prepare for the future. Thomas, Adams, Meghani, and Smith's (2002) study found:

> Teachers said they had observed improvements in students' research skills, ability to use and feel comfortable in using technology, and subject-matter learning as a result of using the Internet. Students were better at locating information for research papers and projects. Their use of the Internet had enabled them to acquire technology skills and to feel comfortable in using the Internet and other computer-related technology. The Internet had strengthened student learning of course content as well, by allowing students to review more, and thus solidify their understanding and retain what they

> learned. Teachers also observed that the Internet sparked students' creativity (p. 218).

The more students are exposed to technology, the more they grow in both academics and personal capacities.

In their work, *A Retrospective on Twenty Years of Education Technology Policy*, Culp, Honey, and Mandinach (2005) take an intensive look back at the last twenty years of education technology policy. They write:

> References also are frequently made to economic and social shifts that have made technology skills critical to the future employment of today's students, and more broadly, to the importance of technology innovation to maintaining the economic and political dominance of the United States globally. The report on Learning for the 21st Century makes this case strongly, reviewing the impact of technology on the job market, the flow of information and resources in a global marketplace, and the impact of digital technologies on daily life. Perhaps most importantly, both this report and others that have emphasized the global context of the call for all forms of educational improvement explain that the ability to expect and adapt to change is fundamental to success in the job market [...] This shift reflects a

> growing recognition among both commercial and academic content developers that effective software and online learning resources must be an integral part of the curriculum. Despite the rapid expansion and diversification of the educational software market and the proliferation of educational software, many reports stressed the need for continued innovation and improvement in the quality of software and Web-based resources (p. 283-292).

As pointed out in the research above, daily computer classes are necessary for students to be successful in the 21st-century workforce.

Daily instructional events should include a dedicated computer course. In this course, students would receive direct instruction in typing, keyboarding, word processing, and spreadsheets. The instruction would be tailored to the student's needs and grade level. Lower grade students would work on keyboarding while upper-grade students would work on creating charts from spreadsheet data. These skills can carry over into the students' core courses. Teachers can implement lessons that involve students utilizing the skills from the computer course to complete assignments in their subject area. This practice would allow students to see the importance of technology across the curriculum. Additionally, students would be practicing their newly learned skills throughout the day in various

classes. As a result, they would learn the skills in a more efficient and timely manner.

Science class, especially in urban districts, lends itself to the use of technology. Computer simulations can replace or augment costly experiments. A biology class could start with a game of Kahoots!, an online quiz game which utilizes the students' own devices or laptop computers, reviewing the necessary skills and facts for the day's activity. After the review, students would transition to using a dissection simulation such as Froguts or McGraw Hill virtual dissections. As students complete the simulation, they complete worksheets in Google Forms or record findings in Google Sheets. The closure would take the form of a peer review of findings.

A daily English course would start with students logging into computers and accessing Google Classroom. They would then complete an initiation using Google Docs. This initiation could be a journal entry, quick grammar edit, or stream of consciousness quick write. As students are working, the teacher can add comments directly to their Google Doc in real time. The student and teacher can communicate through this tool without disrupting the flow of the class. The class would then transition to full class direct instruction. The teacher should utilize multimedia presentation methods that include video and audio segments. Additionally, the teacher would use the Smart Board to allow students to work with interactive

touchscreen features for the lesson. From there, the class would transition to collaborative group work using the collaborative features in Google Docs. The teacher would be able to monitor group member contributions by viewing the version history of the document. The teacher could also communicate with the group in real time utilizing the chat feature. The class would end with a discussion of the group work and an exit ticket to assess student learning.

Vital Teaching Competencies Needed for Effective Instruction

Through years of experience as a public school educator, and through research, the five most vital teaching competencies needed for effective CIT teaching have proven to be:

- Basic computer literacy
- The ability to authenticate web sources
- Planning for effective use of multimedia instruction
- Creation of a classroom environment where the use of education technology is positive and expected
- Adaptability

By having these five competencies, teachers will be able to successfully implement technology in the classroom. Additionally, they will be able to adapt to the quickly changing world of technology. As a result, teachers would be able to implement the newest technology in support of their students' learning and preparation for the future.

Teachers must possess the basic computer literacy skills that they expect from their students. They must be proficient in the use of word processing programs, spreadsheets, typing, and keyboarding. They must also be able to evaluate web tools and resources to ascertain their usability and usability. These skills are not just important to instruction but also to the teachers' professional responsibilities. It is imperative that in order to support teachers in these vital competencies, districts must provide meaningful and current professional development. Meier (2005) writes:

> Teaching with technology involves using technology as a conceptual tool to engage students in more abstract, higher order thinking skills—more analysis, synthesis and evaluation of knowledge. In order to learn how to use technology in this way, teachers must move beyond traditional teaching paradigms. Professional developers can support related teaching changes by demonstrating how technology can be used to design inquiry-based, student-

> centered projects, as well as by teaching specific technology skills. When professional developers locate technology within a dynamic design environment, teachers are empowered to create projects around the specific needs of their students. The design process can also help teachers address performance standards in meaningful ways and helps them define technology as a thinking tool for their students (p. 397).

