Tomorrow's Technology Today








Technology Transforming Teaching & Learning in Connecticut Schools

A Technology Futures Projection Report
The Connecticut Association of Public Schools Superintendents

Tomorrow's Technology Today
June, 2016

Acknowledgements

The Connecticut Association of Public Schools Superintendents (CAPSS) wishes to acknowledge the contribution of the following individuals in the preparation of the instructional technology futures survey

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A Message From CAPSS Executive Director

Tomorrow's Technology Today which is based on the results of a statewide survey that was conducted by the Technology Committee of the CT Association of Public School Superintendents (CAPSS) gives one confidence that practitioners in CT's public schools understand the need to transform schooling and the central role that intelligent use of technology will play in these transformation efforts.

It is easy to not realize that we are living in the midst of a revolution that is being driven by technology. Future generations will view our time as one in which much of human experience was transformed by what technology makes possible. Public education has to either open itself to what technology can do to transform policy and practice or to face the slow death of irrelevance.

For over four years, CAPSS has been calling for a transformation of schooling to a mastery-based personalized learning approach. From the beginning of that call, CAPSS has stated that without taking advantage of what technology makes possible, this transformation cannot take place. *Tomorrow's Technology Today* enhances this discussion in two ways.

1. It identifies specific ways in which technology will change teaching and learning for the better.
2. It provides school district personnel with helpful advice as to how to use technology to transform the learning experience for children.

Tomorrow's Technology Today, then, is a document that is required reading for anyone who seeks to transform schooling itself so that it aligns with what it needs to be in the twenty first century.

Joseph J. Cirasuolo

Joseph J. Cirasuolo, Ed.D.
Executive Director
CT Association of Public School Superintendents (CAPSS)

CAPSS NextEd Recommendations on Technology: Learn more at: www.ctnexted.org.

Leverage Technology. Use technology to transform teaching and learning.

|| Provide educators and students with equal access to technology. || Personalize learning with technology-based systems. || Ensure broadband access to Internet and wireless connections. || Provide on-demand access to learning resources, information and services 24/7. || Integrate technology throughout school districts, facilities, leadership and management to increase efficiency and safety.

CAPSS Technology Futures Projection Preface

Today, Maria got off the bus and headed directly to the middle school's library media center. Today wasn't her best start of the day. Both her lunch and her personal Chromebook computer are on the counter at home and not in her backpack as she thought. She worked last night on her assignments and projects but forgot to put her Chromebook in her backpack. She planned to leave the computer on the kitchen counter last night so she would remember it when she packed her lunch in the morning. That simply did not happen today.

Maria stepped into the library to see another student waiting at the counter. He was returning a Chromebook he borrowed while his was being repaired by the school technician. As he received his Chromebook, he turned to Maria and said, "I'm all set. Don't worry they are really nice to you." Maria explained to the media specialist that she left her Chromebook at home. The media specialist provided her with a Chromebook loaner for the day. Maria signed the form to borrow the computer. She was a bit embarrassed that she was now an eighth grader and this is the first time she did not have her Chromebook with her at school.

On some days, assignments on her personal computer related to support for her daily lesson or preparing for the next day's lesson. But today she had a number of projects that she worked on at home. In English class, she would be working with other students as they developed a position paper on the choice between drinking water from a school fountain or bringing in bottled water. Her team was researching articles on water purity using *Newsela*, an electronic resource of thousands of current event articles scaled at five different Lexile reading comprehension levels. She had extracted a number of articles with evidence to compare and contrast the positions of her team. Everyone would be bringing in their research. She needed to have her work to contribute. In her French class, she would be quizzed on her accuracy and pronunciation when the teacher monitors her vocabulary response through the computer. And, since the district purchased digital versions of the social studies textbooks, Maria was researching some great resources and websites aligned to her social studies chapter review which she developed through Google Docs to include in her presentation in Social Studies. This was not the day to forget her computer.

Maria reported to homeroom and logged in on the computer. What a relief! Because all of her work is saved to the cloud, her work was there. She would be ready for her classes. Other than having to take the standard lunch when you forgot your lunch or money, the day might not be so bad after all!

The teachers here really incorporated the use of technology in their teaching. With students having personal access to technology in school and at home, classes seem to be more engaging and personal. Teachers spend as much time working with groups of students and providing individual responses to student questions as they do providing direct instruction to the class. There is as much group work as class work and individual work. Students really enjoy the opportunity to offer ideas individually and in groups for how they can deepen their learning or design new ways to present their answers to class work. They call this blended learning where teachers and students share in creating ways to improve and personalize learning through the use of technology and its resources.

This story of Maria in a school undergoing transformation through the effective use of technology may sound a little futuristic but in reality it is becoming more and more commonplace. The examples in fact are extracted from visits to districts such as Plainville in Connecticut. With the Superintendents' Association (CAPSS) NextEd Report calling for the importance of utilizing the enormous potential of technology for teaching and learning and the Governor's recent grant initiative supporting district acquisitions of new technologies for teaching, learning and assessment, the school systems in Connecticut are making strides in technology applications.

The purpose of the CAPSS Technology Committee survey was to ask instructional technology specialists throughout the state what they see as the promising practices and exemplary uses of technology which are transforming the instructional environment in schools. Too often, the cost of technology and the financial challenges of the times, limits or directs technology acquisitions. Limited access results in limited professional development which results in limited impact on teaching and learning. However, to the contrary, where a district has a vision and a plan to capitalize on the power of technology, the entire system of teaching, learning and assessing can be transformed. Districts are moving from using technology to simply provide more opportunity for more students to achieve the current curriculum. Innovative districts are not only changing instructional practices to incorporate technology, but they are also re-defining curriculum and learner expectations based on 21st Century skills. Student 1:1 access to technologies using cloud storage has prompted changes in what is taught, how it is taught and how students can represent their learning. Some technologies augment learning styles while other technologies can remove the barriers that limit inclusive, non-restrictive classrooms. And then there is the simple matter of time and place. With access to learning and information technologies 24 hours a day, schools are but one, all be it one of the most important, places where learning happens. The instructional day has been extended by the hours in the day and the days in the year.

These images are provided for the reader to set a context and a receptivity to ten (10) innovations in technology reported by experts in the field in our State of Connecticut as projected expectations within the next five years. The changes relate to emerging technologies but more so to the changes in practice and results which are supported by evidence of promising practices in the field.

CAPSS Technology Futures Survey Findings – Executive Summary

During the 2015/2016 school year the Connecticut Association of Public School Superintendents' (CAPSS) Technology Committee performed a technology futures projection survey asking district instructional technology leaders to identify emerging trends in the use of technology which they believe will direct or transform education over the next five years. The open-ended survey produced a number of projections which were subsequently rated using a 5-point Likert scale for a confidence rating. The raw results are listed below in the rank order of confidence. The top ten projections, taken in isolation provide advice and direction to school districts seeking to focus their efforts and resources on the best practices supporting quality teaching and learning. These projections were then correlated to national research on future and emerging trends in instructional applications of technology. When viewed in context, the future projections, in a time frame as short as the next five (5) years, project not only changes to new uses of technology but also to the changes in instructional practice and student learning expectations optimized by new and emerging technologies. (5/1/2016)

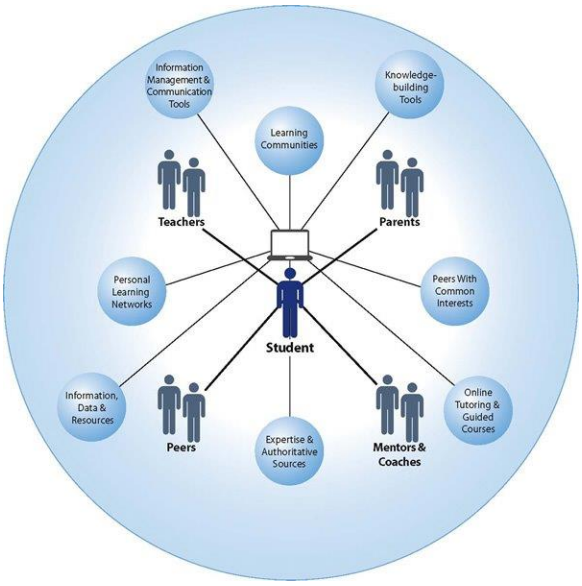
Future Projections of Technology in Connecticut Schools

	Confidence Rating
1. **Accessing quality instructional resources will improve teaching and learning** as evidenced by: Cloud-based resources will enrich instruction and increase learner expectations (4.63) Instructional resources such as Khan Academy and Discovery Ed will strengthen instructional systems (4.57)	92%
2. **Improved communications capacity will strengthen engagement in learning** as evidenced by: Instructional collaboration within and across districts will expand beyond the walls and time of the school day (4.48) Improved SIS systems will inform teachers and parents of progress in student learning (4.42) Personalized learning will increase feedback to allow students to monitor their own progress (4.40)	89%
3. **Technology will re-define opportunities and responsibilities for teaching and learning** as evidenced by: Instruction will incorporate more real time/real life opportunities for learning (4.37) Blended learning systems will improve student and teacher responsibility in the teaching & learning process (4.32) Curriculum will be re-designed to incorporate real-time access through technology (4.26) Adaptive devices will improve inclusive practices to engage more diverse students (4.25) Schools will strengthen efforts in digital literacy, safety and ethics (4.23)	86%
4. **Technology will require and improve new opportunities for professional learning** as evidenced by: Professional learning will incorporate the power of technology to improve personalization (4.18)	84%
5. **Instruction will incorporate technological resources specific to student performance** such as: Digital textbooks will provide ubiquitous access to informational learning resources (4.11) 3-D Printers and other technology-enriched tools will increase and improve student production (4.03)	82%
6. **Technology will allow for more flexibility in student demonstrations of learning** as evidenced by: Technology will increase student ownership and direction for learning (4.08) Students will be allowed more flexible assessment models to demonstrate mastery of learning (4.08)	82%
7. **The dominant access to technology for instruction will be 1:1 devices using mixed platforms** (4.06)	81%
8. **Access to a digital repository of assessment data will strengthen instructional practice and decisions** (4.03)	81%
9. **Learning analytics will strengthen the capacity to improve instructional design and instructional response** (3.92)	78%
10. **The learning environment will change** - Re-designed classrooms will optimize technology use for learning (3.85)	77%

The Projections getting a lower rating support (3.31 to 3.78) are as follows:

(3.78) Schools will increase efforts to promote paperless classrooms
(3.61) Districts will use collaborative procurement practices to address technology costs
(3.52) Flipped classroom will become more common in instructional use
(3.48) Game-based, virtual reality, simulations will be used to engage students
(3.48) Schools will strengthen the use of social media to support instruction and learning
(3.31) Instruction will incorporate persona/ wearable technology

When you take the combined ideas for projections of the impact of technology on teaching and learning and the order of priority of confidence ratings, there is a story being told here:



The highest expectation is that educators will embrace new opportunities for teaching and learning to improve resources and communications.

