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Beyond a Doubt

Digital Is the Future of Teaching and Learning

Starting With the End in Mind

As with any successful process that aims to create or support significant change, a journey to transform schools must be purpose driven. What is the mission of public schooling? Without clarity of the eventual goal, whatever action is undertaken will be untethered to purpose and thus unlikely to succeed.

The driving force for public schools has always been grounded on an egalitarian value. As Western civilization emerged from a “might makes right” dynamic to a shared ethic that “all people have rights,” there naturally emerged a need for a common system to ensure that everyone had the tools to understand these rights and exercise them properly (Cubberly, 1919). As such, since our founding, preparation of all students and the continuation of our democracy have served as the dual foundations of public schools in the United States.

With these assumptions as background, we might reasonably ask, preparation for what? The answer for the last several generations has been preparation of students for their lives, learning, and work beyond the classroom. As public schools have evolved over time, the

consensus mission that has emerged is that in to be worth their investment, education institutions need to ensure that all students acquire the knowledge and skills that are required for them to be successful and productive citizens. Having facilitated dozens of mission-creation discussions in public high schools over the last twenty-five years, I have used the “What are the knowledge and skills?” question to frame each community’s answer.

As a reflection of the society they serve, it is instructive to watch how the answers to the proper-preparation question have changed. The first public schools were established primarily to ensure that every student could read the Bible. With the advent of the Industrial Revolution, we saw the emergence of the famous “3 Rs”: Reading, wRiting, and aRithmetic. So influential and constant were these three foundations that they remain the most tested and reported on academic reference points to this day.

But what is the answer for the 21st century? Currently, what passes for basic skills must be redefined in the context of what is needed for successful participation in an information-saturated and hyper-adaptive digital world. Certainly, some skills are timeless in their necessity, but anyone who believes that the skills required for life in the 19th or 20th centuries will be adequate in 2025 or beyond needs to think carefully about what has recently unfolded in the world around us.

Truth 1: The Future of Learning and Work Is Digital

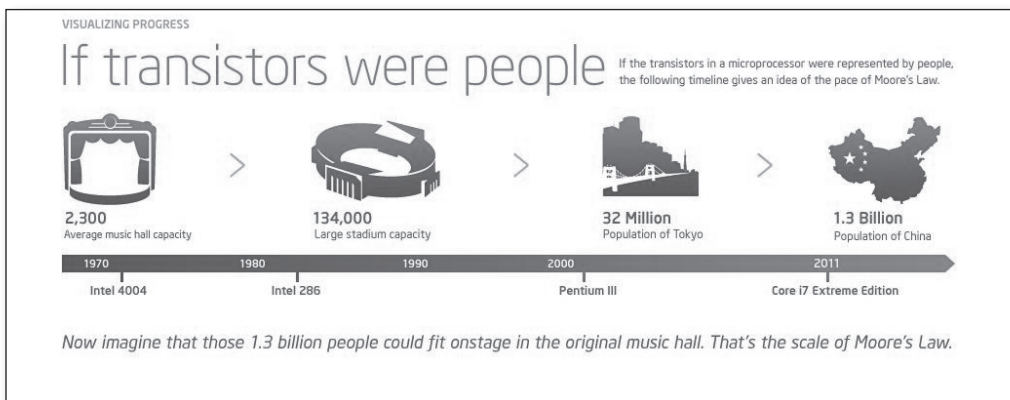
The Pace of Technology Change

It is easy to forget how much of the structure of learning and knowledge access has been altered during our lifetimes. Such is the pace of change in a technology society ruled by Moore’s Law where every eighteen months, device capacity doubles and prices drop (Intel, 2010). Peers on my first public school faculty delighted in telling me about how in the spring of 1969, teachers lined up outside the main office of Housatonic Valley Regional High School to wait their turn to use a miracle device that would save them time in the figuring of their students’ final grade averages: a \$500 Sharp QT-8 four-function calculator. We find digital devices with 10,000 times more computational capability as giveaway prizes in cereal boxes today.

We have become so accustomed to the rapid assimilation of successive waves of technology advancement that we take for granted

how dramatic the accumulated scope of the change actually is. To graph the progression of microchip processor power over the last forty years, a straight line on an upward sixty-five-degree angle would be a good representation. Known as *Moore's Law* after Gordon Moore of Intel predicted this ascension, so dramatic has this experience been that Intel itself has started to use metaphors to help people appreciate how far things have come in so short a time. Figure 1.1 is titled "If transistors were people" and speaks to how many more processing units they are able to fit on the standard central processing unit chip today as compared to when they started manufacturing them in the early 1970s.

