

Learning and Schooling in the Age of Mobilism

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Speeding past the Steve Jobs Post-PC Era into the Age of Mobilism, the authors foresee how, by 2015, each and every student in America's K-12 classrooms will be using their own mobile computing device, with those devices engendering the most disruptive transformation in education in 150 years. Classrooms will move from today's "I Teach" teacher-centric and, by and large, ineffective and boring pedagogy to a "We Learn" pedagogy where the teacher learns along with the students, mastering content and practicing the key 21st century skills.

Introduction: The Times Are Changing

Technology drives change. What is more interesting, of course, is the change in history's direction that advances in technology bring about. For example, China is currently undergoing a course-changing shift—from people living in rural settings to mass migrations into cities. Because the construction industry can erect hi-rise apartment buildings at low cost veritably overnight, new cities are being born in China at an unprecedented, history-changing rate.

At the other end of the scale, new materials and new construction methods are shrinking our electronic devices to unprecedented levels. Here we argue that the shrinking of electronic devices to handheld size is engendering one of those course-changing shifts in history of a magnitude greater than the hyper speed urbanization of China.

The world is entering into the Age of Mobilism. That 1/3 inch thick slab of glass-encased aluminum that serves as the on-ramp to the Global—if not Intergalactic—Information Superhighway, is changing everything at

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warp speed! Here are some illustrative "facts on the ground":

- Apple, Inc., it was reported¹ had more cash on hand last summer than the United States government. For a period of time recently, Apple, Inc. was worth (as measured by stock market valuation) more than any other company in America—more than ExxonMobil, the world's largest energy company.² And, the preponderance of Apple's sales comes not from selling computers but from selling mobile devices.³
- A tipping point is fast approaching: worldwide, more smartphones will be sold than feature phones. Horace Dediu, a futurist specializing in all things mobile, has put up a simple, black-and-white Website⁴ that contains a meter that is ticking off his prediction in terms of days, hours, minutes, and seconds until the sales of smartphones overtake the sales of feature phones; the current prediction is June 8, 2012. Once the tipping point occurs, Dediu claims, smartphones will no longer need to be called "smartphones"—they can and will simply be called 'phones.'⁵
- Essentially every person on the planet that has running water—also has a mobile phone. There are approximately 6.8 billion people on the planet. Approximately 2.6 billion people do not have proper sanitation facilities—they do not have water for drinking, for example. There are approximately 4.18 billion mobile phones in circulation worldwide. Do the math: if you have potable water, you have a mobile phone. No other modern technology on the planet has that level of adoption.
- In a recent survey, over 50% of those surveyed who use a smartphone said: "I use my smartphone for all the functions—it's my life."⁶

In this article, our overarching goal is to explore the major opportunity for learning and schooling that is engendered by the Age of Mobilism. The organization of the article is as follows;

- First, to set the stage for understanding that opportunity, we identify some of the defining characteristics of the Age of Mobilism.
- Next we provide evidence to support the claim that the appellation "Age of Mobilism" is indeed warranted.
- Then, we move to our core theme: what happens when each and every child in a classroom has his or her own mobile learning device—and we argue that the device of choice is a smartphone, not a tablet. It is our position that going mobile enables the transition from an "I Teach" pedagogy to a "We Learn" pedagogy. 'Transition' is too weak a word; 'disruptive transformation' is more appropriate, since for the past 150 years American education has been promoting an "I Teach" pedagogy.

The New York Times Isn't Seeing the Future of Technology in Education

Every few years an article appears questioning the value of digital technology's use in the classroom. The latest installment of "we are spending zillions for computers and they aren't improving student achievement" appeared on page 1, above the fold, in a recent Sunday NYTimes (9/4/2011, http://www.nytimes.com/2011/09/04/technology/technology-in-schools-faces-questions-on-value.html?_r=1&emc=eta1).

Schools are not alone in this quandary. Businesses have also questioned how much technology spending adds to the bottom line. What researchers in that world have discovered is this: when a business uses computing technology to simply automate an existing pencil-and-paper process, the value-added is slim to none, but when a business re-constructs a process to take advantage of the affordances of the computing technology — Shoshana Zuboff called that "infomating" — then the business can reap huge gains. For example, unlike its competitors, Dell Computer didn't use the computer to keep track of its inventory. Rather, Dell used the computer and the Internet to get rid of inventory — and in so doing invented just-in-time PC manufacturing, scooping the industry and making big piles of money.