The results of the increased power, flexibility and access to technology will change WHAT and HOW we teach. As schools increase resources more diverse students will succeed if curriculum and professional development change to ensure that instruction is more personal, real-life and remains a safe environment for learning.

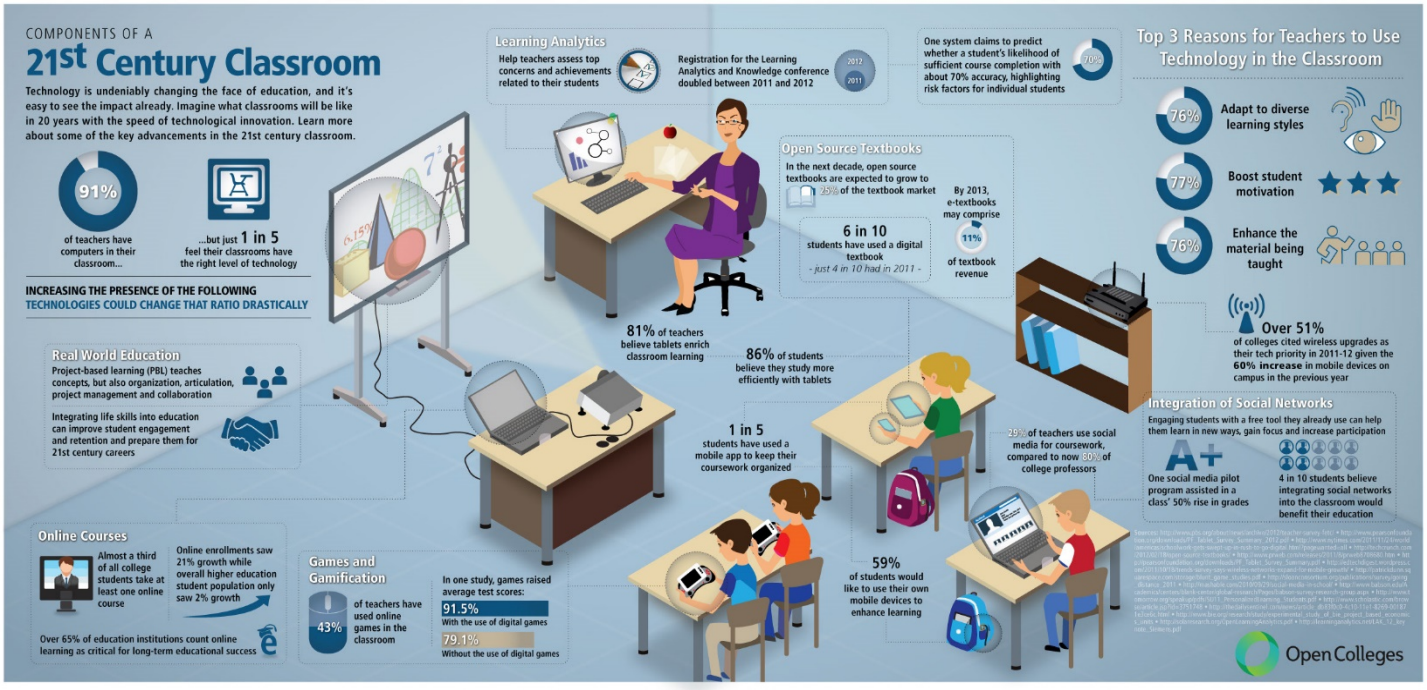
New learning will take new technologies including digital textbooks and emerging technologies such as 3-D printers.

A dominant change which can be achieved is the strengthening of student ownership of learning through ubiquitous access (1:1) to learning technologies, instructional models such as blended learning and more flexible models for student demonstrations of learning.

Access to information about learning can and will strengthen instructional practices through more accessible repositories of data and improved analytics. With improved access to information, more informed decisions can be made to improve instruction.

The teaching, the learning expectations, the measures of achievement and the environment need to change to capitalize on the use of technology.

The survey data suggests that emerging technologies will transform the expectations for student learning. Districts currently using technology to improve student performance within present expectations of student learning may need to reconsider how technology will change the expectations for both instructional practice and student learning.



The following report of the CAPSS Technology Committee Futures Projection Survey provides both detail and context of the voices of Instructional Technology Specialists in Connecticut sharing their expert view of the impact of technology on teaching and learning over the next five years based on emerging technologies and evidence of exemplary and promising practices throughout Connecticut.

More details of the projections are provided on the following pages. Each projection is expanded to include an explanation, support for the projection in recent research, an example of a Connecticut school/district with evidence of a promising practice or exemplar for the projection and some suggestions to help the reader consider the progress of the school or district towards achieving the projection.

STUDY PROJECTION #1

Accessing High Quality Instructional Resources Will Improve Teaching and Learning

Likert Scale survey rankings of 4.57 to 4.63 for improved instructional resources equates to a confidence rating of 92%.

Accessing High Quality Instructional Resources Will Improve Teaching and Learning as evidenced by:

- Cloud-based resources will enrich instruction and increase learner expectations (4.63)
- Instructional resources such as Khan Academy and Discovery Ed will strengthen instructional systems (4.57)

This projection indicates improved access to technology and cloud-based resources support innovative instructional practices and resources for students and staff.

The introduction of Chromebooks and touchscreen notebooks utilizing cloud-based storage advanced efforts in schools to provide students with 1:1 technology for use at both school and home. Student access to such technologies results in exploration of resources for information and more comfort, if not preference, for using technology to support student interests. This increased access is manifesting changes in classroom practices where students can more readily collaborate on assignments. Rather than having students examine a textbook or common resource to find evidence to support a position, teachers can and do capitalize on the diversity of independent or partner investigations of website resources to contribute to a group, partner or individual project. With the capacity to store and share developing work via 'the cloud', students working at home can continue to collaborate on class or homework projects. A team project collaboratively developed through, for example Google Docs, can record changes to document the individual contributions and steps towards a final product. In many content areas there is a shift in learner expectations from a convergent response to a more divergent position supported by valid evidence and documentation. This new access increases learner expectations.

Educators can help students make connections across subject areas and decide on the best tools for collecting and showcasing learning through activities such as contributing to online forums, producing webinars, or publishing their findings to relevant websites.

The lowering cost of technology and the increasing demand for technology-based resources both within education and throughout business and industry has prompted opportunities for learning. Facebook, Twitter, Angie's List and similar networking systems allow collective discussion, sharing of ideas and value-added resources. Such systems have become widespread networks. Digital citizens engage in the common practice and frequency of using such networks. Learning resources such as Khan Academy are being accessed widespread. In some cases, students seek Khan Academy instructional videos to clarify or support classroom learning. In other cases, students are allowed to use Khan Academy and similar resources as primary instruction which is then reinforced in the classroom in a model known as the 'flipped classroom'.

These teachers can advise students on how to build an online learning portfolio to demonstrate their learning progression. Within these portfolios, students can catalog resources that they can review and share as they move into deeper and more complex thinking about a particular issue. - NETP

Another example of changing practice and changing expectations is the example of Discovery Education's 'techbook' series. Similar to the comfort and frequency of access demonstrated by students using 1:1 cloud-based Chromebooks, digital textbooks provide students with the opportunity to study at various points of the day and location in an environment comparable to smartphones. The same technology providing the opportunity for students to explore and store web resources is providing the common text source for the organization of the coursework.

Important in this highly ranked projection is the fact that survey respondents are noting that increased accessed to low cost, accessible, cloud-based resources paralleling the public use of personal technologies is requiring and creating incentives for many new accessible learning resources to be incorporated into both the expectations for teaching practice and the expectations for learner competencies. Innovative districts encourage educators to engage students through technology and to incorporate access to such powerful learning tools into the teaching process.

Research Reports Supporting This Technology Trend Projection.

Fullan (2014) found several benefits of technology resources with regards to teaching and learning. He found that technology provides equitable access to educational resources for all students and teachers at any time. Teachers no longer had to filter through and "deliver broad swathes of content knowledge personally" (p.33). He noted that when access to digital tools was pervasive in schools, it had the power accelerate the pace of teaching and learning exponentially. Fullan describes digital tools and resources, new learning partnerships, and deep learning tasks as the three critical components to radically increasing student learning. He found that when schools actively cultivated all three factors, student realized significant gains in achievement (Fullan 2014, p. 32). Fullan suggested that teachers increase their capacity for digital pedagogy by continuously discovering and creating digital learning tools and resources to:

1) explore new content, concepts, information and ideas;
2) challenge students to create new knowledge;
3) connect with students, peers, and experts beyond the classroom;
4) accelerate students' ability to drive their own learning process; and
5) assess and share information on students' learning abilities and dispositions

The New Media Consortium's 2015 Horizon Report (NMC, 2015) found that the use of digital educational resources had a robust effect on improving teaching, learning, and creative inquiry, and were a significant development in educational technology. The NMC Horizons report also found that the proliferation of digital resources for learning made student learning more accessible and personalized.

The National Educational Technology Plan (NETP, 2016), cites openly licensed educational resources as a way to free up valuable funding resources for districts to realize cost savings and improve the quality of resources at the same time.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Plainville reports that over the past three years, the district has moved to 1:1 student access to technologies in grades 7-12. The transformation included a focus on teacher professional learning. As teachers demonstrated more proficiency in developing technology infused lessons, the district invested in technology purchases for student usage at school and home. Teachers became Google certified to support school-wide transformation. The investment has yielded new instructional practices tapping into the power and potential of technology to promote better student engagement, improved teacher response for personalization as well as new expectations and results for student learning. Blended learning practices are evident in classes. The district purchased a Discovery Ed 'techbook' series for Social Studies. The district has implemented support systems to ensure that students will be provided with replacement devices needed for learning when or if the assigned technologies are damaged or unavailable.

Similar practices are evident in a many Connecticut school districts including but not limited to Meriden, Wallingford, Colchester, Newington and Plainfield and Region 14. Examples of progress in these districts are included in this report as submitted references for readers.

Plainville Schools Introduce Techbook Series

The Plainville Observer
October 21, 2015

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. To what extent do students have access to cloud-based devices for school and home use?
2. How many teachers are incorporating web-based and technology-based resources for student access?
3. Have teachers been provided sufficient time and on-going support to consider value-added web-resources for instruction?
4. Have curriculum expectations, teacher evaluation and evidence of student learning been strengthened to include technology?
5. Does the district provide the necessary resources to ensure that students and staff have access to technology resources as needed?

STUDY PROJECTION #2

Improved Communication Capacity Will Strengthen Engagement in Learning

Likert Scale rankings of 4.42 to 4.48 for technology-enhanced communications equates to a confidence rating of 89%.