Figure 1.1 Visualizing Progress—Moore's Law



Source: Intel, 2010. Reprinted with permission. Retrieved from <http://www.intel.com/technology/mooreslaw/>

We see the greatest impact of these changes in our youth. The current generation of teenage high school students not only missed the heyday of the phonograph, but some are also probably blissfully unaware of all three successive generations of devices that replaced it: the eight-track, the cassette tape, and the CD. They have never known a phone that needed to be plugged into anything but a charger. They have no memory of a time when a person could not be instantly connected to anyone they cared about the second that they had the idea to do so. Forget hand-written anything, this is the same generation that forsakes e-mail because it is too slow. As one of my colleagues observed regarding his texting teens, "If you had told me in 1980 that I would raise two school-age daughters and never hear a phone ring, I would have told you, you were nuts."

New devices go from being "must haves" to quaint relics in a matter of months. Such is life in the digital world. It would be easy to

dismiss these examples as a whimsical consumer electronics phenomenon only and miss the larger point. The capabilities inherent in these devices are forever changing the way we learn and work and have implications for any institution that seeks to prepare students for life within this world. To see this illustrated, just turn to any institution that was born in the analogue era and see how it has adapted, or not, to these new digital circumstances. Newspapers, the post office, Blockbuster, the reference section of your local library—all of these are easy-to-find examples of products and services made obsolete by the advance of technology. On the other side of the ledger are those entities that were made possible by these same changes.

The Rise of the Information Age

To this end, consider the emergence and growing influence of Google. In Google, we can see the arc of a company's development untouched by print, as they were conceived, grew, and now thrive in a purely digital context. In Google's short fifteen-year history, the impact of their work has done more to challenge assumptions related to knowledge and learning than anything since the printing press. Just as Gutenberg brought the printed word to a much broader audience, Google has facilitated and accelerated the digitization of the world's factual knowledge and pioneered processes to make this information accessible to everyone.

Elegant in its simplicity, Google's mission is "to organize the world's information and make it universally accessible and useful" (Google, 2009). So successful has Google been in this pursuit that their search processes have famously crossed over into the popular culture as a verb. Want to find something? You don't *web search* for it, you *Google it*. Google co-founder Larry Page has described the "perfect search engine" as something that "understands exactly what you mean and gives you back exactly what you want" (Google, 2009). While it might feel just a little Orwellian, everyone that has ever used the Google search engine knows exactly what this means. You have a query, you start typing/speaking, a list of possible matches appears, and with each character or word you type/say, the list narrows until your answer or a useful link appears. Brilliant.

Perhaps more than any other digitally inspired company, Google's zeal to achieve their mission has helped build, open, and then widen the information floodgates. As providers of similar search engine services (Microsoft, Yahoo, etc.) try to innovate and keep up with Google's frenetic development pace, their combined efforts have

ensured that the center of gravity for factual knowledge has shifted from print sources to digital access before our eyes.

Access Is the First Step

Once the move to digitize was underway, it developed its own momentum. Knowledge truly is power. When I know something you don't know and that thing has value, eventually I am going to be the winner, and you are going to be the loser. As capital markets began to understand that digital information meant having valuable things before anyone else and how that early access could be converted into profits, the fate of the printed page was sealed. Like a car rolling downhill without brakes, once the move to gain financial advantage by speeding up the knowledge process got going, there was nothing that could be done to stop it. Anyone who resists or steps into the runaway vehicle's path is given credit for bravery but is quickly crushed by its force.

Predictably, even when this trend toward searchable and ready facts was apparent, many traditionalists refused to acknowledge the change or constructed alternative realities to fit their mindset. Certainly, a knowledgeable person in a good library could find things as efficiently as someone who was tied to a workstation in the computer lab. Perhaps there would at least be a balance and a role for traditional books that could sustain print for another generation, yes? Alas, if there was any hope for this last stand to succeed the advent of truly mobile, handheld access to all of this ready data was the digital knowledge Rubicon.

In 2005, the early days of search mobility, I remember being among the first in my social and work circles to use my Palm Treo and Google mobile to retrieve stuff from the Internet to settle arguments or satisfy curiosities. At that time, because I was an early adopter, it was a novel exercise that was thrilling to me and I am sure annoying to others. But as mobile web access went mainstream and the crowd got onboard, this process grew from a sideshow to the main act. I now expect that with my iPhone, I can find whatever I need, whether it be information to assist in work, life, or family activities, to conduct my affairs from wherever I am at the moment I want to do it.