The implication is clear: as long as schools use computers to teach the existing curriculum using existing pedagogies, little to nothing will be gained. However, when schools use technology to support disruptive

curricula and pedagogies, only then will we see significant gains in student achievement.

Unfortunately, the *New York Times* article focused on educational practices and technologies that are hardly a vision of the future. "...drill[ing] students on every basic subject" is neither a visionary, disruptive curriculum nor pedagogy and "laptops" and "electronic whiteboards" are hardly visionary technologies in this Post-PC Era, Age of Mobilism.

Indeed, the research literature on the use of computing technologies — especially mobile learning devices — to support project-based learning — a pedagogy that pushes a disruptive curriculum — does show that positive trend upwards in student achievement that Larry Cuban so rightfully asks for in the *Times* article.

Go to Nan Chiau Primary School in Singapore and see the teachers learning with their students, students focusing on the *how* and *why* rather than just on factual content of science processes, all the while using mobile learning devices as essential, not supplemental, learning tools, 24/7 for 40–70% of the science class time as well as outside the classroom.

Like some businesses, there are some schools that do make excellent use of digital technology. Stop the muckraking and report on those schools.

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- How will this disruptive transformation take place? The same way that it is happening in the corporate world: workers (students) are bringing in devices that they have purchased and are using them for their jobs (learning), forcing their company's IT staff to either accommodate—or ban those devices.⁷ Currently, it is safe to say that upwards of 90% of American public K–12 schools have chosen the latter strategy. But there is a movement in K–12 called "BYOD"—Bring Your Own Device—that is gaining traction that in effect requires students to use their own devices for curricular purposes.

The Age of Mobilism: Defining Characteristics

Below, we identify three key characteristics that define the Age of Mobilism:

1. **Connectedness:** Mobile technologies serve to connect people, all the time, everywhere. Never before in history have individuals been able to communicate with one another all the time, everywhere. In an article entitled "A Theory of Everything (Sort of)," Thomas Friedman commented that

"the world has gone from connected to hyper-connected."⁸ Mobile technologies reduce space and time, previously significant barriers to communication, to minor annoyances. The hyper-connectivity afforded by mobile technologies address a deep human need: the need to not be alone.

2. **Affordability:** Essentially anyone who wants a mobile device can afford to purchase one. Yes, there are issues with data plans, device costs, etc. Indeed, mobilism is a reaction to the elitism of the Age of the PC, where cost was a significant barrier and thus only those with significant wealth could afford to own and maintain a personal computer. Cost is (almost) no longer a barrier to owning and operating an Internet-connected personal computing device. We say almost because currently we are at the dawning of the Age of Mobilism; we will be able to drop the "almost" in 3–5 years when the planet is fully immersed in the Age of Mobilism.
3. **Globalness:** At a minimum: While Vinton Cerf, one of the inventors of the Internet, is working to connect Mars, for starters, to the Internet, mobilism is most definitely a global phenomenon. Mobilism

touches everyone. Many advancing countries that will never have extensive broadband connectivity are simply going directly to cellular Internet connectivity via smartphones. Mobile phone towers are the new traffic signs on the global landscape.

Evidence for the Appellation: The Age of Mobilism

From just our daily experiences, it is not necessarily easy to see the transformation that we are undergoing: while yesterday you might have used a feature phone and today you use a smartphone with a dataplan—no big deal. It is hard to truly grasp the magnitude of the change that is taking place. However, the data presented below, we feel, does help to paint a bigger—and compelling—picture of transformation that is taking place very quickly. Let's start with data on the use of computing devices and then move to data on the use of the Internet.

Mobile Devices: "It's inevitable that all computing will be mobile."

