CHAPTER 2

The New Classroom

"If you don't know where you are going, any road will get you there." —LEWIS CARROLL

When thinking about the digital transformation of education, it's easy to conjure up visions of a futuristic, Jetson-like school with robot teachers, levitating classrooms, students learning while asleep, and so on. We are fascinated with such fanciful visions for good reason. For while the classroom that is described in novels set in the 19th century is one that no longer truly serves our population, it still, in many ways, continues to define the contemporary school experience.

Such classrooms, no doubt, will give way to newer learning environments, but what will the new classroom be like? Will it be defined by an accumulation of new technology items, or a body of changes to support technology use that stem from innovations in architecture and interior design? Will it be a set of promising new teaching and learning practices and, perhaps, a new classroom culture to support them?

It's important for the digital change agent to develop a good sense of what we might call the digital learning environment. In other words, what is perceived as the ideal situation for teaching and learning that will result from the development and adoption of practice that embraces technology, and how technology will function to appropriately and effectively support the brand of teaching and learning that is truly needed and is evolving.

This chapter will explore the many elements of the digital learning environment, including the physical setting, the digital infrastructure, and the body of devices that reside there; from the instructional resources and practices to apply them, to the body of understandings and goals that validate and guide the use of technology in the context of education.

FROM TRADITIONAL CLASSROOM TO DIGITAL LEARNING ENVIRONMENT

If one were to search the web for a term like "digital learning environment of the future," one would come across descriptions of ideal alternatives to the current, traditional classroom. These would include descriptions of everything from floor to ceiling digital displays, wired and Wi-Fi-enabled soundproof study spaces, and student personal devices. It's worth noting that often such visions of "the school of tomorrow" are offered by technology vendors and the entertainment industry.

In all likelihood, though, a very opposite reality is the one that the school digital change agents will face for some time to come. The institution of school changes very slowly. While even those schools built recently *may* have a modern look and feel, and may have some elegant and creative use of common and specialized spaces, deeply ingrained functional aspects of school still feature traditional reliance on separated classrooms that are set for 30 students, more or less, with simple, moveable desks and chairs. The key point here is that these instructional spaces were not designed for technology use. They are generic, intended to be useful for whatever

instructional activity is to go on in them and with the understanding that teachers will make slight modifications (like the layout of the moveable furniture) to make them suitable for the grade and subject being taught. In many, the original electrical wiring, lighting, and other physical attributes are set features, although certainly many classrooms have had their wiring modified somewhat to accommodate increased need. Of course, modifications of all sorts can be made, but these require dealing with bureaucratic, political, budgetary, and other negotiations that likely are beyond the capacity to navigate by educators who are focused, appropriately, on improving teaching and learning.

In view of the above, in understanding classroom tech use, and especially in planning for it, it's wise to survey and understand the capacity and suitability of classrooms in which the technology will be employed—and to do so from the point of view of technology use—ahead of making decisions. Education has a long history of inspired and well-intentioned colleagues making plans and purchases based on the potential of resources, without considering the specific environment in which they will be used, only to find out down the road that implementation was less than desired because of the features of the classroom itself.

TIP:

It is unlikely that those who take on the work of digital change agent will have deep experience and expertise in selecting and maintaining hardware, nor is it likely that those who have this essential knowledge set will take on that work. One approach is to partner with those who do, either within the district or by reaching out to those whom the district outsources solutions to this need. Perhaps even better and easier would be to join a professional learning network (PLN) for school technologists. There may be such a PLN or discussion board already set up in your district. Another option is the ISTE Technology Coordinators' Network, an active group of a few thousand good folks who have, in the aggregate, accrued an awesome body of this type of knowledge and who generously share information and opinion in this area.

RESOURCES THAT SUPPORT LEARNING IN THE DIGITAL AGE

Currently, there is much activity in the acquisition, adoption, and implementation of digital technology in our schools and classrooms. Unfortunately, a good deal of this can be characterized as schools simply "doing technology"—in other words, conforming to a current trend and fad in the field without truly understanding the full implications and far-reaching meaning of doing so. Many are chasing short-term advantages and improvements piecemeal, without awareness of how the various pieces fit together and the picture they will form when eventually all are in place.

