



MOBILE LEARNING:

Not just laptops any more

*New advances in mobile technology could help schools realize the promise of true anytime, **anywhere learning***

Not all that long ago, the term “mobile learning” implied laptop computers and mobile carts that were wheeled from classroom to classroom. Now, as a growing number of students carry smart phones, tablets, and other mobile devices that can connect to the internet wirelessly through a cellular as well as a Wi-Fi connection, the definition of “mobile learning” is expanding—and with it, the possibilities inherent in the term.

The rise of mobile technologies small enough to

carry in one’s pocket, and the increasing power and functionality of these devices, is causing a seismic shift in education technology.

Last fall, nearly 50 percent of middle and high school students said they carried some type of smart phone—a 47-percent increase from fall 2009, according to Project Tomorrow’s annual Speak Up survey of students, parents, teachers, and administrators on their uses and views of school technology.

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There are now five billion wireless subscribers in the world, and of those, 1 billion are 3G subscribers, according to Wireless Intelligence. By 2014, there will be 2.8 billion 3G subscribers. (3G refers to a third-generation cellular network, which is capable of streaming video and other bandwidth-intensive applications wirelessly. Already, some providers are rolling out 4G services that promise even faster download speeds and more capabilities.)

As mobile learning has come to mean something very different than it once did, the very definition of a mobile device may be changing. Mark Anderson of Strategic News Service, a predictive newsletter covering the computing and telecommunications industries, says there are three categories of today's popular computing devices: the laptop, the carry-along (which includes netbooks, iPads, and other slates), and the mobile.

"The 'mobile' is your phone; you never leave home without it," explains Cathie Norris, Regents Professor at the University of North Texas, who works with Elliot

Soloway, founder and chief executive of GoKnow, an education consultancy. Soloway and Norris have been following education and technology for decades, and they work, via their consultancy, to get technology into the hands of every student.

"When you go out, you bring your keys, your wallet, and your mobile," Norris says. This, she explains, is different than other mobile devices like the iPad, which you have to "consciously carry."

As one educator said at a recent conference: Devices like laptops or iPads might never leave the classroom. How is that mobile? The promise of mobile learning, some believe, comes from the true capacity for anytime, anywhere learning—or, as Soloway puts it, "everywhere, all-the-time learning."

True anytime, anywhere learning

"Smart phones rival laptops and the computers of just a few years ago, and they're much more affordable," says Michael Flood, education solutions practice manager at AT&T. "The ultimate question, and goal, is how we can get devices—with computing power and access to the information that will help them learn more effectively—into the hands of students."

Laptops and netbooks, useful as they have been, are not with students all the time. "But as we move toward getting students engaged with other students and teachers outside the classroom, they need their devices with them anytime, anywhere," Flood says. "They won't have a netbook in the lunch line, but they will have a phone, and they will pop it open to seek an answer to a question."

Students with smart phones, 3G (or 4G) access, and a data plan can use the device on the school bus to look up information for a report on their way home in the afternoon. They can do their homework while waiting in the dentist's office. That's the real power of mobile learning, says Norris, who points to the Tom's River School District in New Jersey, which gave every fifth grader a mobile device and access to the internet.

"Every single child did every single piece of homework, on time," she says. "That's pretty unusual. The real power of mobile is just that: If a student has to go to his little sister's soccer practice after school, he's not going to carry his books, he's not going to carry his homework. But he's certainly not going to watch his little sister play soccer, either, so he'll pull out his smart phone and get it done."

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Three (wildly) successful mobile learning projects

The Katy Independent School District in Texas has about 60,000 students. During the 2009-10 school year, the district used bond funds and federal e-Rate funding to create a program that put the Incredible Droid from Verizon into the hands of all fifth grade students at a single elementary school.

The calling and paging features of the phones were turned off, and students were allowed to use the phones both within and outside of class. Students were encouraged to use Edmodo, a secure social learning network for teachers and students, to share ideas with peers, ask questions, and post answers. The phones were incorporated into the students' everyday math and science classes.

"The kids use their mobile phones to do their homework. That's been the most advantageous thing we've seen with the devices," says Lenny Schad, Katy ISD's chief information officer. "It's more interactive, it taps into that creative side, much more so than pen and paper."

The district took advantage of a number of Web 2.0 applications that run on Google's Android mobile operating system. For example, one app allows students to point their phones up to the sky, take pictures of the stars, and have the constellations mapped for them, which they then shared in class. There are math wikis that help students with difficult concepts, and websites that allow students to create their homework online.

"It's been so powerful. The kids are coming back to the teachers and saying, 'Hey, look what I learned we can do on this phone,' so they're showing their teachers and peers how to do new things," says Schad.

Already, the district has seen "huge, huge gains in math and science," says Schad. Benchmark scores for math and science at the pilot school went up between 20 and 30 percentage points, he says. Attendance has gone up, and discipline issues reportedly have plummeted. Teachers in subjects other than math and science have begun using the phones as well, and scores are improving in those areas, too. Music teachers, for example, have had kids use a keyboarding app to study music.

The program was so successful that it was expanded to 10 more elementary schools this year, with 1,500 devices distributed. Katy ISD also allows students to

bring in their own devices and use them for educational purposes in the classroom.

Virginia's York County School Division is another school system that allows students to use their own mobile devices in the classroom for instructional purposes, and teachers are incorporating the devices into their curriculum. For example, one high school civics class has small teams of students working together on a mock election. They create position statements for their candidates, research issues using their own mobile device, save their position statements on the school's network, and share them with one another.