With the arrival of Windows 95 in 1995 with its Mac-like GUI (graphical user interface), one can argue that, finally, computers became "personal," i.e., usable by everyone—not just those who could master the arcane incantations of command line languages. From 1995 to 2008, desktop computers dominated sales, but in 2008, sales of laptops surpassed sales of desktops: "Dec. 26, 2008—Global notebook PC shipments exceeded those of desktops on a quarterly basis for the first time ever in the third quarter, marking a watershed event in the history of the industry, according to iSuppli Corp... this marks a major event in the PC market because it marks the start of the **age of the laptop...**" (the author's term, but our emphasis).⁹

In December 2010, Mary Meeker, a futurist, predicted that: "...by 2012 smartphone sales will be...surpassing PC and laptop sales..."¹⁰ Interestingly, if Mary had only waited for the data to be tallied for the 4th quarter of 2010, she would have been able to give a more accurate prediction: "February 7, 2011...final quarter of 2010, smartphones passed global PC shipments for the first time in history"¹¹ The Age of the Laptop was rather short-lived.

Now, the juggernaut that is the sale of smartphones continues to gain momentum. As we pointed out in the "facts on the ground" at the outset, it is predicted that sales of smartphones will surpass sales of feature phones in 2012.¹² Some predict that smartphones will initially cost just slightly more than feature phones—while that price will drop due to economies of scale as smartphones continue to dominate sales.

That said, the intriguing question is this: to what extent will the sale of "tablet computers"—iPads, etc.—impact sales of smartphones and/or sales of laptops?¹³ While in the section below titled The Age of Mobilism and 1:1 Scalability we will take a strong stand that for K-12 at

least, mobile device means smartphone, here we can count iPad-like devices (2 pounds or less, 10 inch screens or less) as mobile devices. Thus, while sales of iPad-like devices might well cannibalize sales of smartphones, the total number of mobile devices will still inevitably grow and grow.

Interestingly, Jeff Hawkins, also in 1995, made what is clearly a prescient observation: "It's inevitable that all computing will be mobile."¹⁴ It would not be unfair to call Hawkins the Father of Mobile Computing in that it was Hawkins as technical visionary, along with Barbara Dubinsky as the business whiz, who created the Palm Pilot and Palm Computing, Inc., the first truly viable mobile computing device and company.

As is often the case in computing, however, the individual who first promoted an innovation, e.g., Hawkins and his mobile companies Palm and Handspring, is not the individual to take that innovation to true scale. Indeed, from 2002 to 2007, it was Microsoft, with its PocketPC/Windows Mobile devices, that advanced the mobile industry to the next level. But it is Apple, yet again, with its infinitely more usable iPhone when compared with the clunky, stylus-oriented Windows Mobile devices that has set the mobile computing device industry on its current path. And, with HP's sudden—and ignominious—announcement (August, 2011) that its Palm-inspired WebOS tablet is no longer for sale, Hawkins's vision and leadership may well be at best a footnote when the definitive history of mobile computing finally is written.

We shouldn't be too hasty, however, to write epitaphs:

- Nokia, clearly on the skids in mid-2011, may be reborn due to its alliance with Microsoft. If anyone knows how to design, manufacture, and market low-cost smartphones, it is Nokia. While certainly lovely, Apple's higher-sticker products don't go over big in the Global South (the PC term for "advancing" nations).
- With the future of Android seriously clouded by Apple, Microsoft, and Oracle's successes not in the marketplace but in the court room, Google's bold move in buying Motorola Mobility, also in August 2011, may be just what Android needs to continue its serious successes in the marketplace!

Mobile Web: "We're in the era of the mobile platform now, and the app is reigning as king."

While the dramatically rapid adoption of mobile devices is one huge piece of evidence to support the notion that we are entering the Age of Mobilism, the "other shoe" to drop is usage—what do people do with their devices, mobile or otherwise? First, let's look at Web use (see **Figure 1**):

- The Mobile Web is growing at a phenomenal pace, and it is forecast to overtake the desktop Web in 2014. Or in other words, more users will be