With the constant emergence of digital resources (many of them free or "open") and requirements to adopt them from districts or state departments of education or from funders or other interested parties that are focused on single, specific uses of technology, it is small wonder that school communities are encouraged to embrace individual items to perform individual functions, without much regard to how they all may fit sensibly into an ever-increasing body of digital additions to the world teachers work in.

Consequently, there's much involvement in "doing" without benefit of a big picture awareness of what it all means. To help make sense from this growing, potentially confusing mass, every school needs members of its community who see and can share a big picture understanding. Without that, much may be done, but arrival at a worthwhile destination is doubtful.

The other major dimension to the new, digital learning environment is composed of the resources that run on devices and that directly shape the activities in which students are engaged. In supporting the school community to embrace this new learning environment, the learning management system (or LMS) is a valuable, supportive resource.

What's an LMS and Why Opt to Use One?

In short, an LMS is a common virtual platform designed to make it easy for teachers and students to access resources from multiple sources. It's a home base, a platform that members of the school community can use to participate in the online life of the school and their class. It can function as an extended group or public communications resource, and can support the work and activities of learners as individuals or in small groups. It can

be a vehicle for teachers to share information with students in their classes, to distribute assignments, and to receive completed work; they can provide feedback and grades, and keep records of all things that happen in the LMS environment. Beyond all this, using the LMS becomes an enlightening immersion in classroom technology for newcomers to this dimension of education, one that supports users as they become comfortable technology and explore its dimensions.

In her article titled "LMS Enhances K12 Instruction," Katie Kilfoyle Remis, states:

> *Without an LMS, teachers and students trying to access online education tools must sign in and out of multiple applications, including open education resources, subscription-based learning programs, and websites that teachers created for their courses. Teachers also need to log in to the student information system and administrative applications, such as grade books.* (REMIS, 2015)

If your school hasn't adopted an LMS yet, or is contemplating doing so, this is one "square one starting point" to take seriously. It is a low-cost (no cost in many respects), simple, and effective way for a school to begin transformatively integrating technology. Further, schools that begin this way soon have deep experience with a model that can later account for other types of technology integration.

In conducting one of my online graduate-level courses for practicing teachers who intend to become school technologists, one of my students volunteered that he felt that the approach taken by his school (inner-city New York City) was a wise one. His school had adopted a small handful of technology items that were used across the grades, classes, and subjects. These included class sets of laptops (one rolling cart in which the laptops are secured and charged), interactive whiteboards in most classrooms, and an LMS for all classes. This approach allows schools that are just emerging from minimal technology use to have a vibrant tech use program, but one that is simple enough to ensure success as the school grows into deeper tech use, building on successes without being overwhelming. By deploying just a small handful of devices, albeit devices that are highly flexible and can accommodate many varieties of digital content, learning activities, and approaches to instruction, the school (or at least a good portion of it) can move as a whole into new stages of the evolution of education. There are fewer key skills for which teachers need professional development, fewer

types of technical issues to address when things go wrong, and a more uniform way for the school culture to change as it embraces the new.

Google Classroom

As is the case for the school mentioned above, the LMS (whether a full blown, true LMS or a similar resource tapped to function as one) can prove to be an important initial resource for schools attempting to expand their technology use program to a fully comprehensive one. There are numerous choices for this category of resource. Many schools have opted to adopt Google Classroom, a free and easy to use resource, as their LMS. In a review on the Common Sense Education blog, teacher Marjorie P. describes Google Classroom as follows:

> *Simply put, Google Classroom serves as the mission control for your classroom— incorporating communication, collaboration, and assessment in one shared, digital space. Teachers create virtual classrooms for each of their classes. Students then join the classroom using a class code. The stream section functions a lot like a Facebook wall where teachers can post assignments, questions, announcements, and so on. Students are also able to post announcements, including multimedia posts. Parents receive daily or weekly summaries of student work and announcements. Parents and guardians can remain totally in the loop and correspond with teachers. The possibilities with Google Classroom are endless because it integrates with the GAFE apps and with other teaching tools as well.* (COMMON SENSE MEDIA, 2017)

DEVICES AND INFRASTRUCTURE

The above sections focus on how technology interfaces with practice and curricular needs and the ways the school is organized to address them. This is in keeping with well-thought-out priorities. Unfortunately, in the history of evolving digital learning environments, educators have mistakenly devices and infrastructure the top priority. This leaves them in the position of figuring out what they can do, from the instructional point of view, with the technology they have already invested in, rather than first informing themselves about what's possible in terms of technology-

redefined teaching and learning, then deciding on which approaches and practices they want to make part of their program, and only then acquiring the devices and infrastructure necessary to do so.

Three Teaching Modalities and How Technology Can Support Them

One important way to understand and plan for devices and infrastructure is to focus on the ways that teachers work with students. While there are many, an easy way to look at this is that teachers are generally assigned to work with classes of roughly 30 students. In order to maximize instructional impact, teachers will teach in three modalities:

1. They'll conduct whole-class lessons and discussions.

2. They'll direct students (most frequently when they are seated in a whole-class configuration) to work independently (this includes doing homework and independent research and projects).

3. They'll create (or direct students to form their own) small study or work groups, generally of two to four students each. This is a long-proven practice.

To see if your planning is on track, ask "Does the technology available to teachers and students support all three modalities?"

The whole-class modality has been neatly handled by the use of interactive whiteboards. These function as a large-screen display that all class members can see during whole-class lessons and discussions. Some teachers also encourage students in small groups or individually to use these, when appropriate, to support learning.

Some schools have successfully taken the approach of standardizing technology use with the distribution and deployment of just a few varieties of common classroom devices, such as interactive whiteboards, digital document cameras, and mobile carts with classroom sets of laptops or tablets. They train the teachers in their use (both how to operate them physically, handle them from the classroom management perspective, and how to use them in teaching). By limiting the universe of what they use

(at least in the early stages of digitally transforming themselves), schools simplify and manage what might be seen as an overwhelming body of work and change.

Class sets of laptops, Chromebooks, or tablets (e.g., iPads) are easy to use to support paired or small-group instruction, with groups or pairs often sharing the device. This may be done to extend the usefulness of such devices when there isn't a single device available for every student or because there is some instructional advantage in doing so.

Ideally, there is a single device available for each student for those times that the teacher, acting as instructional designer, feels that individual work best supports the learning that is targeted. Other times the sharing takes place in order to give a degree of access to each student, although the impact of sharing may be that it detracts as sharing a book might.

School Technology for Administrative Tasks

While the major thrust of a school's full realization of the potential of technology to enable it to provide the best experience possible for students should be the way technology impacts teaching and learning, we should note briefly that, toward that end, there are numerous administrative chores schools must handle. Importantly, these relate to student learning, too, in the sense that when technology is applied, it can free up all parties to devote more time and energy to the school's core business, teaching and learning. These chores are unavoidable and can get in the way of teaching and learning. They include attendance, student records, communicating with parents and collecting paperwork from them, communications throughout the staff, and administrative needs (like buses, lunch, fees, extracurricular activities, etc.) that more often are better handled through the wide variety of emerging digital resources.

FEATURES OF THE DIGITAL LEARNING ENVIRONMENT

Digital devices, infrastructure, and bandwidth are not what constitute the digital learning environment. They should be considered as resources

required to establish and support the environment. Although it would be pointless, one could use connected devices and the digital resources that run on them simply to transcribe teaching and learning as it has existed for a very long time into a digital version that would barely scratch the surface of what technology can help accomplish. Some of the most salient features of this new environment are briefly identified and explained below.