This expectation for vocational and personal hyper-connectivity is the new driving energy of the information age. According to Alexa (2011), the top ten web traffic sites worldwide in the first half of 2011 are all either information search or social network sharing sites. Worldwide Internet pathways facilitate billions of information exchanges every hour.

This demonstrates that the world has become one massive information-sharing network, with enormous numbers of people relentlessly seeking, gathering, and sharing information in real time. This is how

Figure 1.2 Top Ten Internet Traffic Sites as of June 30, 2011

| | |
|-------------|-----------------|
| 1. Google | 6. Baidu |
| 2. Facebook | 7. Wikipedia |
| 3. YouTube | 8. Windows Live |
| 4. Yahoo | 9. Twitter |
| 5. Blogger | 10. QQ.com |

Source: Alexa, 2011.

Twitter went from its launch and the first “tweet” in July 2006 to delivering tweet number 350 billion just five years later (“Twitter Delivers,” 2011). Change on this level cannot occur without social consequences. As access has exploded, so have constructions around the expertise, status, and credentialing that used to be associated with accumulated factual knowledge. Traditional academic stratifications have always been built and secured in

part by access to knowledge: the limitations on what books people could read or were allowed to use. Tuition purchased access to professorial expertise and accumulated library knowledge. The “expert” was identified as such because she spent years gathering and storing information that few others had access to.

Raising the Performance Bar

No more. With digitization has come the great democratization of factual knowledge. The common ruck has just as much access to the world’s digital information as the most learned expert. With a device that costs less than a pair of fancy sneakers, any learner can access almost any piece of data whenever he wants it. As a result, as facts have become ubiquitous, like any other supply and demand commodity, their value as a currency in the knowledge market has declined.

If anyone can find any fact from anywhere at any time, doing so becomes the norm, and the attention shifts from what you know to what can be done with what you know. So what if you know it or can find it; anyone can do that. Can you add value to it, can you communicate it, can you share it, can you inspire with it? Authors like Tom Friedman (2011) and Daniel Pink (2005) have written brilliantly on this topic, and it is this dynamic that should be raising the “basic skills” bar for educators and schools and driving increased learner expectations.

Unfortunately, there are those who fall back on convention and propose that the answer to factual saturation is to double down and

add even more of the same onto already impossibly overloaded curricula. How else to explain curriculum maps that assume the acquisition of multiple knowledge standards every day and require “pacing guides” to ensure that proper coverage takes place? In an era when you had to carry everything you needed in your head, this kind of “just in case” mentality—as in, “We will teach this to you just in case you may need it at some as yet to be determined point in the future”—was an important curriculum touchstone. As the world’s foundational knowledge has grown geometrically, so has the pressure to expand the size and contents of the just-in-case curricula. What follows, then, are increasingly absurd attempts to transfer it all into student brains in the same 180-day, knowledge-cramming window we have always called the school year.

Ultimately, this is a futile pursuit because being able to just know or find lots of stuff is not enough. Today, to be considered a valuable knowledge worker, you must be able to find what you need on a just-in-time basis. You need to sort out the meaningful from the meaningless, make new connections between seemingly random data sets, and then creatively align learning process with intended purposes. What used to be considered the foundation of knowledge work, the accumulation of facts and details, is now outsourced through technological processes. In his groundbreaking book *A Whole New Mind*, Daniel Pink (2005) describes this shifting phenomenon as “the three A’s”: Asia, abundance, and automation. Pink makes the case that with the huge numbers of factually knowledgeable people, the abundance of quality options, and the automation of low-level knowledge processes, significant value-added work must be at the conceptual and creative level.

REFLECTION/STUDY QUESTION

Have you felt the tension between “just in case” and “just in time” in curriculum deliberations? What is the current state of the debate in your community? Has the introduction of knowledge-gathering devices and ubiquitous information access shifted the discussion about how much constitutes enough in a deliberation over what students actually need to know to be productive?

Knowing Is No Longer Enough: 21st Century Skills

With technology and access to the world’s knowledge, getting the factual level answer correct is now assumed. It is what happens next that will determine your ability to add value. This approach should not be confused with an argument that content and rigor does not

matter. Of course they do: Skill without any knowledge foundation is useless, and skill application without rigorous standards of quality is just busywork. We need to know enough to give us context.

This is more of a productivity issue, how and how well you gather the facts you need before you take action. In any enterprise, ignoring technology-enabled leaps in productivity in favor of tradition may have a romantic allure and satisfy a nostalgic urge, but you cannot follow that path and expect to remain competitive in the marketplace. A farmer who plows, plants, and picks by hand may have our respect, but he is unlikely to have our business simply based on the volume of goods he is able to produce when compared to his peers riding tractors and using conveyors. Similarly, in an ever-rising information tide, you either learn how to swim or you drown.