Improved communications capacity will strengthen engagement in learning as evidenced by:

- Instructional collaboration within and across districts will expand beyond the walls and time of the school day (4.48)
- Improved SIS systems will inform teachers and parents of progress in student learning (4.42)
- Personalized learning will increase feedback to allow students to monitor their own progress (4.40)

This projection indicates that improved access to technology will improve and strengthen both communication and engagement for learning.

One clear evidence of the impact of technologies is the impact on communications and engagement. Services such as Facebook and Twitter and other social media services engage millions of people daily at virtually all hours of the day. The industry is a multi-billion dollar industry supported by advertisements to historically large audiences.

"…today, social media and collaboration tools are encouraging schools – both virtual and physical- to tap into a learning community's collective brain."

5 Trends That will Transform Education by 2025. Century Link

Improving technologies and improving software development are providing schools with strong information systems. Advanced student information systems include student and parent portals where either can monitor and follow student performance in academics, attendance and other areas. This same program can link various information and reporting systems such as IEP-Direct, S504, health records, grading and curriculum requirements. Educators are being provided with one-stop access to important information related to student development via school-constructed dashboards. The same system can send home student alerts to encourage improvement.

Within the instructional environment, wireless technologies and cloud-based networks allow teachers to privately review and comment on student work and progress. The same technologies that can provide multiple, varied approaches to diverse learners can also provide a discreet and supporting communications system to encourage learners to achieve. Improving the lines of communication requires that schools establish new expectations for engaging families and incorporating student reflections into instruction.

Students can collaborate and communicate on the development of a project through programs such as Google-Docs. Teachers can collaborate on instructional design and curriculum development projects. Could-based networking and storage opens communications beyond the walls of the school, the district, the state and the country. The time and the location of learning and collaborating are no longer limited to the school day of operation. Schools have reported where a student absent at home was still able to participate and contribute to a team development of a science laboratory report.

Collaborative learning models are proving successful in improving student engagement and achievement, especially for disadvantaged students.

NMC Horizon Report

Included in the projection is the acknowledgement that virtual access to technology at any time in the day, student and staff who have assimilated this communication process into their daily social life will more readily assimilate the power of such communication networks into their instructional support system.

As these technologies continue to expand there is also increasing evidence and concern for the improper use of such information systems which being manifest as cyber bullying and unsafe communications. Districts more actively engaging the power of communications technologies are also increasing their efforts to provide a safe learning and communications environment. Districts also need to address accessibility to these learning opportunities from home to ensure equitable opportunities for all students.

Research Reports Supporting This Technology Trend Projection.

The National Education Technology Plan (NETP, 2016) found students to be more engaged in an educational setting when they communicated with mentors, peers, and colleagues through social media and digital tools that fostered collaboration. The NETP report also recommended that school districts implementing broad wireless access will allow parents to be able to help their students by looking up academic content they may not understand, and will provide equitable access to district-provided tools such as online communications portals and learning management systems.

The report recommended districts provide technology devices for all students to access these digital learning resources. The report was very clear in the role that digital tools played in facilitating educator, student, and parent collaboration and communication. Further, The NETP report cited the benefits of online learning platforms that display effects of missing assignments, progress toward goals, and channels for communication with mentors and teachers.

The National Education Technology Plan (NETP, 2016) recommended that "states, districts, and others should design, develop, and implement learning dashboards, response systems, and ***communication*** pathways that give students, educators, families, and other stakeholders timely and actionable feedback about student learning to improve achievement and instructional practices" (p. 63). The NETP report cites Baltimore City public schools (BCPS) as a case study of a district that uses digital tools and resources for effective communication**.** For example, the report states that **"**BCPS uses several communication outlets to provide information regarding S.T.A.T., including district and school websites, newsletters, social media, BCPS-TV, and Parent University" (p. 67). Ensure that every student and educator has at least one Internet access device and appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school. The report points out that effective technology based communication grounded in strong vision and leadership at all levels from teacher-leaders to school, district, and state administrators can lead to connecting learners and educators to the vast resources of the internet which will facilitate communication and collaboration.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

The integration of technology in Region 14 classrooms has engaged students in a higher level of learning and allowed students to demonstrate their skills in a variety of ways. Technology allows our students to make connections outside of their classrooms while learning 21st century skills. Students frequently engage in virtual field trips using Skype and Google Hangouts where they have the opportunity to meet students outside the region and get the chance to meet experts and authors. Technology integration in Region 14 has given students the opportunity to apply their skills in authentic ways, to connect outside of the district. Students are creating graphics, collaborating on writing, designing and animating with code, writing music and producing videos with the support of their teachers and the use of technology. Technology allows our students to easily collect real data, create presentations, and communicate their findings in a variety of ways. Access to technology for all students allows teachers to share digital content and create assessments that can be differentiated.

In another wireless, networked CT classroom, students were reciting into their own computer a series of new French vocabulary words. The teacher would monitor and listen to the pronunciation and fluency of each student and provide personal feedback for improvement based on a defined rubric of performance. This personalized response to supporting student learning not only provided improved instructional support but also allowed a more responsive instructional model for students facing learning challenges.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Does you district currently have a data system or data dashboards in place to drive student achievement?
2. Is the data presented in form that is easy to use and actionable?
3. Do teachers meet on a regular basis to have conversations about student achievement that is grounded in data?

STUDY PROJECTION #3:

Technology will Re-define Opportunities and Responsibilities for Teaching and Learning.

Likert Scale rankings of 4.23 to 4.37 for re-defining teaching and learning equate to a confidence rating of 86%.

Technology will re-define opportunities and responsibilities for teaching and learning as evidenced by:

- Instruction will incorporate more real time/real life opportunities for learning (4.37)
- Blended learning systems will improve student and teacher responsibility in the teaching & learning process (4.32)
- Curriculum will be re-designed to incorporate real-time access through technology (4.26)
- Adaptive devices will improve inclusive practices to engage more diverse students (4.25)
- Schools will strengthen efforts in digital literacy, safety and ethics (4.23)

This projection indicates that improved access to technological resources will result in teachers providing more real-life and real-time opportunities for learning.

The application of new technologies in teaching have created new and stronger teaching practices. Rather than simply using technology to help more student become successful with existing curriculum goals, the technology itself has prompted changes to curriculum accessing the strength of technology and social media to engage students in a powerful medium of resources. Students not only access new, real-time information but they are also contributors to the information system. Blended learning incorporates student interests, student voice and student learning into curriculum expectations. In this way, student interests facilitate personalization of instruction. Supporting this trend in strengthening and personalizing instruction is the capacity of technology to provide adaptive devices that both augment existing learning capacity as well as provide alternatives to include more students in the learning process.

"…whatever is learned through the motivation of passion is rarely if ever forgotten,"

writes Marc Presnsky in his book Teaching Digital Natives

Blended learning improves student and teacher responsibility in the teaching and learning process, and provides more engagement and ownership in the learning process. Although many models exist, for blended learning, a broad definition defines blended learning as an instructional strategy in which teachers deliver instruction via a mixture of real-time instruction and asynchronous virtual classrooms (Schoolology, 2015). Blended learning can extend learning beyond the traditional school day by providing students with 24/7 anytime/anywhere access to content and learning materials. Lessons can address diverse learning styles and allow learners to review content their own pace. Communication between student and teacher are enhanced through digital tools such as online discussions, email, and message threads to provide real-time feedback.

Blended learning is a pedagogical strategy by which students learn via a mixture of face-to-face and digital instruction. When done well, blended learning transforms education and improves the quality of interaction between students and educators."

The Definitive Guide to Blended Learning (2015)

The recent proliferation in online digital content has provided educators with more choice in **curriculum content**. Teachers traditionally have been constrained by pacing guides and a need to cover the mandated content. Access to digital curriculum is freeing educators and students from constraints of prescribed curricula by allowing web access to content knowledge. Curricula will have to be re-designed to incorporate real-time access through technology to promote deeper learning. The shift away from exclusively content allows educators to focus on the art and process of learning.

When new curricular resources are effectively implemented, dramatically improved student outcomes can occur (Fullan, 2014).

Adaptive learning technologies are defined as software and devices that adapt and adjust to an individual student's needs and performance level (NMC, 2015). In short, they adapt to the way people learn to accelerate progress. The emergence of these adaptive technologies supports a broader educational trend to personalize the learning experience. Adaptive technologies provide a potential solution for tailoring the classroom experience for all students (NMC, 2015). Adaptive technologies can track student response data and automatically develop a customized instructional strategy based on an individual learner's strengths and weaknesses. Formative assessment tools allow teachers to monitor individual student responses, and differentiate instruction in real-time. Finally, adaptive technologies hold the promise of allowing all students to compete on a level playing field and close the achievement gap (NETP, 2016).

"… to realize fully the benefits of technology in our education system and provide authentic learning experiences, educators need to use technology effectively in their practice." National Education Technology Plan

Research Reports Supporting This Technology Trend Projection.

Technology carries the promise to transform teaching and learning. To start to fulfill that promise requires a fundamental shift in the traditional ways in which we think about teaching and learning. Fullan (2014), describes new digital pedagogies that are not simply instructional strategies, but rather powerful new models of teaching and learning accelerated by digital tools and resources to support deeper learning. He envisions learning partnerships that team teachers and students in an engaging and authentic cycle of inquiry, and help students learn about themselves as learners in the process. To meet this promise, the professional capacity of educators must evolve to adapt to these new pedagogies. Teacher pre-service programs will also have to realign their programs to ensure that future teachers are well versed in digital pedagogy to meets the demands of 21st century skills (NETP, 2016). School leaders will have to actively cultivate a culture of digital practice can to transform educational practice at scale.

The New Media Horizon Report (2014) identifies a number of areas where the power of technology can improve teaching and learning including but not limited to rethinking the role of teachers, shift to deeper learning approaches, create authentic learning opportunities, and integrate personalized learning and rethinking how schools work.