Learning ABOUT Technology vs. Learning WITH Technology

For many, the hardest part of the digital shift to understand is that the primary place and purpose of technology in our schools is not to have students learn about technology itself.

Yes, we want them to know the basics of technology, to gain some understanding of how it works and pick up some of its key skills, like simple programming and coding, just as we want them to understand and know a bit about everything important that goes on in and shapes the world. However, by far the greatest point of technology use programs is the way that the technology transforms how people think and work and communicate. It does this profoundly in the real world beyond school—those are the things that technology was created to do in the first place—and we want to bring the power of that transformation into the nature and quality of the educational experience we offer our students.

21st Century Skills

One group that has studied technology's impact and resultant changes in thought, work, and communication is the Partnership for 21st Century Skills (P21), which has produced a good deal of material to explain it—much of it with significant implications for the field of education. Examining the body of work P21 has generated, one sees that it has identified areas of learning that are either new to the digital age or that have assumed a particularly high importance in it. These are all associated with technology, but are not technology in and of themselves.

At the core of the group's work is the P21 Framework, which represents 21st century student outcomes, organized into four areas:

- **KEY SUBJECTS:** English and world language arts, arts, STEM subjects, and social studies

- **LEARNING AND INNOVATION:** critical thinking, communication, collaboration, and creativity, often referred to as the four Cs

- **LIFE AND CAREER SKILLS AND INFORMATION:** flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility

- **MEDIA, AND TECHNOLOGY SKILLS:** creating, evaluating, and effectively using information, media, and technology

Note that while the framework represents these areas distinctly for descriptive purposes, P21 views all the components as fully interconnected in the process of 21st century teaching and learning. Moreover, the framework lists the support systems of standards and assessments, curriculum and instruction, professional development, and learning environments as essential elements.

Digital Content

The most traditional and classic approach to education involves distributing content to students; having them review and reflect on it; discussing the content that's been consumed in whole-class discussions or through one-on-one questions; having students respond to it in quiz, test, essay, or other format to check on what's been learned; and then either addressing gaps in what's been learned or moving on to the next theme.

Education reformers have long found problems with this approach. One is that the content itself is too limited to produce good learning results for our very inclusive school populations. The new digital content, however, has the potential to afford great flexibility in a number of ways.

Format

A great deal of teaching and learning has traditionally been accommodated by the use of the classic textbook, which set identical material before each student. Add a few collections of essays or short stories and class subscriptions to periodicals and that pretty much sums up the material that drove (in many cases, still drives) school over the past 150 years. Digital content allows for the format (the size, style, font, color, and so on) to be varied, may provide some portions in media (such as animations,

video, and sound clips), and may be searched for specific items. Some versions allow for teachers to customize the content for specific classes and students, by annotating content and adding links to related content. Teachers may even be able to track which items have been consumed and responded to by students. The possibilities for customizing the content are vast, and producers often upgrade by incorporating features and tools from recently emerged resources, such as new channels for sharing via social media applications.

Distribution

With digital content, it's possible for a class to receive a variety of texts, perhaps with different individuals receiving different versions or titles. In addition to the burden of carrying books back and forth from home to school, shortages often necessitated sharing books, which, in turn, required schools to allow students access to texts only when in class or at specific, narrow bands of time. With digital distribution of content, students may access content from a device when and where they need it, obviating carrying copies and allowing them access when school is not in session.

Expense

Providers now often include supplemental items and services to make purchase of their materials more attractive. Digital content has spawned a significant body of free or *open* content.

Interactivity

Digital content is flexible and interactive. Students will find hyperlinks in the text, enabling them to explore subject connections that seem interesting or appealing, to view embedded when interested, and to use embedded tools (like audio text readers or reading pacers) to support and customize their experience of consuming content.

Simulations / Visualizing Content and Concepts

Traditional textbooks called for students to learn about things by reading descriptions and perhaps by seeing some photos or illustrations. There are many subjects that students need to see unfold in order for them to visualize and understand the material. The germination of a seed is one example; the splitting of an atom is another. Other topics, like the eruption of a volcano, are far too dangerous to be done in actuality, yet are difficult to comprehend from mere narrative description. Such topics can be understood through the use of digital media.