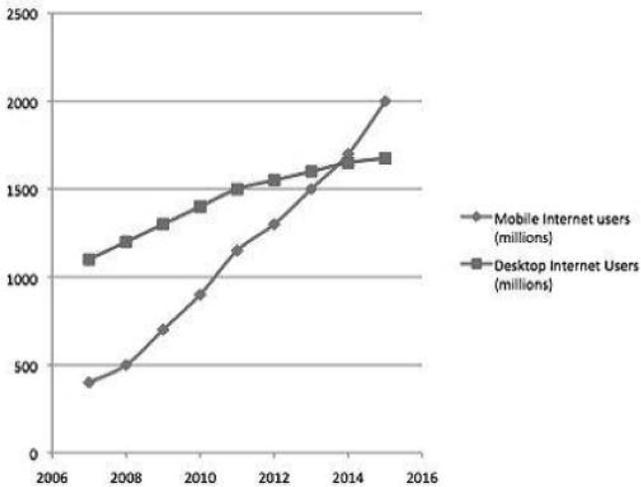


Figure 1. Yet another Tipping Point: Web access from desktop to mobile.¹⁶

accessing the Internet through their mobile phone versus their PC for the first time in 2014. Currently, approximately 900 million people access the Web through their mobile phones, compared to 1.4 billion desktop Internet users. In 2014, mobile Web users will outpace desktop users (1.7 billion to 1.65 billion approximately).¹⁵

We hasten to point out that it is a usability technique that enables Web use on mobile devices. That is, the majority of Webpages up to now were built to be viewed on 17–22 inch screens—not for mobile, 3–4 inch screens. But, Apple invented the two-finger zoom technique that makes viewing of Webpages acceptable on a 3–4 inch screen. So, until Webpages are expressly redesigned for 3–4 inch screens—or mobile apps are developed to take the place of those Webpages—it appears that the many people are willing to forgo a better viewing experience on their laptop or desktop for the convenience of having an acceptable viewing experience everywhere, all the time.

But, viewing a Webpage—on mobile devices or not—may well no longer be a focal user activity! *Wired* Magazine, on its cover, proclaimed “The Web is Dead” in April 2010. And data, depicted in **Figures 2a** and **2b**, indicate that that the “Web surfing” days of yore are being replaced by visiting Websites directly—with Facebook gobbling up the lion’s share of those visits.

Coinciding then, with the decrease in Web surfing behavior, what are people doing on mobile devices (see **Figure 3**)?

- “... for the first time ever, daily time spent in mobile apps surpasses desktop and mobile **Web consumption**.”¹⁹

Flurry, an Internet consultancy, observed that over the past 12 months, time spent on the Web and time spent using apps both increased—but not by the same amount! Web use increased 9% while mobile app use



Figure 2a. Facebook is the New Destination on the Web.¹⁷

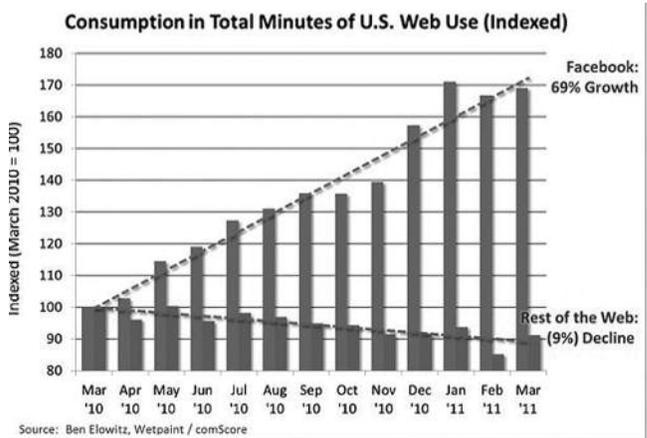


Figure 2b. The Web is dead: Facebook killed it.¹⁸

increased a whopping 91%. As one blogger noted: “We’re in the era of the mobile platform now, and the app is reigning as king.”²⁰

Mobile apps are a new type of software. Applications are large-scale computer programs like Word or Photoshop or Internet Explorer. In contrast, apps are small, bite sized pieces of functionality—and more often than not, pieces of a Website. For example, consider the task of finding a Starbucks store on a trip. Instead of opening up the laptop, booting it up, opening a Web browser, typing in a URL for Starbucks (or finding a bookmark from a menu), waiting for the Starbucks Website to come up, and locating the Starbucks store finder on the Website, one simply flips through one’s app collection and taps on the “Starbucks Store Finder App”!

Interestingly, again it is a usability technique that makes mobile devices easy to use and thus acceptable.