The National Education Technology Plan report (2016) states that conversation has shifted from whether technology should be used in learning how it can improve learning to ensure that all students have access to high-quality educational experiences.[3] Technology increasingly is being used to personalize learning and give students more choice over what and how they learn and at what pace, preparing them to organize and direct their own learning for the rest of their lives.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Plainfield reports that it now has nine pilot projects in technology and 1:1 student access for students in grade 8-10 which will expand to subsequent grades over the next years. The pilot projects awarded to faculty (usually as partner submissions) were based on proposals submitted indicating the readiness of staff to implement their model, the proposed changes to instructional practice, the anticipated improved student learning outcomes and the evidence of success. The first pilot results were presented to the Board of Education. Students presented their view on the value and importance of having 1:1 access to Chromebooks, and being taught through blended instruction where the teacher interacted with students via the technology. One student presented using notecards and PowerPoint. Another student read from notes on an I-Phone. Another student used a wireless Chromebook. The last student stood up; spoke into the microphone and stated, "I'm Jonathan and I have Asperger's. If not for this class and the technology, I would not be speaking to you. You would not be able to read my writing. But because I had the support I needed through the technology I can prove that I am as bright as any other student and speak to you tonight." The BOE approved new pilots! Plainfield efforts speak to one of the ways in which districts can move towards technology transformation linking professional learning, blended learning practices, student results-based expectations and technology acquisition and distribution. The ultimate transformation is the change to teaching, learning, leading, student expectations and results empowered by technological resources.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Do teachers utilize blended learning practices to increase student interest and personalization in planning and performing lessons?
2. Do teachers demonstrate interest and responsibility for providing real-life and real-time instructional experiences for learning?
3. Does curriculum revision and development include technology applications for learning and assessment and expectations which capitalize on emerging information resources of technology?
4. Does the school/district provide augmentative technologies to support and improve student learning that result in inclusive practices with evidence of closing the gap in student achievement among subgroups?

STUDY PROJECTION #4:

Technology Will Require and Improve New Opportunities for Professional Learning

A Likert Scale ranking of 4.18 for technology-related changes to Curriculum & Practice equates to a confidence rating of 84%.

Technology will require and improve new opportunities for professional learning as evidenced by:
Professional learning will incorporate the power of technology to improve personalization (4.18)

This projection indicates that improved access to technological resources will result in substantive changes to expectations and results for professional learning.

To achieve the changes projected in the use of technology in education, educators must assimilate not only new understanding of the technological resources but also the applications of technologies to more powerful teaching and learning practices. The advances in technology itself requires training and learning in the opportunities afforded by the technology. But technology access by itself does not translate into learning empowerment. Harnessing the power of technology requires thoughtful consideration of how learners can interact with technological resources to strengthen their understanding and their ability to communicate their learning.

"Change the focus of professional learning from technical training to understanding how to design assignments that are more empowering and engaging for students in a 24-hour supported learning community"
November Learning (2013)

Professional learning for educators must include knowledge and practice of new and emerging technologies; opportunities to experiment and apply new technologies into instructional practices; support to develop measures of performance capitalizing on the technologies; and the personalization of professional learning to address the diverse stages of technology utilization and applications of technology specific to the content area and grade levels of educators. Similarly, advances in technology applications supporting leadership responsibilities will require support for the professional learning of leaders.

Technology can remove barriers of time and distance to allow educators to explore new applications of technology for teaching and learning within and across school districts. Technology offer a more diverse array of responses and opportunities for diverse learners. To achieve established learning expectations, teachers can offer additional strategies empowered by technologies which broaden the resources for learning or which provide a learning format more appropriate to specific learners. But new technologies are also changing learner expectations. Educators need to practice with new applications of technology to understand the strengths and challenges of any new instructional practice.

The New Media Consortia Horizons Report 2014 identifies the following as important changes in the use of technology in education:

- *BYOD/1:1 Technology*
- *Cloud Computing*
- *Games and Gamification*
- *Learning Analytics*
- *The Internet of Things*
- *Wearable Technology*

NMC Horizons 2014

The process of instruction is one of the highest levels of the cognitive domain. Effective teaching requires the assimilation of core practices so that the focus of instruction is on the learner not the practice or process. With new and emerging technologies, attention of the educator can be split between the medium, the resources and learner expectations. Professional learning is a key factor in the transformation of teaching through technology.

Just as the technology noted in other related projections will serve to enhance personalization of student instruction through blended learning practices, so to the professional learning of educators and leaders must be designed with personalization for the participants. Leaders and supervisors can provide virtually instant feedback and reflection upon formal or informal observations. Lessons developed by one teacher can be shared within and across schools for input and advice. Educator passions and special skills (multiple intelligences) can contribute to collaboratively designed lessons to personalize instructional while maintaining the core learning expectations. Professional learning is needed to transform a practice of teacher-led instructional practice to student-interest based learning.

Research Reports Supporting This Technology Trend Projection.

The National Education Technology Plan report (NETP, 2016) recommended that districts and teacher pre-service institutions provide rich "professional learning experiences powered by technology to increase their digital literacy and enable them to create compelling learning activities that improve learning and teaching, assessment, and instructional practices" (p. 83). The report recommended intensive job-embedded professional learning opportunities in technology to support learning, as technology should not be separate from content area learning but rather embedded in it. Denver Public Schools has used technology to empower and personalize professional learning for its 425 teachers and school leaders (NETP, 2016). DPS has developed an online community of practice where teachers use a digital environment to reflect on professional practice and share ideas. DPS reports that when teachers used technology to take ownership of the professional learning process, they were more engaged and had accelerated professional growth (NETP, 2016).

The New Media Horizon Report (NMC, 2014) recommended that district leaders and policymakers rethink how they invest in technology as a professional collaboration tool to improve the effectiveness for professional learning and collaboration among teachers (p. 12). Technology has provided a platform for collaboration and social learning within online and blended communities of practice that were not possible before.

Fullan (2014) found that when teachers in Elmira, Ontario used a technology based professional learning systems to collaborate on "student learning goals, second on precise pedagogy, and third on how technology could enable and accelerate learning in high level standards. Teachers collaboratively designed an 'accelerated learning framework' that mapped how student learning goals, deep learning competencies, exemplary pedagogy and technology all work together. They began to practice using this framework school-wide, bringing clarity to intentions, processes and tasks, and desired outcomes. They developed a targeted 'professional learning and professional practice' strategy that embedded effective use of technology within the framework. The result: after being essentially flat lined on learning achievement, they dramatically improved on annual standards measures. Reading proficiency, for example, climbed from 72% to 93% in three years, and writing improved from 69% to 87%, including closing the gap for boys compared to girls" (Fullan, 2014. p. 32).

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

In Vernon, the alignment of middle and high school Technology Education tracks is producing results. Our middle school Technology Educational program begins to build on STEM concepts started at the elementary schools. Students build a set of skills leading to the use of Solidworks, 3D printing, and video editing in 8th grade. In high school, the students captivated by the technology are able to enter one of two tracks: Engineering/Manufacturing for those that are STEM driven or Communications for those enthusiastic about Digital Media and Design.

The engineering students get the opportunity to use real world machines like a Laser Engraver, CNC router, ProtoTrak CNC Mill, and the industry leading G-code creator, MasterCAM. Furthermore, those students choosing the STEM pathway have the opportunity to take additional science courses and earn a STEM Scholar recognition on their diploma. Students in the Communications track will get to use Adobe Photoshop, Adobe Illustrator, Adobe Premiere and Chief Architect.

Award winning projects have come from both the high school technology education tracks, ranging from the Home Builders Association to the White House Film Festival. Additionally, students in either track can earn 6 college credits and several have gone on to acquire paid internships.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Does you district currently have a data system or data dashboards in place to drive student achievement?
2. Is the data presented in form that is easy to use and actionable?
3. Do teachers meet on a regular basis to have conversations about student achievement that is grounded in data?

STUDY PROJECTION #5:

Instruction Will Incorporate Technological Resources Specific To Student Performance

Likert Scale rankings of 4.11 to 4.03 for student performance-based technological resources equates to a confidence rating of 82%.

Instruction will incorporate technological resources specific to student performance such as:
Digital textbooks will provide ubiquitous access to informational learning resources. (4.11)
3-D Printers and other technology-enriched tools will increase and improve student production. (4.03)

This projection indicates that in the next five years new technological resources will re-define expectations for learning.

More than twenty years ago, the proliferation of word processing and computer-assisted-drafting (CAD) programs and programmable calculators demonstrated improved student capacity, performance and expectations with respect to established educational goals. These technological developments were embraced more-readily than other innovations and remain today as valued instructional resources. Often, the guiding factor in a decision to embrace a new technology is a perceived improvement in student efficiency, effectiveness or response to diversity for student achievement within an existing set of learner expectations. When that technology demonstrates new and valued learner expectations, the technology often becomes a core tool of learning.

"The new digital pedagogies require students to create knowledge and connect it to the world using the power of digital tools"

A Rich Seam; How New Pedagogies Find Deep Learning. (Fullan, 2015)

3-D printers and technological devices specifically designed as enhancements to valued industry and educational goals are increasingly finding their way into instructional environments which are working to prepare students for the 21st century workforce. So too are digital textbooks ('techbooks') becoming more prominent in schools. For many reasons including but not limited to the cost of textbook replacement, the rapid change of information and the comfort if not preference of learners for digital readers as well as the investment and marketing of textbook companies of electronic textbooks, schools are increasingly considering digital textbooks.

Companies such as Discovery Education offer a curriculum series in mathematics, science and social studies and other areas and provides a 'techbook' series that includes lessons, professional development and differentiated reading levels to engage more diverse students. The interest in this new resource is strengthened by the fact that the techbook aligns to existing learner expectations and curricula. Once embraced, the interactive features of the techbooks can prompt new expectations of the teacher student.

Entire school districts are starting to go open-source, too, such as the Bering Strait School District in Alaska, which is using a Wiki-style format for its curriculum.

CK12 is part of California's Free Digital Textbook Initiative, and school districts in Pennsylvania are also considering using its materials once the curricula has met state standards.
From: Mind Shift

3-D printers and 'techbooks' are not the only new technologies finding increased use and presence in classrooms. They do represent a pattern of adoption of technology where the initial interest is to promote improved student performance of existing learner expectations. The receptivity is sparked by a perception that the technology enhances student capacity. But once embraced, the conceptual design of the technology opens opportunity for learners to produce new thinking, new aspirations or new results. The technology introduced as aligned to existing learner goals can in fact become a catalyst for curriculum transformation.

Quite simply, when technology aligns to existing expectations (textbooks, new skills) the staff and public more readily accept the need and responsibility to provide such tools as it does not require a new understanding of a changing workplace or changing practice.

Research Reports Supporting This Technology Trend Projection.

Fullan (2014) found learning technologies are using feedback based on student performance data to adapt the content and challenges they present to students. The advances in student analytic systems and smart technologies have revolutionized that way that content is tailored towards the specific learner. Collecting more individual learning data allowed teachers to develop a more holistic and personalized learning program for their students. Adaptive accessibility options have made learning available to a wider range of students (NETP, 2016).

Three main principles drive application of universal design for learning (UDL): [25, 26, 27]

1. Provide multiple means of representation so that students can approach information in more than one way. Examples include digital books, specialized software and websites, and screen readers that include features such as text-to-speech, changeable color contrast, alterable text size, or selection of different reading levels.
2.
3. Provide multiple means of expression so that all students can demonstrate and express what they know. Examples include providing options in how they express their learning, where appropriate, which can include options such as writing, online concept mapping, or speech-to-text programs.