Blended Learning

In essence, the blend refers to online learning mixed with face-to-face learning. The online portion may be accessed by the students in school, often under the supervision of a teacher. In a flipped classroom, the student may access the online portion of the program at home or elsewhere, with class time set aside for face-to-face exchanges with teachers and fellow students.

The blended approach has several advantages. First, some students benefit from the independence from school. Some may have social difficulties or logistical issues in physically getting to a brick-and-mortar school. Students may be permitted to learn through a much higher degree of control over the time, place, path, or pace of learning. Second, a school may have a teaching staff limited in its abilities (for example, in foreign languages) and may extend its range of learning opportunities by offering courses monitored in the local school but hosted and originated elsewhere.

Data-Driven Instruction and Adaptive Learning

Most educators lament the poor quantity and quality of information to be had when trying to assess if material has been learned or not. A quiz gives little information about what hasn't been learned and why, nor does the very slow flow of the data it provides do much to inform the ongoing instruction.

Technology can track the content consumption, response habits, learning quality, and accuracy of students who interact with it. Technology can reconfigure the content and response requests on an ongoing basis as the learner interacts with it. One example of this is the adaptive courseware provider Knewton, which was described in a post on the EdSurge blog.

> *"After the teacher assigns a lesson, the system will give students pretests to assess their knowledge, and then deliver different sequences of learning materials and assessments based on how they progress. Teachers can also upload their own materials, which will be tagged with metadata about their subject, standards, and other information that can be used by Knewton's adaptive learning algorithms."* (EDSURGE, 2015)

We have arrived at the beginning of this sort of digital learning resource and the road ahead is a fascinating and likely very rich one.

Connected Learning

One of the most transformative aspects of technology for education is the expansion of the platform for teaching and learning achieved by having classrooms online and connected to the internet. Before the digital era, teachers had access to an extremely limited selection of content materials. The internet now provides access to the greatest collection of content items ever assembled, as well as a vast number of possible peer learners, mentors, teachers, experts, and others who may impact and broaden the educational experience.

Being connected establishes a condition in which some long-valued approaches to teaching and learning may finally be implemented. For example, providing students with a personalized learning experience has been an unrealized goal for a long time; with access to the vast body of content online, it becomes possible to locate items of interest for each student. Better yet, they can search to find items of interest to themselves.

Tech-Supported Collaborative Learning

Another dimension of the transformed learning experience is to be had through the use of social media resources such as Facebook and the social learning group work facets of Edmodo, Schoology, and other increasingly popular online resources. The longstanding practice of organizing students into groups to learn collaboratively is easier to facilitate with technology, rather than attempting to do so solely in the face-to-face version of the classroom.

CHANGING TO A DIGITAL PLATFORM FOR TEACHING AND LEARNING

All things change, including the goals of education and the form it takes to realize its goals. These are currently undergoing deep changes due to the emergence and adoption of digital technology.

There are actually two strong dynamics at work. First, the ways that schools get their work done—including their physical characteristics, the resources they use, and the ways they organize students for participation—are all changing to take advantage of and to accommodate digital technologies.

Second, the bodies of concept and practice that define teaching and learning are also changing, for a variety of technology-driven reasons. Better practices and understandings of why they are advantageous have emerged and are now practical to implement due to the power and availability of technology.

For example, project based learning (PBL), an approach and practice that has attracted interest from progressive educators for a long time, has become more appealing and popular than ever because of the ways that digital technologies make it practical for all to embrace. One aspect of PBL requires students to do significant amounts of research, both on what work has been done on their chosen theme before they begin their work as well as to gather information from a wide variety of sources to use in the creation of their project. Before students had easy access to the web, such research would have been so prohibitively difficult and slow that such projects would have been too impractical for teachers to offer students as learning activities. The creation of student products, the central focus of the practice of PBL, would also have been too difficult for most to take on. Currently, though, with easy to use and near ubiquitous digital resources like desktop publishing programs, audio and video creation tools, and resources that easily generate graphics, creating student products that have the function and feel of professional work is within the grasp of most students—a powerful and impactful change established by a host of technology resources commonly used in our schools.