Keeping today's students afloat in a just-in-time digital world is the reason for the growing interest and focus on what have become commonly labeled *21st century skills*. A quick literature search with that term will immediately demonstrate the weight of this attention. Over the last decade, there have been hundreds of articles and studies directed at either identifying 21st century skills or advocating for their elevation to core curriculum status. As an example of the sense of urgency now aligned with this topic, starting in 2011, the secondary school accreditation organization in New England (New England Association for Schools and Colleges, 2011) requires all applying high schools to identify academic, civic, and social learning expectations under the banner of 21st century skills.

So, what exactly are 21st century skills? In the broadest sense, they can be summarized as the information literacy, communications, problem-solving, and creative attributes needed for success in a dynamically changing learning environment. They differ from a list we might have created a hundred or fifty years ago due to the starting assumptions about knowledge access and the modern importance of being able to effectively sort through multitudes of potential sources and points of view.

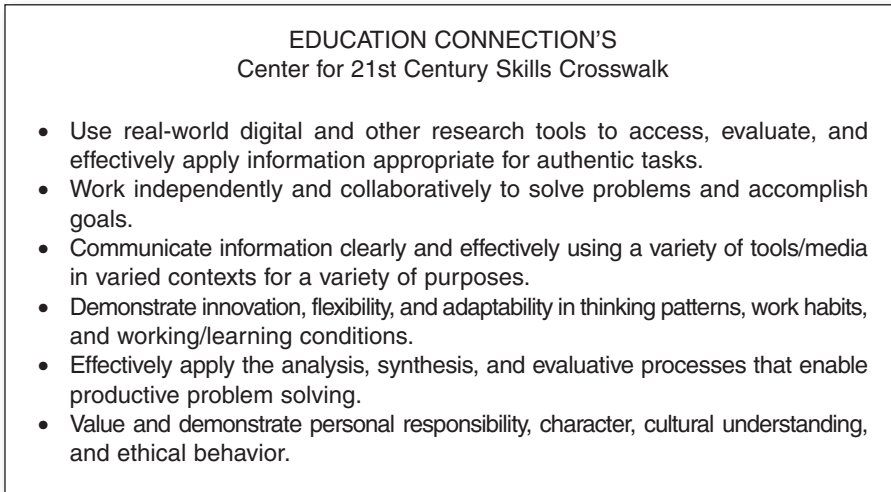
To gain the specificity needed to actually teach and assess these skills, we need to dig a little deeper. Since 2004, my own organization, EDUCATION CONNECTION, has hosted our own Center for 21st Century Skills. This first of its kind training center was created to provide public school students with models of exemplary, self-directed learning experiences built on solid content foundations. In our center, we work with teachers from our member districts to create challenge-based, Moodle-hosted, blended learning curricula that engage students in the development and practice of 21st century

skills. As a result, we have been recognized with funding by the U.S. Department of Education's Investing in Innovation program and by the National Science Foundation for our ability to identify, teach, and assess these skills.

When we started the conversation with educators about how to identify specific 21st century skills to use as a focus of our programming, we began by reviewing much of the contextual material that started this chapter. With that as a starting point, we then looked to others who have done similar exercises to compare findings. Much has been written over the last decade or so on this topic, so there was plenty of data to work with. For our reference, we compared our thinking with what we believed to be the three most important recent compilation studies of 21st century skills: the North Central Regional Education Laboratory's *enGauge: 21st Century Skills* (NCREL, 2003), the International Society for Technology Education's National Technology Standards (ISTE, 2008), and Ken Kay's 21st Century Skills Partnership (<http://www.p21.org/>, 2004). With all of this information to work with, we completed a crosswalk of these three studies.

The result of this exercise was a list of what we believe to be the six most important 21st century skills. We limited it to six out of dozens of possible skills because we believe, as will become apparent as we move through these chapters, that focus is important. A district that is attempting to teach and assess for twenty or forty different skills will soon discover that by spreading their energies, they end up doing few of them as well as is needed. We have found that starting with a core of six helps our participating districts begin the process of understanding and explicitly integrating 21st century skill competencies into everyday instruction. A complete description of these skills with assessment guidance is available for download at the *Digital Learning for All, Now* website. Directions for accessing and downloading this and all of the other resources on that site are listed in the next chapter.

Whether you start with one of the studies we used, find another, start from scratch, or use the skills crosswalk we developed, I am confident you will find that there is an implicit recognition that it is the process of integrating, connecting, and creating new knowledge/value and then communicating the outcome that is the consensus framework of knowledge work in the 21st century. If your district has been working on integrating Common Core State Standards, you will find a similar set of assumptions underlying the content delivery of these as well. A more complete description of what an educational system based on this framework looks like is explored in Chapters 5 and 6 of this book.