Provide multiple means of engagement to stimulate interest in and motivation for learning. Examples include providing options among several different learning activities or content for a particular competency or skill and providing opportunities for increased collaboration or scaffolding.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Norwalk reports implementation of Chromebooks throughout the district as a learning platform has been a successful and meaningful use of technology as an instructional tool for teaching and learning. They implemented over 5,000 Chromebooks and initiated teacher driven professional learning opportunities such as tech coaches(teachers in each building) who offer PD in each school and "edcamps" which are professional development conferences offered by educators for educators.

Plainfield and other districts have incorporated 3-D printers into its graphics design course expanding its program to include new technologies to meet a changing industry.

Coventry's adoption of 3-D printing lead to student development of a prosthetic hand.

Eastford reports its use of distance learning to afford its students instruction in world languages and as a result offers a wider range of language instruction.

Many districts throughout Connecticut report the use of touch screen technologies with students as early as Kindergarten. The technologies specifically responsive to the age and development of the student and/or the purpose of the instruction are finding the quickest entry into the educational system.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Does you district currently have a data system or data dashboards in place to drive student achievement?
2. Is the data presented in form that is easy to use and actionable?
3. Do teachers meet on a regular basis to have conversations about student achievement that is grounded in data?

STUDY PROJECTION #6:

Technology Will Allow For More Flexibility In Student Demonstrations Of Learning

A Likert Scale ranking of 4.08 for student performance-based technological resources equates to a confidence rating of 82%.

Technology will allow for more flexibility in student demonstrations of learning as evidenced by:
Technology will increase student ownership and direction for learning (4.08)
Students will be allowed more flexible assessment models to demonstrate mastery of learning (4.08)

This projection indicates increased student participation in defining learner goals and student-defined evidence of learning as well as more flexible assessment models due to technology will strengthen in the next five years.

The evidence of changes to assessment due to technology is substantial. At the national level, the changes to student testing such as Smarter Balanced Assessment (SBAC) as well as college board testing and other standards-based benchmarking assessments have moved to technological formats for many reasons. On-line, digital assessments provide more accommodations for learners and can result in faster, if not immediate, feedback.

Schools that have adopted capstone or graduation by demonstration requirements have found that technology provides more flexibility and versatility to allow students to represent their learning in multiple formats. As there are increasing demands for evidence of performance there are increasing demands for technology-based assessment and student demonstration systems.

The traditional education system was built under the premise that students learn at the same pace. Adaptive learning tools, made possible by data science and artificial intelligence, may reset that expectation, by altering material and how it's presented based on student performance. Under this approach, students are given resources based on how they perform on assessments.
From: 5 Tech Trends That Will Transform Education by 2025.

Research Reports Supporting This Technology Trend Projection.

Fullan (2014), recommended more authentic application and real world testing to make learning more relevant. He called for new examples of assessment used in new pedagogies to not just capture content, but to display knowledge mastery, and prepare students for life beyond school. An excellent model, he writes, is to make student work public in an exhibition to receive real world feedback. Technology has given students the ability to present their work in many forms such as multi-media presentations, digital portfolios, or web based platforms, and make their work viewable across the globe. Many schools use the power of digital portfolios to track a student's learning progress throughout their entire K-12 career. Students access their portfolio at any time and reflect upon their growth. "E-Portfolios" allow parents and teachers to view historical student work for more focused feedback and conservations about a child's learning goals (Fullan, 2014. p. 36).

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Plainville has seen teachers turn to a variety of new and innovative ways to plan and implement instruction, as well as share materials and curriculum. But it has been changes in assessing learning that have been most evident. Teachers utilize technology to provide students with options for demonstrating their learning in more varied and creative ways.

The State (CSDE) has adopted a computerized assessment for SBAC which has allowed for a more responsive testing format, adjusting to the student response and providing districts with a quicker response time for results.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Does you district currently have a data system or data dashboards in place to drive student achievement?
2. Is the data presented in form that is easy to use and actionable?
3. Do teachers meet on a regular basis to have conversations about student achievement that is grounded in data?

TOMORROW'S TECHNOLOGY TODAY – ONE DISTRICT'S PATH TO TRANSFORMATION – PLAINVILLE, CT

Professional Learning & Development - How did you initiate teachers experimenting and being supported with technology?
Before the purchasing of any student devices, Plainville had invested in new technology for each teacher/classroom. All teachers K-12 had Mac laptops and all classrooms had interactive screens/projection. Our original model for professional learning was more informal. The IT department did some after school sessions for teachers, and teacher colleagues with tech skills would do what they could to share tech instructional strategies.

Resources – How did you invest in teachers getting the technology needed and students getting the 1:1 devices?
From a district leadership perspective, we decided early on that we would use the attention and build up over Common Core, 21st Century Skills, SBAC, and teacher evaluation to our advantage. We worked for over a year to educate our Board and the community on the advantages having a technologically trained faculty, and the right tools in the hands of teachers and students. Of five schools three had been through construction projects that included technology infrastructure and equipment upgrades. We developed a five-year replacement cycle for student/teacher devices as well as upgrades to infrastructure across all schools. Our selling point to the Board of Ed and the town, was a consistent investment annually of approximately 1% of our entire budget for the "Tech Replacement Plan". It worked because it quantified what we needed and it gave the public some perspective into how little we were asking, in relation to the big-issue problems we were solving.

On-Going Professional Support – How have you worked to provide local, just in time support?
Before purchasing any student devices, we tackled the issue of professional development, and created a new structure. We gave teachers back two (2) work-days (of the 187 contractual working days) for a "Self-Design" model. We moved to a menu-day approach for three (3) additional contractual professional development days, all new learning presented by our own faculty. We offered every teacher in the district the opportunity to become "Google Trained" through an online program offered by Google Apps for Education. Teachers needed to complete the training on their own time and agree to develop at least two workshops for colleagues. Those successful received a stipend and were paid the contractual rate for every two-hour PD session they offered. This was the single best investment throughout this change process. Plainville developed a cadre of 30 teachers, representing all schools and departments to serve as experts and motivators.

Communications – How have you informed and celebrated success in student learning and new instructional practices?
"Digital Pedagogy" became the term used around the district. We discussed our tech efforts at each and every public event, but always under the vision of "changing the way teachers teach and students learn". We had our teachers and students do public demonstrations for our Board members, Town Council, parents and the community. Promoted our STEM curriculum, courses and activities as a tangible link to the results of our changing pedagogy, new equipment, infrastructure improvements, and the distribution of new student's devices (Chromebooks).

Infrastructure – How have you developed the technical support, Wi-Fi infrastructure for school-wide access, and addressed repairs and loss of access to technology?
Plainville is fortunate to have a strong and visionary IT leadership and staff. We leveraged the expertise, and eventually shared it with the municipal government side as well. This willingness to work together with the Town to improve IT across the entire community helped local political leaders see the level of skill our staff bring to the table and it enhanced the support we ultimately receive to keep the vision and planning alive moving forward.

Instructional Practice – How this is transforming teaching – the place, the time, the actions of where and when teaching happens
Equal and complete access for students both in class and at home (Chromebooks and Comcast connection plan) led to a shift in instructional strategies and in planning. Teachers leveraged the access to technology our students had, flipping lessons, blended learning, organizing curricular materials in LMS (Moodle, Google Classroom, Schoology, etc… NOTE-Plainville did not limit or require one specific LMS, instead we allowed teachers to use what they were comfortable with.

Diverse Learning Needs – How has the district incorporated support for special needs and disadvantaged students and families?
We worked with any family that did not have home access. Comcast assisted with a low rate plan ($9 month for internet only) the Town began an initiative to add Wi-Fi internet access to light poles in certain areas of town. We placed a set of Chromebooks at the public library and did some training for the library staff.

Family Engagement – How is Plainville is engaging families in understanding new opportunities for learning and meeting family needs?
At all open house and conference events for the first two years, we ran learning lab type events for parents to stop in, play and learn on the Chromebooks. Our own teachers were the presenters at these events. Many teachers had parents using Chromebooks as part of open house presentations and conferences. We also did a series of training sessions at the Plainville Senior Center, to help inform grandparents who are often caregivers in the before/after school time blocks.

Funding/Resources – How does Plainville sustain funding for technology reform?
The annual "Tech Replacement Plan" was approximately 1%, and politically it became a point of pride for both the Board of Ed and Town Council. The funding was used for equipment in infrastructure, teacher/classroom devices, and student devices (Chromebooks). Each budget development period the BOE would earmark the funding then request from the TC the funds be deposited into a "Capital" spending account on the Town side. The Board and TC collaboratively worked to fund these items in a transparent manner, which was appreciated across the community. In the last few years, the two entities even cooperated to deposit excess funds from other grants, projects and the BOE operating budget into this Technology Replacement (Capital) Fund.

Progress Monitoring – How has Plainville established goals and expectations for teaching and learning to measure progress and impact?
Initially we were very careful not to draw lines in the sand around tech use and the digital technology shift requirements for teachers. Instead we gave teachers time to obtain the level of training and skill they needed, let colleague enthusiasm take hold, and make it clear we were not backing down form our digital pedagogy focus. After the first few years we saw marked change in the number of teachers that had embraced the technology and the positive impact on teaching and learning. In 2013, at convocation, I was comfortable enough in our progress to announce to the administration and faculty that I would not let the very small percentage of teacher still unwilling to embrace this change get in our way. The vast majority of our faculty has worked too hard and invested too much to let anything/anyone slow us down or stand in our way.

Leadership – How has Plainville addressed leadership for both the technical support and the instructional support and vision?
In addition to other aspects already mentioned…we relied heavily on "implementations team" at each level (HS, MS and Elem) as a leadership strategy. These were representative groups of teachers and admin. That met regularly to discuss, plan and implement our tech roll-out, from equipment to PD, this group discussed and decided on nearly everything. They were not all the tech stars of their schools, but were respected within the faculty. The teachers on this committee did a tremendous service to our initiative through word-of-mouth and the obvious bottom-up approach to leading the changes.

Student Learning – How are student learning and demonstrations of learning changing due to new technologies and new access?
The first big wave of change in this area is demonstration of skill/knowledge acquisition. We have seen our teachers turn to a variety of new and innovative ways to plan and implement instruction, as well as share materials and curriculum. But it has been changes in assessing learning that have been most evident. Our teachers began to utilize the technology to provide students with options for demonstrating their learning in more varied and creative ways.

STUDY PROJECTION #7:

The Access to Technology for Instruction Will be 1:1 Devices Using Mixed Platforms

A Likert Scale ranking of 4.06 for 1:1 student access to technology using mixed platforms equates to a confidence rating of 81%.

The dominant access to technology for instruction will be 1:1 devices using mixed platforms (4.06)

This projection indicates that schools will increasingly improve student and staff access to wireless low-cost cloud-based digital resources technologies available during and beyond the school day.