ACTIVITY

HOW DOES TECHNOLOGY IMPROVE TEACHING AND LEARNING?

How does technology make it possible for the teacher to be more effective? How does technology make learning possible in situations where it wasn't possible or less likely before its implementation? How does technology enable the expansion of the curriculum, the variety of activities a school can provide students? How does technology enable better understanding of students' abilities to learn, what they have learned, and how to use that information to foster better, more effective learning?

In a table, list seven to ten examples of transformative technology use in teaching and learning, ways that technology makes them significantly better. Describe practices and resources to support them and write brief before-and-after descriptions of the application of technology to specific activities and goals listed.

Nine Ways Technology Can Transform Teaching and Learning

The following section offers glimpses into some of the most common and meaningful ways that technology transforms the essential activities that are comprised in teaching and learning, the ways that students participate, and some approaches and philosophies that establish and legitimize the context for them.

This may be used as a reference for envisioning the ways that specific schools can align themselves with how schools are using technology to evolve into digital age learning environments. It may also serve as a touchstone to determine how much change a school will plan to take on and why. The elements of transforming the learning environment include:

FROM PRINT CONTENT TO DIGITAL: Traditionally, students and teachers have used print textbooks, class sets of which have each student using an identical copy created with the average student in mind. Digital content allows for each student to have a version that can be personalized and to access it wherever and whenever needed.

FROM HARD COPY STUDENT RESPONSE TO DIGITAL: Moving to a digital platform allows students to respond to teacher challenges and prompts employing many means of representation, many of which are just right for learner needs. Likewise, teachers can respond to students using a wide range of media and can archive and retrieve student work much more efficiently.

FROM HARD COPY TEACHER GRADE BOOKS AND PHYSICAL DESK TO LMS: The now common learning management system (LMS) is a networked, master platform that allows teachers to efficiently distribute content and assignments as well as track student attendance, calculate performance, and adjust instruction based on the information gathered.

REAL-WORLD LEARNING: Technology makes practical a long-sought dimension of grounding student activities in real-world contexts.

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PROJECT-BASED LEARNING (PBL): PBL has been around for a very long time. However, the logistical and practical aspects of it can be challenging for teachers who have limited time and resources. With technology, projects are facilitated and made student-friendly, allowing students the satisfaction of creating professional-looking products.

DATA-DRIVEN INSTRUCTION: Teachers have always kept data on student performance. However, collecting the data and using it in a timely manner has been difficult. Digital content can collect and analyze data about student learning on an ongoing basis, making assessment practical and allowing for better instruction.

ADAPTIVE LEARNING AND ADAPTIVE ASSESSMENT: Technology can be applied to learn about the student's learning abilities, preferences, needs, and styles. Based on this information, the student receives material that is tailored to his or her needs and that establishes a unique, personal learning experience.

GROUP AND SOCIAL LEARNING: Theories like constructivist learning make a strong case for learning socially. However, it is a commonly held belief among teachers that social learning presents problems, especially in classroom management: breaking classes up into smaller work groups strains their ability to monitor students. With the emergence of social networking resources like Edmodo, students participate in virtual work groups, and the teacher, with the support of the digital platform, can track their activity and communicate with them directly in the system to give feedback and suggestions.

EXPANDED PLATFORM FOR STUDENT ENGAGEMENT: Classes connected to the web may transcend the physical limitations of space and distance and time. Students can be connected to individuals who represent important learning resources like the authors of books the class is reading, politicians, scientists (NASA is one source), and others. They can engage in collaboration and co-learning experiences with classes of students in other countries, giving each class the experience of practicing the other's native language. Students can work in virtual labs and access online library materials, regardless of the day of the week or time of day.