Figure 1.3 Six Critical 21st Century Skills

If the historical narrative about the transition from print to digital is not enough to convince you about the veracity of Truth 1, then the accumulating scholarship, effort, and consensus regarding the need for focus on 21st century skills should do it. Across the broadest spectrum of professional educational work over the past decade, the consensus is overwhelming: The future of learning and work is digital. I would offer one possible twist. It is not the future of learning and work that is going to be digital as much as the focus of learning and work is *already* digital. Truth 1 in *Digital Learning for All, Now* is not a prediction of the future; it is an observation of present fact.

As such, if preparation for life beyond school is the focus of a public school's mission, then all schools need to make it their primary goal to ensure that every learner has access to the instructional experiences, information, and resources needed to prepare them for learning, life, and work in the 21st century. I believe that achieving this goal is the defining educational challenge of our time, and everyone must recognize that it can only be accomplished by acquiring the proper tools that enable its occurrence. There is no need to just take only my word to support this position, nor should you think that this is simply a fancy of left-leaning educator's search for the next big thing. From conservative thinkers like Jeb Bush and his Digital Learning Council to the U.S. Department of Education's National Technology Plan, the alignment is growing: "Preparing more than 50 million students with the knowledge and skills to succeed in college and careers is the greatest moral and economic challenge of our era" (Bush & Wise, 2010, p. 4).

REFLECTION/STUDY QUESTION

Has your school/community begun the discussion of what constitutes 21st century skills? How do your findings compare with EDUCATION CONNECTION's Center for 21st Century Skills crosswalk list?

Truth 2: Proper Preparation for the Digital Age Requires Digital Access

How Do We Achieve Fluency?

Agreeing with this truth requires only an application of common sense. The famous question “How do you get to Carnegie Hall?” has only one answer that works: practice. To gain fluency and understanding in any arena demands sustained work and feedback over many years. Want to be a good chef? You need to cook. Want to be a scratch golfer? You must practice and play—a lot. The same goes for reading, writing, public speaking, and any other skill-based pursuit.

This is the foundation of Truth 2: Adequate preparation for a 21st century digital work and learning environment demands that students have ready 1:1 access to technology and aligned instructional practices so that they may invest the time needed to become fluent users of these tools. The reality of teaching and learning for the 21st century is that to prepare students for an environment that is constantly changing and adapting, educators must be able to replicate or introduce them to learning experiences that prepare them for it. To be fluent with problem solving and adaptability, to be digitally literate adults, learners must practice and use these skills consistently over time.

This is not about the mechanical use of the devices themselves. Anyone who has seen a teen tackle a new phone or gadget that she has never touched before and immediately start playing with it, experimenting with it, and figuring out how it works knows this is true. Practical technology proficiency is easy for a generation raised in its midst. Fluency and understanding of how these tools are used appropriately for knowledge creation in a rigorous and accountable learning environment is an acquired talent that is rarely mastered without lots of practice.

The point of Truth 2 is that technology devices and 1:1 access to them is the platform on which the skills to thoughtfully solve problems in a digital academic environment are built. Just as you would

never get in a car driven by someone who has learned to drive only by reading a manual, it would be equally misguided to think students—or their teachers, for that matter—who have predominately used static print texts as training for digital information processing would be ready for that challenge.

Living in One World, Learning in Another

And yet, for a variety of fiscal and cultural reasons, this is the model that the vast majority of public schools continue to employ today. We distribute books and paper and implore students to be ready to learn every day, but we ban or restrict the use of the devices they know they will need or use for the rest of their lives to do the exact same work. Fearing a loss of control, we create policies that lock down networks and access to information sources. If students are lucky, they get to spend a couple of periods a week in the computer lab, using a machine that is not their own, to do a little searching or to put the finishing touches on a project. In an average American public school setting, it is safe to say that as a matter of total time on task, the digital information tools that students need the most practice with are the ones that they collectively have the least access to.

If this seems too harsh, consider how we teach and assess what endures as the most tested of all expressive thinking skills: writing. Think of the gap between the way this skill is taught and assessed and the predominant methods under which it is applied. Students spend all of their recreational and personal writing time composing on a keyboard or voice-recognition device with ready editing capability. Additionally, it is virtually certain that every word a student will ever write for an important task in a value-added job in his lifetimes will be composed the same way.