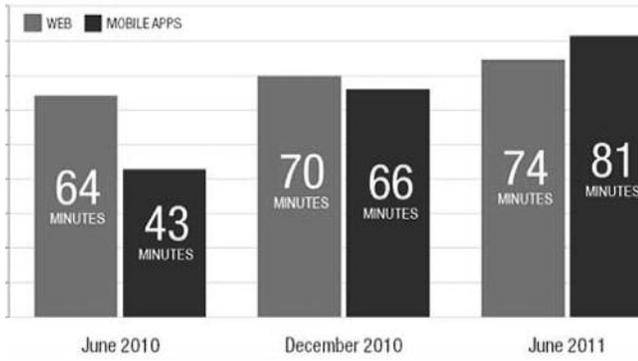


Figure 3. Change in usage patterns over 12 months.²¹

Just like the “pinch and zoom” feature, apps make using a mobile device not only not painful, but actually fun. For example, while typing a URL on a hard, external keyboard is time consuming, pecking it out on soft keyboard with your finger—or worse, with a stylus—on a 3–4 inch screen is definitely not fun. So, software developers have figured out that they should carve a portion of a Website out and package that functionality as an app. At the release of a Facebook app that enables users to just access their Facebook messages, a journalist commented:

- “I wish more app developers would think [of creating an app for a piece of functionality on the Facebook Website]. Instead of trying to combine everything on the Internet into one mobile interface, create separate apps for stand-alone functions that people perform often and want to do in a hurry. Let the phone’s home screen be the thing that contains and presents them all.”²²

The minimal functionality comment is spot on, but no good deed goes unpunished; with lots of apps, one’s home screen can become overflowing—which, in fact, is already happening. Perhaps someone other than Apple will be able to address this problem.

Apps represent more than pieces of Websites. Flurry (see **Figure 4**) found that using apps to play games and visit social networking sites took up 79% of the users’ time. This graphic screams “consumption”—accessing and using media, playing games. What percentage of time is spent using apps to create, to construct media? While more research is clearly needed, at first blush the usage pattern of mobile devices doesn’t seem to include a great deal of media construction.

**Call It What It Is:
Horseless Carriage → Automobile**

Steve Jobs, addressing a recent conference²⁴ after the rollout of the iPad, commented that we are entering the Post-PC Era. But, that nomenclature is really a negative way of talking; it says what the era is not—it is not the PC era. Similarly, initially the term “horseless carriage” was used to denote a new device—again, a negative

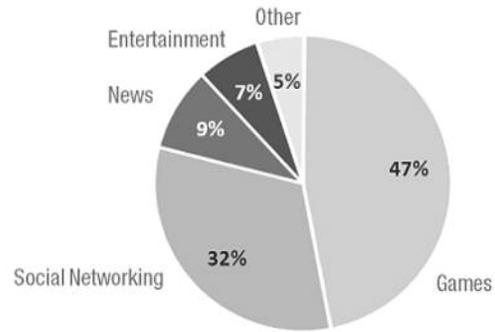


Figure 4. What apps are people using?²³

way of talking—until the term “automobile” was coined. It is our position that we are ready to move to the positive way of naming the current epoch; we are moving from the Post-PC Era to the Age of Mobilism.

The Opportunity Engendered by Mobile Technologies: Direct, not Teacher/Textbook Mediated Access to and Manipulation of Information

By 2015, we predict that each and every U.S. student, from 1st grade to 12th grade, will have with them 24/7—inside and outside the classroom—an Internet-connected, smartphone-sized, mobile computing device. And, we predict that schools will no longer be banning these devices from the classroom. (How this situation can come to pass we discuss in the next section, below; but for the sake of this section, please “suspend disbelief.”) Classrooms with students so equipped are poised to make the most significant, most disruptive change in educational practice in over 150 years; classrooms can move from an “I Teach” pedagogy to a “We Learn” pedagogy.

In an “I Teach” classroom the teacher and textbook provide the students with content and skills that they need to master. While this direct-instruction, teacher-centric “I Teach” pedagogy is the established norm, increasingly we recognize that this form of instruction is in effect a barrier to learning for many students.