1:1 technology access can be broadly defined as schools assigning a technology device for every student to use at school and take home for academic purposes. 1:1 access is also an instructional model where students have technology and resources such as internet access, digital course information, and digital text books available 24 hours per day and 7 days per week. The emergence of low cost devices, the proliferation of online electronic resources, and assessments that required a device for every student testing will continue to drive districts to make the leap to 1:1.

"Let's drop the phrase "one-to-one" and refer instead to "one-to- world." This simple, one-word change takes us beyond the focus on the boxes and wires and alludes to why we are making the investment in the first place."
November Learning (2013)

Despite the vast promises of 1:1, technology by itself will fail to move the bar on student achievement. As Simon Sinek says, "start with the why". "What is the purpose of learning with technology", and "what advantages can it deliver to our teachers and students?" At the most fundamental level, technology should enhance a student's ability to discover, learn, question, and think critically.

When done right, a successful 1:1 technology program can transform a school district, but it takes a clearly articulated vision and comprehensive implementation plan to be successful. Logistical concerns, upgrading existing infrastructure to meet increased demand, user policies, and expense are just some of the obstacles that district leaders must overcome when choosing to go 1:1. There is a significant amount of time and resources that must be devoted to professional development, curriculum revision and alignment to maximize on the promise of digital education.

"The study found that students in a laptop program outperformed their peers in the control group in literacy response and analysis as well as writing strategies".
What Does the Research Says about 1:1 (2012)

District leaders looking to go 1:1 can support the change process through leadership practices as teachers learn to make the shift from a paper ecosystem of learning, to a focus on a system of digital pedagogy. School leaders are often faced with digitally ready students, but not digitally ready teachers, or a digitally ready curriculum. It takes time for educators to get up to speed and build a comfort level. Leaders need to support professional risk tasking for teachers while they try out new ideas; encourage teams of teachers to form professional learning communities to share ideas and best practices; build capacity; and "practice what they teach". Technology should enhances teaching and should not simply replicate traditional instructional strategies.

Planning must include clear, coherent goals; an implementation plan; educators willing to take risks, and data tracking, and progress monitoring to measure if the rollout is successful and making a difference in the lives of students. A multi-year rollout plan can make the scale of the project manageable. Staggered rollouts of one or two grade levels per year can help with funding and resources, and districts looking to take the 1:1 plunge can learn from the successes of other districts through professional collaborating. A 1:1 initiative might seem daunting early on in the process, but when properly implemented with a purpose, educators can deliver on technology's promise of revolutionizing learning in the 21st century.

"It is impossible to overstate the power of individual teachers in the success or failure of 1:1 computing"
ASCD (2011)

Research Reports Supporting This Technology Trend Projection.

Most district leaders believe that 1:1 technology initiatives help create more engaged learners, and have a significant effect on student achievement (ASCD, 2011). Going 1:1 gives students and teachers access to the best, most current resources available, and increases learning equity among students. Edtech magazine estimates that there are 13.2 million computing devices in the nation's schools, with an estimated ratio of 1 device to every 3.6 students. 81% of students polled thought that using technology in the classroom allowed them to learn in a way that was best suited for them. Sauers and McLeod (2102) found that schools with successful 1:1 programs had higher levels of student engagement, motivation, and attendance, as well as higher writing scores and problem solving skills. They also noted increases in science education outcomes for middle and high school students that used technology on a daily basis.

NETP reports: Over the past 40 years, we have seen unprecedented advances in computing and communications that have led to powerful technology resources and tools for learning. Today, low-cost Internet access devices, easy-to-use digital authoring tools, and the Web facilitate access to information and multimedia learning content, communication, and collaboration. They provide the ability to participate in online learning communities that cross disciplines, organizations, international boundaries, and cultures. Many of these technology resources and tools already are being used within our public education system. We are now, however, at an inflection point for a much bolder transformation of education powered by technology.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Newington Public Schools issued over 1,900 Chromebooks to students in grades 3 to 8 and reallocated all of the iPads in the district to grades K to 2. The 1:1 Device Program facilitates: access to digital educational resources; availability beyond the school day; individualized learning; creativity and innovation; personal and social responsibility; critical thinking and problem solving; communication and collaboration; technology literacy skills; and college and career readiness.

While many feel that this was a sudden implementation, it actually has been in the works for a number of years, with many factors contributing to its growth and success. First, the Information Technology Department began the groundwork a number of years ago through the gradual evolution of the infrastructure to support a 1:1 initiative, including the network's capacity, coverage, and hardware. Furthermore, as far as devices, the district has also participated in many different pilot programs over the last five years including iPads, laptops, Chromebooks, and BYOD. With each of these pilots, the district collected and analyzed data from students, teachers, and parents, before making the decision to move to Chromebooks.

As noted in a number of the districts sharing their efforts in this report, either through local funding or state/grant funding, school districts are investing heavily to provide students with tomorrow's technology today. Schools are providing 1:1 technology for student use at school and home and addressing equity and access in their communities. The Governor's technology grants supported district acquisitions in support of the move to a new state assessment. But, more and more districts are demonstrating commitment of local funds annually to purchase and maintain technology for students and staff.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Is your district currently 1:1? If so, is successful or not and why?
2. Does your district's 1:1 plan have a clear vision for student outcomes, and a way to measure progress towards those goals?
3. Is there a professional learning plan and coaching model in place to build the digital capacity of teachers?

STUDY PROJECTION #8:

Digital Assessment Data Repositories Will Strengthen Instructional Practice & Decisions

A Likert Scale ranking of 4.03 for strengthening instruction through access to data repositories equates to a confidence rating of 81%.

Access to a digital repository of assessment data will strengthen instructional practice and decisions. (4.03)

This projection indicates that schools will access data repositories to strengthen their use of data to inform instructional practice and decisions.

Good teachers have always used formative assessments to guide and adjust their instruction. Assessing student learning is a fundamental part of education, and research shows that quality formative assessment and feedback has a positive impact on student learning. The feedback loop of quality assessment provides more timely feedback to students, and helps teachers individualize and tailor instruction to the individual student. Good assessment for learning is at the center of curriculum and instruction. Timely assessment data allows teachers to gauge student understanding, anticipate misconceptions, and scaffold learning. Assessment is a continual, ongoing process of gathering data, and reflecting to make informed judgments to improve student learning.

" The potential of technology to improve formative assessment is significant"

National Center for Research on Evaluation

Teachers can use technology to gather evidence of student learning, and to make objective judgments on student achievement against goals and standards. Technology gives us the ability to make students and teachers partners in the assessment and learning process. Learner feedback about lessons can help educators improve content for future lessons and improve classrooms practice. Teachers can report to parents on how far their child has progressed during the year, how they compare to relevant standards, and what the student, the parent and the teacher need do to improve student performance. Digital assessments allow teachers to provide timely, transparent data for parents, keeping parents in the loop about their child's academic progress. A variety of assessment methods provide teachers with a more holistic picture of a student's particular strengths and weaknesses. Technology provides multiple ways to access student work such as journals, multimedia, and electronic portfolios. Technology has allowed teachers to deliver more complex assessment experiences such as simulations which incorporate authentic real inquiry based world experiences in context

Digital assessments can offer remediation of academic deficits. For example, progress monitoring and diagnostic assessment software such as STAR allow educators to gather baseline student performance data against a set of benchmarks and standards to implement research based interventions tailored to a particular student. READ 180 is a blended learning technology solution that uses adaptive technology, real-time data, and instant feedback to help teachers with struggling readers. Formative assessments such as KAHOOT (www.kahoot.it) and Socratic (www.socratic.org) provide fun and engaging activities with real time feedback on class and individual student levels of understanding.

"Socrative empowers you to engage and assess your students as learning happens.

Through the use of real-time questioning, result aggregation, and visualization, you have instant insight into levels of understanding so you can use class time to better collaborate and grow as a community of learners.

Socrative.com

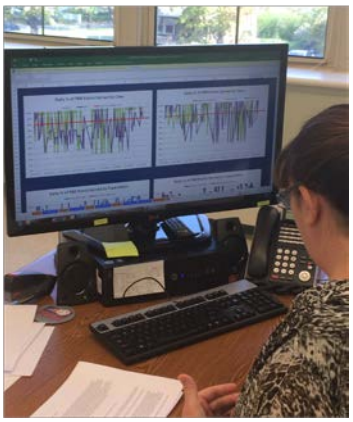
By providing educators with access to high quality digital resources and assessments, district leaders can support rapid feedback on learning progress, and more achieve more complex learning in the process. Summative assessment scores at the end of a curricular unit should not be a surprise to either teachers or students. Formative assessment data gathered over the length of a unit can identify student levels of understanding, target students for intervention, and personalize learning. Quality formative assessment, when aided by technology, can provide both teachers and students with a clearer picture of learning and increase learning outcomes for all.

Research Reports Supporting This Technology Trend Projection.

Fullan (2014), that most existing assessments measured strictly content reproduction and not deep learning tasks, and noted that they were the biggest "barriers to the widespread adoption of new pedagogies (p. 9). Digital assessment that shared and tailored assessment to the individual got to the core of deeper learner as they adapted to the specific learner needs of the student. Fullan most traditional assessments to be lacking in an attempt to measure deeper learning, and most existed for accountability purposes and compliance. He felt that technology posed a "new opportunity" to measure what learning is really occurring, and that most educators agreed that it was time to change traditional assessment practices (p. 38). Fullan found new digital forms of assessment to be at the "very early stage of development, and represents a major challenge in the immediate future" (p. 70). He noted that it would be easier to develop new digital pedagogies than it will be to assess them. He also noted that the "two domains—pedagogical innovation and assessment of learning must go hand in hand". And "the next phase of (digital learning) must be marked by identifying and developing measures of the deep learning outcomes".

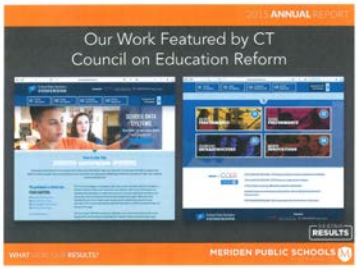
NETP recommends: Interoperable formative assessment formats offered by major testing consortia for use by educators throughout the year are an important first step. The next generation of tools should integrate across platforms and tools seamlessly, be designed with a mobile-first mindset, and be guided by UD and UDL principles to ensure accessibility by all stakeholders. Although current products and dashboards include basic functionality and features that improve on those of their predecessors, future iterations should be built on a premise of feedback and conversation, allowing learners and families to discuss learning outcomes and evidence and increasing agency and ownership across stakeholder groups.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.



Meriden has been effectively tracking teacher success in several ways for many years. The district uses a tool called the Meriden Teacher Dashboard, which is not evaluative, but rather serves as the basis for conversations about professional growth. Principals can see teacher's data on personal absences and student discipline, as compared to peer, school and district averages. This allows principals and teachers to work together to change behaviors for more positive outcomes in the school and classroom.