But, when it comes to on-demand writing in school—or, more critically, the all-important time-limited assessment of responsive writing—what is the practice? Teachers introduce these assessments with phrases like, “Open your blue books and be sure you have three sharp pencils and a workable eraser before you start writing.” With that, we begin critical assessments that can play a role in determining a student’s future using a process that she will never use again once she leaves school. How many kids have we underestimated or labeled as poor writers due mainly to the fact that we do not give them a chance to demonstrate the skill through a process that is aligned with their primary compositional strategy? The way we assess writing now is more a reflection of a student’s ability to use antiquated

methods than it is a measure of his absolute writing potential given appropriate tools.

As we should expect, in multiple studies of writing testing, starting as early as a decade ago, students who were allowed to compose answers on computers consistently write longer and higher quality responses than those tested with paper and pencil (Russell & Plati, 2000). Would we ask a musician seeking to be an orchestra's first violin audition for that honor by playing the clarinet? Sure, the musical principles are the same, but the application is vastly different with the unfamiliar instrument. Asking students to regularly prove, in the context of our current high-stakes testing environment, their writing ability with one tool while we know they will and must use another seems fundamentally unfair.

As long as public schools remain primarily paper and textbook based, the gulf between the appropriateness of the preparation system we provide and the learning and work environment that our students will enter continues to grow. As the distance between these two worlds widens, the degree to which students question the credibility of the process will increase along with it. Once that skepticism reaches critical mass, you can shut the schoolhouse doors because the authenticity battle will have been lost. Without 1:1 access to the tools that form the foundation of 21st century learning and work, students cannot be properly prepared for life in this environment—and they know it. Facing Truth 2 is no less than a matter of survival for public schools.

REFLECTION/STUDY QUESTION

Can you think of other areas, subjects, or processes where the print/textbook instructional systems are out of alignment with the digital systems that predominate outside of the public school environment? How have you engaged your students or children in discussions about these gaps? If so, how do their responses inform your thinking about the urgency to make a public school transition to a digital learning environment? What would your community's reaction be to the goal of getting out of the textbook business within three years?

Truth 3: Continued Investment in Print Is a Waste

Once we accept the inevitability of Truths 1 and 2, what naturally follows is just logic. The goal is digital, the current state is print; if you

want to move from one to the other, then further investment in the print-based system of instruction you want to leave behind is a waste. If the term *waste* seems too strong, consider what Jim Collins says in *Good to Great* (2001), where he demonstrates that in every organization seeking improvement, there will come a time when they have to “face the brutal truth.” His point is that until we label and confront unaligned and misguided work for what it is, we will never have the strength or impetus to change it. When the facts show that performance is poor or your methods are ineffectual given your goal, you cannot put a shine on it and just hope it will get better. You have to look at the underlying reasons behind the data and act on the root causes. History is littered with extinct institutions that believed that their past successes guaranteed a bright future despite what the data told them as they were on their way down.

For schools, this means facing the reality that continued investment in a print educational infrastructure and the lack of sound transitional planning for a complete move to digital are ultimately counterproductive. If we want to prepare students for the 21st century, then the overriding strategic and resource-allocation goal for all public schools must be to create a system where all students have 1:1 access to the tools and instructional settings required for 21st century success. This conclusion makes good rational sense, and most educators understand it and would act on the notion if they could; they just don’t see how getting to 1:1 is possible in the current budgetary climate.

The goal of a transition to 1:1 tempts us like a shiny lure. We can see what the potential of the instructional model is by looking toward the handful of districts, schools, and the one state (Maine) that have already found a way to jump across the gap between the print and digital worlds. Authors like Pamela Livingston have documented the successes of 1:1 efforts and provide sound guidance on what is required for success. Her book, *1-to-1 Learning: Laptop Programs That Work* was published by ISTE in 2006 and is now in its second edition (Livingston, 2009). Cathleen Norris and Elliot Soloway (2011) from the University of Michigan have written similarly about the success of 1:1 efforts using handheld devices as well. Effective programs in this realm always have clear goals; enough learning structure to provide guidance, along with the freedom to allow for the empowerment of learning; and good infrastructure support.

In my own experience, when exposed for the first time to the potential of a 1:1 21st century learning challenge, I have seen veteran teachers’ enthusiasm for the profession reignited. I have watched students from every possible demographic work long hours, struggle

and persevere, excel, and then speak with pride about their work as they shared it with others. We will explore these success stories and the lessons learned from them more deeply in Chapters 5 and 6. Suffice it to say at this point that the data are pretty clear: When designed and supported properly, a rigorous, problem/challenge/inquiry-based 1:1 instructional system is more aligned with the purpose, interest, and needs of a digital generation. Despite this clarity, it is at this point that the promise and desire to move to 1:1 usually gets stalled amid a myriad of frustrating barriers and dead ends.