However, in a classroom where every child has his or her own Internet-connected mobile learning device (MLD), no longer is the teacher/textbook needed to mediate a student’s access to content. Rather, the MLD affords the opportunity by which students can not only gain direct access, themselves, to all manner of content but also they can manipulate and even create content. From accessing textual, video, audio, etc., content on the Internet to conducting and recording interviews with parents, relatives, shopkeepers, construction workers, and others, to visiting, via the Internet, remote countries, museums, laboratories, etc., to working (and playing) collaboratively with students all around the world, to taking pictures outside the classroom that are concrete

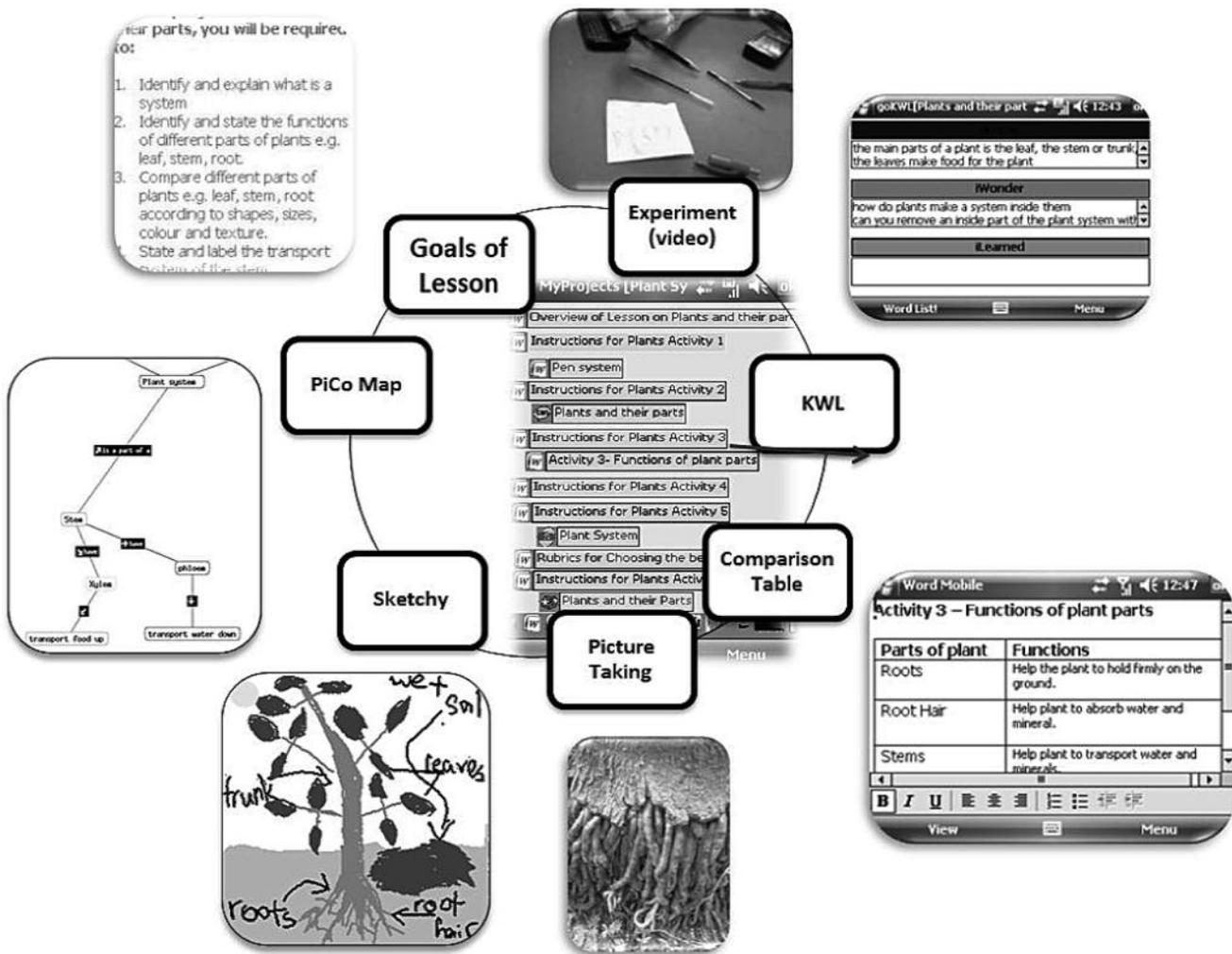


Figure 5. A lesson on plant growth for Grade 3 students in a primary school in Singapore. In this lesson, a third grade student creates more than seven artifacts using seven different apps—where all the consuming and creating of multiple media types are done on a 4-inch screen smartphone.

instantiations of the abstract ideas being explored inside the classroom, to creating content of their own design, finally, students can take ownership of their learning.