Meriden collects data on the classroom effectiveness of teachers and can highlight teachers who are high performers through the Meriden Teachers Sharing Success program. This program asks high-performing teachers to open up their classrooms as models for other teachers. Through a Peer Coaching program, teachers in the same content area and grade-level can also volunteer to support each other. Both of these programs provide individualized professional development that is based on the premise that Meriden's best teachers are, in fact, their teachers.



The Meriden Public Schools uses many innovative practices to ensure that its data systems are integrated and support the district's mission. Meriden tracks academic, emotional, climate, and behavioral data to monitor students' progress in meeting success. As an example, the district uses the School-Wide Information System (SWIS) to display longitudinal data on student behavior in meaningful ways. The system allows administrators and teachers to observe trends in behavior, which prompts data-driven decisions about the types of interventions that will improve outcomes for students. SWIS and other data points are discussed in regular data team meetings that Meriden holds to make sure all students stay on track.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. What types of digital assessment tools is your district currently using?
2. Is the feedback provided through digital assessment being used to both guide instruction, and help students reflect on their own learning?
3. Are digital tools being used by students to provide multiple pathways to demonstrate their learning?

STUDY PROJECTION #9:

Technology-Supported Learning Analytics Strengthens Instructional Design & Response

Learning Analytics impact on teaching received a Likert Scale projection ranking of 3.92 equating to a confidence rating of 78%.

Learning analytics will strengthen the capacity to improve instructional design and instructional response. (3.92)

This projection indicates that improved access to technological resources in the next five years will result in better use of analytics to drive instructional decisions for student success.

Data should be accessible and easy to read, and help educators make informed decisions about the next steps of action. Data gives students a way to measure their own progress, gives them a sense of ownership, and motivates them towards goals. The promise of learning analytics is to help students and teachers measure daily progress towards their learning goals. Where state data systems generally provide summary district data at the macro level (NETP, 2016), data used in the classroom can provide a transparent picture of achievement, and help students and teachers identify strengths or weaknesses.

"Technology provides a unifying platform to connect data, people, content, resources, expertise, and learning experiences that can inspire and empower teachers and learners"
NETP (2016)

The influx of technology-based data analytic systems has allowed districts to leverage the power of data walls, while solving the previous shortcomings of the bulletin board. It has automated the time intensive process of compiling and calculating classroom data, and freed up valuable teacher time to work with students. The evolution of technology-based data systems literally has allowed districts to capture a students' performance over their entire K-12 career, tracking effective classroom interventions, and making predictions about future progress. Information from an analytic system provides educators with a holistic, more nuanced picture of what is really happening with our students.

Software has allowed educators to adapt instruction and assessments to the specific needs of the individual learner. Online diagnostics from formative assessments provide immediate feedback to students and teachers, and drive the work of professional learning communities or grade level data teams by identifying needs for improvement and providing data to guide the discussions (NETP, 2016). Analytics allow educators to review student response data in real-time.

"education systems will leverage the power of technology and data to measure what matters and improve learning"
NETP (2016)

Technology empowered assessment can not only adapt to an individual student's responses, but also pipe that information to a data system for instant analysis automatically disaggregated by subgroups. Analytic systems provide district leaders with real-time data that is crucial towards making strides in equity and closing the student achievement gap. Analytic systems can identify at-risk students earlier, resulting in interventions that can turn the tide for student success. They can provide a holistic picture of a student including, behavior, attendance, and assessment data.

Envision a scenario where each day, students and teachers can log onto any device and have instant access to an updated dashboard of their academic progress. Students can meet with their teachers in morning to set the learning goals for the day based on those dashboards. At the end of the day, grade level teams of teachers can meet to review the learning outcomes based on automatically updated data, and use that information to plan tomorrow's lesson. Parents can log on at night to review their child's learning day and check homework assignments, all in a confidential manner. That is the promise of technology and learning analytics.

"The appropriate use of data to personalize learning, improve practice and visualize student progress for teachers, families and students." NETP (2016).

Research Reports Supporting This Technology Trend Projection.

The National Educational Technology Plan (NETP, 2016) recommends the use of learning analytics to allow educators to review individual student responses and class wide engagement data quickly, giving greater insight on how students are mastering key concepts. The NETP plan also recommended that "teachers collaborate to make instructional decisions based on a diverse data set, including student and teacher observations and reflections, student work, formative and summative assessment results, and data from analytics embedded within learning activities and software aided by real-time availability of data and visualizations, such as information dashboards" (NETP, 2016. P.41). The NETP recommended data dashboards as a way to "integrate information from assessments, learning tools, educator observations, and other sources to provide compelling, comprehensive visual representations of student progress in real time. A learner's attendance data, feedback from instructors, summative evaluation data, and other useful information all can be made available in formats specific to different stakeholders. Learning dashboards can present this data in easy-to-understand graphic interfaces" (p. 60). The NETP goes on to propose that educators use data dashboards to help students track their learning progression, as well as help identify at risk students. At the district level, dashboards can help "educators to track learner performance across time as well as monitor groups of students to identify shifts in equity, opportunity, and achievement gaps. Although teacher dashboards are becoming commonplace, student and family dashboards can offer promising opportunities to help students take control of their own learning." (NETP, 2016. p.41).

The New Media Consortium (NMC, 2015), found learning analytics to be a significant technological trend that could increase student success and personalization. Recent advancement in technology based learning analytic systems continue to advance this trend in the literature with the promise of real-time learner data to accelerate student learning. And, finally, Fullan (2015) found the use of student performance data crucial evidence to informing effective instruction, personalization, and real-time feedback to students.

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

Meriden staff and students are encouraged to "Take Charge of Your Learning". Innovative teachers who embody the concepts of student centered learning are recognized through the I'm Charged! Initiative. The 11 program criteria include engaging in ongoing professional development and lifelong learning, leveraging technology to communicate with students and parents, assessing student progress using digital tools for timely feedback and to inform instruction, and using technology to provide meaningful learning experiences for students. Once selected these classroom teachers serve as exemplars and contribute to the MPS learning community by sharing best practices with colleagues.

Meriden has developed two confidential surveys, as well as an online reporting portal for students in need of assistance. The *Getting to Know You Survey* is administered to students in grades 3-11 in the spring. This instrument allows students to identify their interests and measures student mindset and motivation by subject area. Teachers are then able to access the results in order to build better relationships and create more meaningful learning experiences for their students.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. Does you district currently have a data system or data dashboards in place to drive student achievement?
2. Is the data presented in form that is readily available, easy to use and actionable?
3. Do teachers meet on a regular basis to have conversations about student achievement that is grounded in data?

STUDY PROJECTION #10

10. The Learning Environment Will Change

A Likert Scale ranking of 3.85 for changes to the learning environment equates to a confidence rating of 77%.

Re-designed classrooms will optimize technology use for learning (3.85)

This projection indicates that resources in the next five years will result in classroom environments changing to more effectively utilize technology.

The impact of technology on society, and the emergence of new digital pedagogies have forced many districts to redefine what classrooms spaces look like. Educators are rethinking and re-designing existing physical learning spaces to optimize technology use to support learning. This requires both a physical and conceptual shift in the way we think about classrooms. The emergence of blended-learning, virtual course work, and online content has moved instruction beyond the classroom and school walls. This has driven a change in the way teaching and learning occurs and what physical learning spaces look like. With the emergence of 1:1 access, the locus of technology has shifted to the individual student. Standalone, dedicated computer labs have become largely redundant.

As I design my new classroom, I've come to realize that regardless of how much "technology" a classroom has, it isn't the technology that is the most important component—but rather how we realign physical and virtual learning spaces to fit student needs.." Extreme Technology Classroom Makeover,(2015).

To meet the technological evolution challenges of classroom design, and accommodate 21st century learning, school buildings require a significant investment in infrastructure. Schools must have robust Wi-Fi connectivity throughout to access digital learning content, and spaces must be flexible and adaptable enough to meet future needs. Technology must be easily accessible to both teacher and students. The physical arrangement of desks and furniture must support real time collaboration between students. Classrooms must be optimized with charging stations devices and USB ports for a variety of devices. Smart screens have taken the place of projectors to allow students to demonstrate their work with their peers, watch multi-media content and live stream lessons. Classrooms are becoming project-based student centers of innovation where students use technology to collaborate and solve real world problems.

"Rigidity is the nemesis of innovative education design" School Facility Design (2015)

Traditional single use lab spaces are being repurposed into multi-purpose, inquiry-based Maker Spaces and STEM labs where students engage in hands on, project-based experiential learning. Maker Spaces are not strictly computer or manufacturing labs, but rather represent a marriage of traditional technology education, STEM education, and academic course work. They are centers of innovation and experimentation where students conceptualize an idea, design and visualize it on a computer, then prototype it with a 3-D printer into a final product that they can hold and touch. Such labs cultivate a student's artistic and analytical thought process and engage students in what Fullan (2014) refers to as a much deeper learning.

"Kids are saying they want to learn more about technology and science, but they also want to experience it creatively and use it personally," ISTE (2014)

Schools are also increasingly trying to meet student technology needs in tomorrow's workplace. For example, The Hour of Code is a global movement to introduce students to the concepts of computer science, logic, and problem solving that sets a foundation for a successful 21st career path in application design. Redesign initiatives such as the High School Reimagined project, and The Super School Project are bringing together education experts, employers, teachers, and students together for collaborative conversations about what the schools of the future will look like. All of the initiatives in this report such as digital collaboration, innovation, personalized learning, and 1:1 access put major technological demands on existing spaces. Classroom design can be a tool to support a better learner experience, foster improved educational outcomes, and cultivate the 21st century skills that students will need to fill the jobs of tomorrow.

Research Reports Supporting This Technology Trend Projection.

New Media Horizon Report (2015) cites emerging research on the role that technology has on changing the class room environment. In a recent two-year study funded by the Dell foundation, researchers found that blended learning spaces allowed educators to better personalize the learning experience, and facilitate small group instruction. Teachers also reported that their students felt a greater sense of accountability in their learning process, and a more "self-directed culture" overall. (NMC, 2014, p. 16).

Fullan (2014) suggested that "when ubiquitous technology is implemented and every student has a portable device," existing computer labs "can be repurposed into spaces such as classrooms or meeting rooms" (p. 72), and can save districts significant capital expense in the process. He also noted that "new digital pedagogies benefit from different types of facilities with different space arrangements than traditional classroom-based schools". Fullan (2014) is believes that traditional classroom structure will be supported by technology, but not entirely replaced by virtual classrooms, as most classrooms move to some sort of blended environment in the next five years.