Money, Money, Money—and Other Barriers

First, and unfortunately, there is the matter of money. In the current economic and school budget climate, even with consistently falling technology prices, it is hard for most educators to imagine that they will ever be able to finance a move to 1:1. Based on our traditional expectations, we know that if we are going to require or assign something in school, we have to provide every student with a copy. If we wanted to get to 1:1 using traditional notebook computers and this supply model, under the best conditions, that would cost \$500 to \$750 per student. With a school size of 752, this means it would cost at least half a million dollars to get 1:1 off the ground in an average American high school (National Center for Education Statistics, 2002). It is interesting that in some communities, the accumulated yearly cost of supporting print education is greater on a per-pupil basis than this device cost, but the challenge of coming up with the big chunk of money all at once prevents the consideration of the move to digital.

We will explore these figures in more detail in the next chapter, but let's assume at this point that these start-up costs are the main reason that many of the first 1:1 initiatives undertaken had to be supported by outside resources, began as classroom pilots, or had to be introduced one grade at a time. Today, it seems that for most districts, in a time when they struggle just to keep up with staffing and benefit costs, large one-time or multiyear start-up investments in technology seem impossibly out of reach. It is for all practical purposes a non-starter—"Sure, we would love to get to 1:1, but we can't afford it." End of story.

But what if a district could afford it? What if there was a combination of strategies that could be pieced together with only your current budget resources that would result in every student having her own digital device and ultimately enabling your district's transition to digital learning? Is that something you might be interested in learning more about?

This is the promise of *Digital Learning for All, Now*. Every district that is willing to think a little differently about resource allocation and instructional programming can afford the move to 1:1 learning, and the move can start today. It is a change process with two movements, however. First are the fiscal, policy, and technical changes (Chapters 2 and 3) that enable the acquisition of the technology. Next come the much more difficult professional adaptive changes required to shift goals, instruction, and assessment processes into alignment with 21st-century learning (Chapters 4, 5, and 6).

The good news is that the move to 1:1 is financially possible; we can get there from here. In the broadest sense, the key to the *Digital Learning for All, Now* financial strategy is the reinvestment of assets garnered through three different changes:

1. Leveraging crowdsourcing to supplement the districts hardware capability—in other words, letting students who want to, and can afford to, bring their own devices to school for use in an official school capacity
2. Saving money from the elimination or drastic reduction in the number of textbooks, copies, and printed material required for the educational enterprise
3. Savings realized by the elimination of redundant work caused by the current technology scarcity model employed in most districts

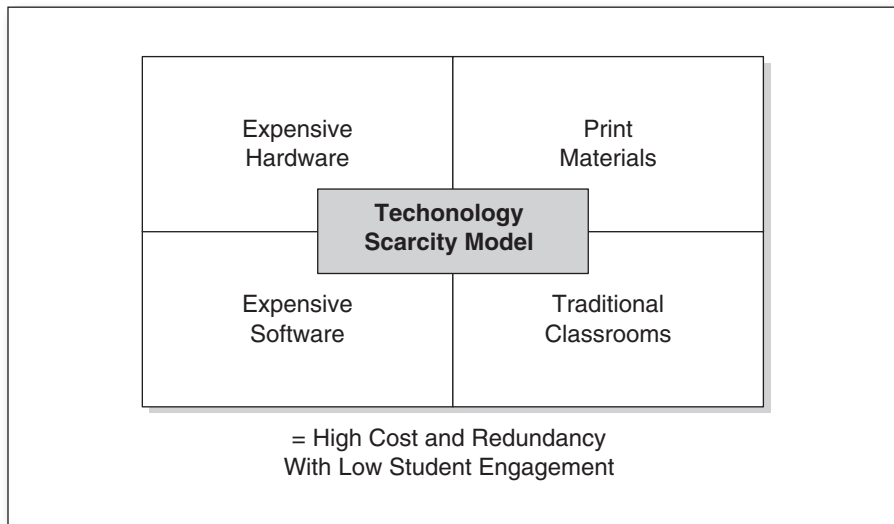
As Chapters 2 and 3 are each devoted to detailed descriptions of these first two changes, I want to explain the third, the end of the “scarcity model.” Most businesses and organizations have made the transition from print to digital processes, and once they do, they rarely continue to replicate the original process in the presence of the new technology. For example, once a store starts using QuickBooks to track its finances, it probably does not keep a backup set of handwritten ledgers. It backs up the new processes data but does not run a duplicate print system, as the waste of such an endeavor is readily apparent.