And, with students themselves not only directly accessing but manipulating this enormously broad range of content, the teacher’s role in the classroom can change from giver of information to director of learning. Now the teacher can direct and mentor students in their learning activities and, in fact, learn together with their students. For example, we described in detail in a recent *Educational Technology* article,²⁵ a 3rd grade science classroom in Singapore’s Nan Chiau Primary School that has made the transition from “I Teach” to “We Learn.” In **Figure 5**, the images ringing the smartphone—the device used by each student—depict the artifacts created by a student who was following the directions of his teacher (upper left—“Goals of the Lesson”) in a lesson about plant growth.

Figure 6a depicts children having a conversation

around the artifacts created on their MLDs, while **Figure 6b** depicts a conversation between students and their teachers. It is well documented²⁶ that creating multiple media artifacts leads to learning, and conversing about those artifacts leads to learning. Indeed, as noted in our *Educational Technology* article, the students in this 3rd grade classroom outscored five other classes on the national exam—even though it was administered on pencil-and-paper. Additionally, the students depicted in **Figures 6a** and **6b** are learning key 21st century skills, such as self-directed learning and collaborative learning. “We Learn” is a win-win pedagogy.

The Age of Mobilism and 1:1 Scalability

From a casual read, the picture painted in the immediately above section is of a 1:1 classroom—each child has his or her own personal, laptop computer. And for the past 10 years some schools have issued laptop computers to create 1:1 classrooms. Maine was the first statewide



Figure 6a. Grade 3 students at Nan Chiau Primary School in Singapore. This image captures the representative activities being carried out in the science classroom: a group of students engaged in conversation about the lesson, a student working by himself quietly, etc. But notice that the smartphone is a key tool in all the activities.



Figure 6b. Teacher and students engaged in “We Learn.” The teacher of the class, shown in this picture, was not trained in science. But, in interacting with the students as their mentor, guide, and advisor, the teacher—as well as the students—developed a deep understanding of the science material in the lessons.

rollout of 1:1 laptops. In fact, it was the only statewide rollout because the cost to provide a laptop computer to each and every student, and provide WiFi connectivity, and maintain the laptops is prohibitive. Even though the cost of laptops per se has recently dropped significantly, laptops are still not a technology that will scale up to

Table 1. Adults and teens owning mobile phones.²⁷

Year	% Adults In US Owning Cellphones	% Teens In US Owning Cellphones
2004	65%	45%
2006	73%	63%
2008	77%	71%
2010	85%	75%

55,000,000 American school children—let alone to children all across the globe. Simply put, the model that schools provide computers to create 1:1 is not a scalable model.

However, as we enter the Age of Mobilism, the cost of Internet-connected mobile devices is, not surprisingly, plummeting—so much so that telco’s offer some mobile devices for free when purchasing a multi-year data plan. The cost reductions can’t come soon enough for America’s youth, however. As the Pew Internet and American Life Project has documented in **Table 1**, teens (ages 12–17) still lag behind adults in cell phone ownership. Cost is most likely the show stopper, since teens clearly recognize the value of a mobile phone:

- “I’d rather,” deadpans Philippa Grogan, 16, “give up, like, a kidney than my phone. How did you manage before? Carrier pigeons? Letters? Going round each other’s’ houses on BIKES?”²⁸

In the Age of Mobilism, it is obvious then how schools all across America—if not worldwide—will go 1:1 following the example set by workers in companies; students will simply bring their own (mobile) computing devices into their classrooms! The term coming to be used to describe this phenomenon is BYOD—Bring Your Own Device. Even though today BYOD is in its infancy, the future is clear. In reflecting on his experience at the ISTE Conference in Philadelphia, June 2011—attended by upwards of 15,000 educators, researchers, administrators, and vendors—in a list of the top five take-aways from that conference, one journalist put BYOD as #1, commenting: “BYOD is unstoppable.”²⁹

While adults might feel that a tablet sized-screen would make a better learning device than a smartphone-size device, the question remains: Will schools be willing to buy each and every child a tablet-sized mobile device—where the tablet-sized devices cost as much if not more than netbooks? Recall that we argued, based on observing the dearth of 1:1 netbook implementations, that netbooks (or worse, laptops) simply were not a scalable technology—especially during these challenging economic times (2011). Thus, it is our opinion that the device that the majority of students bring into their classroom under a BYOD mandate will be smartphones, not laptops, not netbooks, and not tablets.