The proliferation of Makerspaces and 3-D printing in schools is again most strongly supported in The New Media Horizon Report (2015), which cited multiple examples of how these new classroom environments. The NMC reports found that makerspaces were allowing students to bring their creative ideas from conception to practice, explore authentic application if their idea, and help solve communal problems in the process (NMC, 2014. p. 40). (*For detailed examples of Makerspaces and 3-D printing in practice, refer to NMC, 2014. pp. 38-42)*

Tomorrow's Technology Today: This trend projection can be seen in Connecticut schools where promising practices are changing teaching and learning.

The Wallingford Public School District is committed to increasing student engagement through project-based learning opportunities. One exciting initiative is the 3-D Learning Program that empowers creative, innovative problem-solving and engages students in a collaborative atmosphere that promotes unique and personalized learning experiences to increase student success. The Wallingford 3-D Learning Program is founded in district initiatives such as mastery-based learning and the Wallingford 100.

The Wallingford **3-D** Learning Program is designed to create a personalized, constructivist-learning opportunity for all students. Students are encouraged to collaborate to **DREAM** big, **DESIGN** creatively, and **DO** what innovators, creators, and engineers embark on every day.

Through the implementation of makerspaces at both middle school and all four 3-5 elementary schools, all students are provided opportunities to explore creative problem-solving while at the same time increasing their STEM skills. The spaces are equipped with unique flexible furniture and a myriad of technical tools ranging from 3D printers to drafting tables and Legos.

Suggested Guiding Questions Related to District Implementation of This Area of Technology Utilization

1. To what extent do the learning spaces in your district support technology based instruction, and student collaboration?
2. How can your existing classrooms be adapted to meet the needs of future learners?
3. Is a technology rich learning environment part of the conversation when discussing renovating existing classroom space or planning new construction projects?
4. Does your school have the ability to construct a maker space, and how could the current curriculum support such experiential and project based learning?

DIMINISHING TRENDS IN TECHNOLOGY APPLICATIONS

In addition to asking instructional technology specialists throughout the Connecticut educational system for their projections on the emerging trends in applications of technology for teaching and learning over the next five (5) years, respondents were also asked to identify one or two diminishing trends. The purpose of this survey data was to provide some context for instructional planned to consider what, if any, present uses of technology may be proving of less value or may be replaced by new or emerging technologies.

The results of the survey respondents are provided below. These twelve (12) indicators were not put through a validation round of Likert Scale confidence ratings. The focus of the survey study was to project the future uses and applications of technology for teaching and learning. The suggestions of diminishing trends are offered only as a perspective and reference to the readers. The trends are listed in the order and magnitude of the frequency of being identified by survey respondents.

REPORTED DIMINISHING TRENDS IN TECHNOLOGY APPLICATIONS FOR TEACHING AND LEARNING

1.	SMART Boards and large scale student demonstration systems would be replaced by other reporting systems.
2.	Dedicated computer labs would be replaced or lessened by the use of 1:1 student use of technology.
3.	Localized use of applications and storage will be replaced by cloud-based storage and access.
4.	Single platform applications and operating systems will no longer be necessary for school-wide instructional systems.
5.	Laptop computers will diminish (as computer labs above) for student access to 1:1 technology.
6.	Student 'clicker' input devices will no longer be needed for other data response systems. (Use of 1:1)
7.	Keyboarding skills will no longer be taught in isolation.
8.	Paid software applications will lessen to the strengthening of free/public access applications.
9.	General, group professional development will substantially change to more personalized professional learning.
10.	BYOD will be replaced by school provided technology.
11.	Restrictions on student access to technology will reduce as personal devices and access is incorporated into instruction.
12.	Flipped classrooms will diminish due to improved, alternative instructional models that capitalize on technology.

The first six projections indicate that previously designed and utilized systems will be replaced by advances in technology. While SMART Boards are fairly common in many schools, the technology requiring projection devices is undergoing replacement by smart screen, interactive televisions not only due to cost savings over short-life projector lamps but also because the increasing use of touchscreen 1:1 low-cost cloud-based digital resources is fostering more interest in large scale similar technology for student use during demonstrations of learning.

Similarly, computer laboratories while considered valuable as productions centers for specific content areas (i.e. drafting, science) are being replaced or dismantled where students are provided 1:1 wireless low-cost cloud-based digital resources. Accessibility is a significant factor of effectiveness in student use of technology. Where technology hardware and memory capacity was costly, schools and districts established labs and local file servers to create low cost, dumb-terminal laboratories. However, as cloud-based memory storage became more economical it is replacing school and district need for laboratories and resident large-scale memory storage.

Projections 8-12 speak more to the changing expectations for the uses and benefits of technology. Concurrent to the continued development of new applications of technology supported by a billion dollar educational industry is the increasing access of schools to free/public applications. In some cases, the cost for some 'free' application (App) access is borne by wider-spread public interest in the same resources resulting in financing through advertisement.

Technology is proving to provide more personalized instruction and therefore is prompting more personalized professional learning. Practices where schools seeking to improve student access by allowing personal devices to be brought to school (BYOD) are quickly turning to district-provided technologies as a necessary 'tool' for instruction and learning.

Other trend projections that were reported included the position that when technology advances ahead of school integration of such tools schools have imposed restrictions on the use of cell phones and social networks. However, these tools are a part of the fabric of society and more schools are now looking to create effective and safe applications of such tools to align with social and cultural interests.

While the trend projections identify with strong confidence continued use of media-based and cloud based learning resources such as KHAN Academy, the diminishing trend projection identified diminished reliance on a 'flipped classroom' where primary instruction is provided by internet resources during non-school hours. As schools embrace more technology, strengthen instructional practices using 1:1 student access and integrate applications for teaching and learning, web-based instruction will supplement, not supplant, teaching.

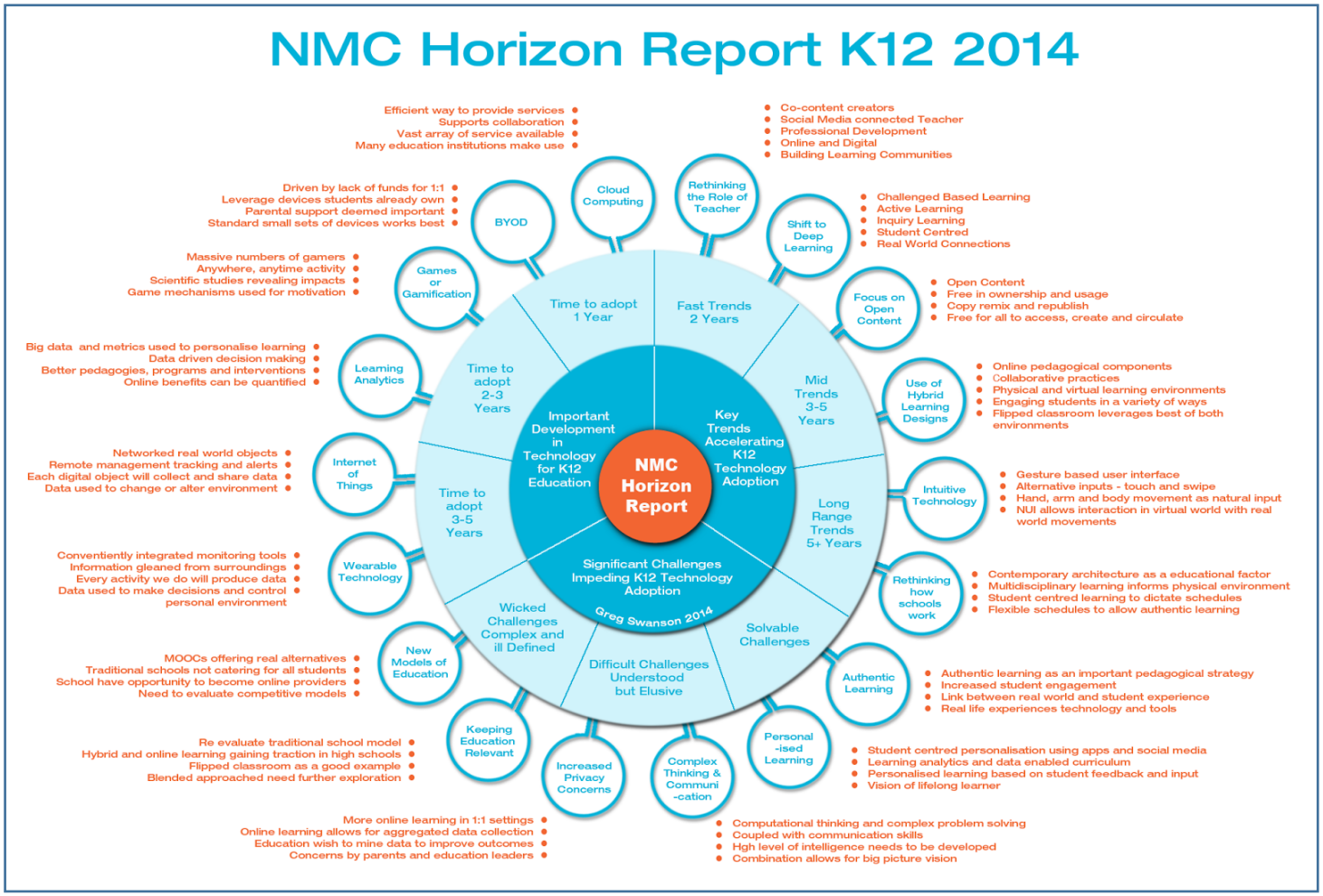
STUDY IMPLCATIONS FOR DISTRICT AND SCHOOLS

How can this study help districts plan for technology-supported transformation of education?

The projection of promising technology practices which will strengthen over the next five years provides districts and schools with a focus on planning for technology-supported instruction to improve student learning and student results. The evidence of recent reports and research validating local Connecticut educator projections provides additional support and encouragement to consider such factors as districts work to improve teaching, learning and leading and close the gap in student achievement. Districts may wish to use the ten projections as a rubric for monitoring progress in technology applications. The projections may be helpful to districts and schools developing long-range or strategic plans for improvement. The diminishing trends provide ideas for consideration in re-assigning or re-purposing existing technological resources. The reference resources provided in this report serve as support to study teams engaged in transformational reform efforts. The local examples of promising practices or exemplars provides opportunities for readers to visit sites for context or understanding of the challenges and successful practices that were experienced by districts or schools which are demonstrating some evidence using technology to support instructional innovation and impact.

The systemic nature of technology-supported transformation of education.

While each of the projections represent a specific focus or initiative for a district, many of the projections serve to support or enable other projections. Certainly, providing wireless, 1:1 access low-cost cloud-based digital resources to students for school and home use will increase student access to web-based resources for learning. That access will require the professional learning of educators to incorporate these recourses into safe, meaningful, value-added instructional opportunities. Over time, earlier or pre-defined learner expectations can and will change to include student-interests and expectations. This personalization of instruction is a cornerstone of blended learning.



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