Additionally, Mouza (2006) notes:

> The need for quality professional development is particularly evident in the field of technology. The current influx of computers in schools places new challenges on teachers, who are now required to master a variety of tools, redesign their lessons to incorporate technology, adopt new pedagogical approaches, and reexamine deeply held beliefs about teaching and learning. Yet, teachers receive little support for these fundamental changes. Traditional "sit and get" training sessions without follow-up support are not effective in helping teachers develop real facility in teaching with technology. If teachers are to be held accountable for the ways in which technology is used in their classrooms, they need to have sufficient opportunities for quality professional development. Such opportunities need

> to address both technology use and technology integration into classroom teaching (p. 406).

Providing this professional development will allow teachers to stay abreast of the most current technology as well as learning the skills to successfully implement this technology in their classrooms.

However, teachers do not need to be trained in every new technology. Prensky (2010) asserts that teachers do not need to be experts in all the various technologies that students use in the classroom. Rather, teachers need to be willing to partner with their students and explore new technologies together (pp. 101-103). Teachers need to plan to include technologies in lessons in an integrated and relevant way, not as a separate technology activity.

In order to create an environment where the use of technology is positive and expected teachers must be willing to release some control and responsibility to students. Allowing students to write papers or create presentations based on the course content but guided by their passions engages the student who will then take more ownership over their learning. The same theory applies to allowing students to use the technologies and presentation methods that best suit the project.

Finally, teachers must display adaptability in many facets of teaching. They must be willing to adopt new technology as advances are made. They must be

willing to change the way they teach as technology continues to change the way children learn and interact with the world around them. They must be willing to evolve in their practice. In the area of technology, teachers must become students that thirst for new technological knowledge. Teachers should be lifelong learners in the world of technology.

Imperative Technological Learning Objectives for Student Success

The International Society for Technology in Education (ISTE) Standards for Students website (2018) states:

> Today's students must be prepared to thrive in a constantly evolving technological landscape. The ISTE Standards for Students are designed to empower student voice and ensure that learning is a student-driven process. Connect with other educators in the ISTE Standards Community and learn how to use the standards in the classroom with the ISTE Standards for Students ebook.

ISTE (2018) lists seven student standards/learning objectives on their website. In the current state of public schools, the following three are the top learning objectives for students in the Bridgeport Public Schools' current climate:

Empowered Learner -- Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

1a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

1b Students build networks and customize their learning environments in ways that support the learning process.

1c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

1d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

Knowledge Constructor -- Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

3a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

3b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.

3c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

3d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

Creative Communicator -- Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

6a Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

6b Students create original works or responsibly repurpose or remix digital resources into new creations.

6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

6d Students publish or present content that customizes the message and medium for their intended audiences.

Students as empowered learners convey the idea that students take charge and ownership of their learning. Students can also create a sense of community through technology.

Students as knowledge constructors imply that students have learned how to learn independently. Students as creative communicators indicates that students can communicate clearly using varied technological resources. These three standards are distinct but extremely inter-related. When they are properly addressed in a classroom, they overlap and cannot be completely separated. Lessons that address these ideas include a multitude of student choice in topic and presentation. Wighting (2006) researched the idea of technology building community and found:

> Students who were interviewed revealed that not only did they find computers helpful for assignments such as research projects but also they enjoyed using them for that purpose. The evidence, derived from qualitative analysis, supports the quantitative data suggesting that students experiencing high computer use in class responded more favorably than did students with low computer use to questions contained in the spirit and learning domains of the SCCI. [...] If students enjoy using computers in their lessons, as well as recognize their value, motivation for learning may increase. Technology should not be viewed as an end in itself but as a tool to augment the sense of

> classroom community. Teachers should be encouraged to use computers to simplify, facilitate, and enhance individualized and social-learning processes (p. 377).

In a math course it might take the form of student presentations of mathematical concepts where the student demonstrates to his peers using technological means of his choosing. In a science course, a student would research an aspect of core material that was of particular interest using student-curated resources and presenting his findings creatively focused on his intended audience.

Using these intertwined standards and learning objectives, English language arts students would present their book club reading selections in the form of well-written online reviews. A book club is a network of empowered students who customize their learning environment through book choice. The group constructs knowledge by planning learning strategies, reading, and researching the issues and themes present in the text. They curate a collection of resources that pertain to those issues and themes. Finally, the student communicates creatively by choosing the appropriate platform to publish their original book review. These reviews can foster a culture of communication when their peers respond an refute aspects of the published content.

The intertwined standards and learning objectives of Empowered Learner, Knowledge Constructor, and Creative Communicator are imperative skills for students to learn in the current climate of public schools. These standards and objectives will help to prepare students to be successful not only as they continue their education, but also as they prepare to become productive members of society.

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