Concluding Remarks

Technology drives change—globally. Mobile technologies are profoundly changing how people on Planet Earth function on a moment-by-moment, day-in-day-out basis. Calling this epoch the Post-PC Era does not give this epoch its due. In this Age of Mobilism, then, fueled by the technology, learning and schooling will undergo the most dramatic and disruptive change in the past 150 years—since the invention of the one-room schoolhouse, in fact.

Needless to say, “I Teach” has staved off all manner of pressure to change; “We Learn” will not just roll into the classrooms. For starters, teachers need to be retrained; teachers teach the way they were taught and so “I Teach” is most comfortable to them. Curriculum needs to be revamped; if we teach the same old stuff—who, what, and when facts—but in a new way, we are missing the opportunity—of exploring the “how” and “why” of things—afforded by “We Learn.” And, the 800-pound gorilla, testing, will need to be addressed. While testing companies blithely prepare their materials for 17 inch-screened, online computers, they are ignoring the fact that those types of computers are not readily available in K–12; schools’ current IT infrastructure cannot scale up to massive, school-wide, online testing.

But even K–12 schools will not be able to resist the Age of Mobilism. While all other technologies in K–12 have been brought into the classroom by adults, this time it is the students themselves that are bringing in their own personal technology. Consider then the following image: In a high school, each and every one of the 3100 students file into their 1st period classroom; they take their seats, lay their smartphone that is already in their hand on their desk, and they look up, expectantly, at the teacher. Use the mobile devices or ban them?

Make no mistake, this situation will happen; nay, it is happening! We reiterate our prediction: By 2015, each and every student in each and every classroom in America will be using a mobile learning device for curricular purposes, 24/7. FYI: S. Korea just announced that by 2015 each and every student in their classrooms will be using a mobile learning device.³⁰ We told you so—sort of! □

Notes

¹http://articles.cnn.com/2011-07-29/tech/apple.cash.government_1_ceo-jobs-apple-cash-balance?_s=PM:TECH .

²<http://www.dailymail.co.uk/news/article-2024281/Apple-worth-338bn-leads-Exxon-valuable-company-world.html> .

³<http://www.asymco.com/2011/07/26/apple-has-moved-on/> .

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⁵<http://www.asymco.com/2011/05/07/phone-tipping-point-count-down-reset/> .

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¹²<http://tech.fortune.cnn.com/2011/02/07/idc-smartphone-shipment-numbers-passed-pc-in-q4-2010/> .

¹³<http://web.me.com/hdediu/Smartphonecountdown/Welcome.html> .

¹⁴Indeed, rumor has it that Windows 8 will unify smartphone, tablet, laptop, and desktop functionality.

¹⁵Jeff Hawkins, page 12, *Piloting Palm: the inside story of Palm, Handspring, and the birth of the billion-dollar handheld industry...* by Andrea Butter & David Pogue, 2002, John Wiley and Sons, NY; http://books.google.com/books?id=_mBN_Ai55C_QC&pg=PA12&lpg=PA12&dq=it+is+inevitable+computing+mobile+jeff+hawkins&source=bl&ots=qhQRwetXrC&sig=ThKSZcC6qmhUpGcb4-ZwEFDEcuY&hl=en&ei=LLPTvSjC4TCgAe5z4mBBw&sa=X&oi=book_result&ct=result&resnum=3&ved=0CDEQ6AEwAg#v=onepage&q=it%20is%20inevitable%20computing%20mobile%20jeff%20hawkins&f=false

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¹⁷Quote from: <http://strategy.wikimedia.org/wiki/Mobile/Forecasts> based on data presented in: http://www.morganstanley.com/institutional/techresearch/pdfs/Internet_Trends_041210.pdf .

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