In schools, because of our traditional one-size-fits-all ethic and egalitarian history, we assume that if everyone can't have access to something, then we must either not use it or buy it for all. So, no matter how much technology we purchase, if we do not achieve 100 percent coverage, we are obligated to provide a duplicate print system to ensure that no student is left without the basics. In teaching American history, for example, even though the class is going to go to

the computer lab for three weeks in February to work on a project, the rest of the time, every student still needs a textbook. Bring on the 900-page, eight-pound, \$100 textbook to guide them through their print-based learning journey.

The result is an overlap between print and digital instructional resources that creates a costly redundancy in educational systems. This is a wasteful overlap that schools cannot afford. In addition to the increased costs caused by the redundancy, because students so rarely have access to technology, design changes that take advantage of the growing pool of online instructional resources are restricted. The final result means lots of money spent on technology but very little learning gain acquired for the investment. This dynamic is described in Figure 1.4.

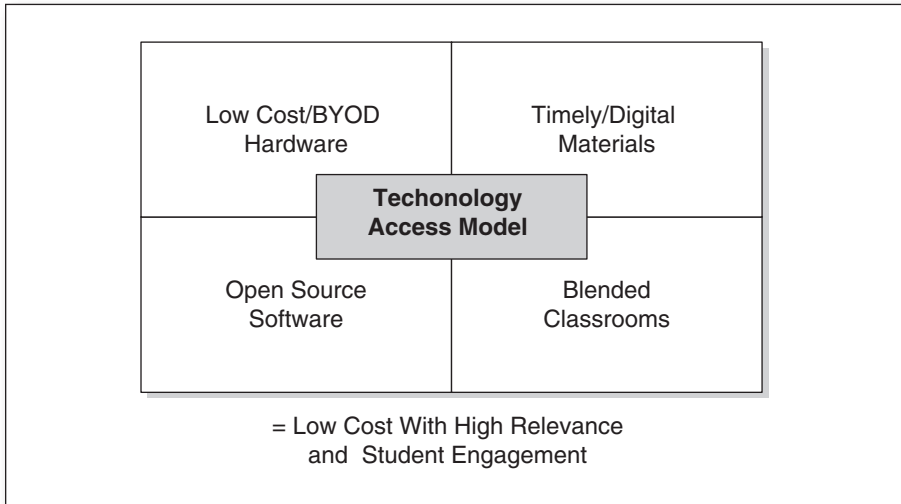
Figure 1.4 Technology Scarcity Model



Once you are able to make design decisions based on an assumption of 1:1 access for all students, you immediately are free of the expensive redundancies that shackle the school budget in the scarcity model. You now have a number of different options within your reach that allow you to save additional money. These include the elimination of reliance on print materials, the reduction of copies, increased flexibility in transportation and facilities use, and many more. But as we know, it's about more than just money. With a 1:1 technology access model, the instructional environment can be redesigned to be more responsive to the needs of the generation of learners you are serving. Additionally, as we will explore more completely

in Chapter 5, you have the ability to engage and empower learners through the technology in ways that print simply cannot duplicate. This access model is described in the next figure.

Figure 1.5 Technology Access Model



This approach can work, it does work, and more and more districts are starting the journey to make it so. The first step is getting started on the hardware problem. As mentioned earlier, when we have traditionally approached this issue, we have started the conversation with the question, “How can we afford to buy every student a device that is appropriate for full participation in a digital learning environment?” Most of the answers to this question are predictably depressing. What happens, however, when we change the question to “How can we ensure that every student has a device that is appropriate for full participation in a digital learning environment?” and avoid the assumption that schools have to be the sole provider of those devices? When it is put this way, one of the answers can be, “Let’s let them bring their own.” Chapter 2 will explore in detail the coming revolution that is Bring Your Own Device, or BYOD.

REFLECTION/STUDY QUESTION

What areas of waste and redundancy do you see between the print and digital systems at work in your district/school? What work and costs could be eliminated, combined, or saved if you knew that every student and home would have 24/7 access a digital device?

CHAPTER SUMMARY

In this first chapter, we have explored the history of technology's advance and its impact on our culture and, ultimately, on our schools. With that as context, we then walked through three indisputable truths that frame the rationale behind this book: (1) that the future of learning and works is digital, (2) that students need access to digital learning to become fluent, and finally, (3) that print investments are counter to the mission of effective preparation for students in a digital age. We know we need to get to a 1:1 instructional model, but so far, we just have not had the financial resources to make that happen on a large scale. This is why an affordable solution to bridge the gap between print and digital is such an exciting possibility. BYOD is that solution, and Chapter 2 is all about how to make it work.