A school's technology leader, especially in the role of digital change agent, will need to be informed about and balance several sets of goals for the use of technology:

> **TECHNOLOGY-SPECIFIC LEARNING:** Proper and effective use of devices and digital resources needed for teaching and learning across the curriculum, as well as specific technology skills as goals unto themselves, like coding, programming, web design, and robotics.
>
> **LEARNING MADE POSSIBLE OR BETTER ACROSS THE CURRICULUM:** Visualization resources like virtual dissection in biology courses, online research skills for history courses, classroom to writer's studio Skype sessions for ELA, and so on.
>
> **LOCALLY REQUIRED LEARNING:** Local (school or district) adolescent health or safety awareness sessions, school-to-work local industry preparation learning, or local student projects-based learning efforts.

In numerous ways, digital change agents will need to understand the nature and extent of the role technology plays in each of these bodies of approaches to teaching and learning. Further, they will either need to be able to explain these approaches themselves or arrange for others to do so. The extent to which the school engages with technology and the impact it will have on the school's instructional culture and curriculum development will be greatly impacted by how convincing and inspiring these explanations are.

REMOVING BARRIERS TO MEANINGFUL TECHNOLOGY INTEGRATION

Knowing and understanding the emerging landscape of teaching and learning—what's out there and how it differs from the place where we have been teaching and learning for well over a century—is a crucial initial step for the digital change agent. In essence, there is a broad new dimension to education. No community of educators can occupy all of it, nor would they want to. However, before the particular niche that best nourishes each community can be found (or created), the full territory should be known.

One of the great impediments to much broader adoption, more meaningful integration, and reaping the abundance of benefits from instructional technology has been the misperception that technology is not truly part

and parcel of the body of overarching goals and practices of mainstream education. It has been viewed as something separate and apart, a discrete set of skills and understandings that are different from the mainstream. At times this notion of technology has been respected, even sought by administrators and policymakers, who see technology as a body of skills and activities associated with successful employment after graduation. In that sense, either reluctantly or enthusiastically, it's been acknowledged as necessary student preparation for the real world.

This notion is better than the alternative: ignoring or marginalizing technology as a niche body of knowledge. Still, this lack of comprehension of, and appreciation for, the greatest potentials of technology by instructional supervisors and school administrators often leads them to see little true value and purpose in making technology a part of what goes on in classrooms across the curriculum. As a result, they often establish token examples of technology adoption and integration in the school and view this as entirely sufficient.

Small wonder, then, that for so many years and in so many schools the technology program was defined by a computer lab or two, divorced from the mainstream of the school's instructional efforts. In such labs, "computer teachers" taught students *about* technology, teaching everything from the design of computers, to keyboarding, to file management, to simple web design, to coding and programming (which has experienced a recent spurt of high interest.) What has been missing, however, is the crucial understanding that technology is in direct and strong alignment with the most sought-after and often elusive goals in education. Further, it actually is a highly effective way to make such approaches and practices implementable. In fact, one would be on firm ground observing that, for a number of practices, technology represents the only way to bring them to life.

Ironically, some of the high-profile considerations that do drive what receives a good deal of effort and attention in our schools, such as standardized testing, don't relate well to technology as facilitator or enabler. Such tests are increasingly being digitized as a way to implement and grade them more practically, but their format, most often, encompasses short responses and thinking skills that are low on Bloom's Taxonomy. Yet instructional technology has the ability to make possible and practical the teaching and learning of more complex and higher-order skills, a true step forward for instruction.

And yes, there are many digital resources either designed for, or adapted and dedicated to, preparing students for success on standardized tests, even though that preparation is not directed at teaching the types of improved learning that the era of tech is ushering in. While this may earn technology some short-term respect, it does not promote technology's association with its greatest potential to improve education by supporting and facilitating unique, individual, and spontaneous responses to experience and solutions to real-world problems.

By seeing the obvious and logical relationship between technology and important and highly sought-after instructional goals, a crucial barrier to the adoption of technology can be surmounted.