"We constantly hear from students and teachers that they need more computers, more devices, but we have significant fiscal challenges, and our sense is we'll never be able to keep up with demand for computing devices," says Superintendent Eric Williams. "But students have ... iPhones and other mobile devices, so we want to make use of those."

The school system does not have the resources to set up a separate wireless network comparable to what you might find at an airport or a coffee shop, but it will be piloting a program to let users register their devices by their MAC address to the existing network. "This way, the user is known to us. The possibilities are pretty exciting in terms of having access to additional computing devices," Williams says.

Project K-Nect's pilot program began in the 2007-08 school year and was continued in 2009, during which 150 eighth through 12th grade students were given 3G-enabled smart phones to connect wirelessly to educational resources on the internet and to each other, both on and off campus.

The phones provided access to supplemental math content aligned with teachers' current lesson plans, and they also allowed students to collaborate with each other and contact after-school tutors who could assist them with mastering a targeted skill set. Teachers used software apps on their laptops to send messages to students on their phones, giving them homework assignments and viewing collaborative work.

The project has shown positive qualitative and quantitative results. The average math proficiency rate of K-Nect students at one of the participating high schools was 30 percentage points higher on North Carolina's state exam than that of students



not in Project K-Nect but taught by the same teacher. Throughout the project, students have discovered creative ways to use the phones and the 24-7 internet connectivity to increase their understanding of Algebra I, especially with social networking tools such as blogging and instant messaging.

According to an evaluation by Project Tomorrow, teachers revealed that the mobile devices and the problem-based learning approach encouraged by Project K-Nect transformed the way they taught math. The pilot program has been expanded beyond North Carolina to include Virginia and Ohio, with approximately 4,500 students. **eSN**

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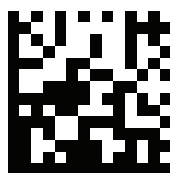
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Rethink Possible



Where are we going? A look at the future of mobile learning

The movement toward a one-to-one computing environment—that is, one device for every child—soon will be moot, says Phil Emer, director of technology planning and policy for The Friday Institute, which is housed within North Carolina State University. “The truth is, we’re going to blow through one-to-one. Right now, we might have four kids to one machine, but two years from now, we’ll have one-to-four. That is, one kid to four devices.”


That might not seem possible for schools to manage or support—but to remove some of the burden, schools should consider stopping the practice of doing certain things locally and do them online instead, Emer says.

“Why run your own eMail service now?” he says. “Have Microsoft or Google run it, [and] save a bunch of money. Get out of the business of running eMail servers and domain control servers and servers that run your finance systems. There are services available now that do that very well, very inexpensively—and big enterprises use them. So why don’t [schools] use them and free up time and money, and invest that money in devices?”

Another key shift is that telecommunications companies are no longer in the business of selling and managing wireline or even wireless telephone service. They’re in the business of wireless data networks. “We can talk about my iPhone being a phone, but it’s really an eMail device, a phone device, an internet device,” Emer says.

Along those lines, Emer believes that eventually the telecom companies will be “involved in the whole solution: not just the 3G wireless solution, but how do you provision the end devices? How do you engineer, manage, and monitor the wireless networks? How do you ensure that the students have data access outside of school? There’s an AT&T answer” to all of these questions.

A third thing that will have to change, according to Emer, is the Federal Communications Commission’s e-Rate program, which currently helps schools connect to the internet. “What we need to be doing is having the e-Rate discount the cost of the data plan,” he says. “So, fix the e-Rate, which the telecomm companies can help us to do, so that it addresses the data connection to users.”

The FCC is already funding a study to look at the merits and challenges of funding wireless off-premises connectivity for mobile learning devices. The pilot program will help the FCC decide whether—and how—those services should be eligible for e-Rate support. As part of the pilot program, the FCC authorized up to \$10 million for funding year 2011 to support a small number of innovative, interactive off-premise wireless connectivity projects for schools and libraries. As of the December 2010 due date, the FCC had received 85 “seemingly valid” applications. 

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It’s not just the convenience of mobile devices that is driving an increased interest among educators; smart phones also have been shown to help improve student performance in the classroom.

In 2008, public high schools in North Carolina began a pilot program to see if they could improve Algebra I performance among low-income students who lacked wireless internet access at home. The program, called Project K-Nect, started with 150 ninth-grade students who were given smart phones equipped with Algebra I content. Project K-Nect chose tech-savvy teachers—those already using technology in their classrooms—to implement the course. Content on the phones aligned with their current lesson plans, and students were encouraged to learn from each other both inside and outside the classroom. Students did so by using social networking applications on the smart phones, as well as other internet resources such as Algebra.com. By the end of the school

because they didn’t have enough of them, so the best they could do was supplemental. And supplemental use is just that. It’s not enough to move the needle.”

To really change student achievement, Soloway says, computers need to be used as essential tools, for up to 70 percent of the school day. When schools can supply a device for every student, the pedagogy and curriculum can change. Teachers stop “telling,” and students start “finding,” which moves teaching from a teacher-centric to a student-centric experience.

But is such student-centric learning really effective? Absolutely, says Tom Greaves, founder of education technology consulting firm The Greaves Group and co-author of a study called Project RED, a national effort to analyze what’s working in technology-rich schools.

In a recently completed large-scale study of 1,000 schools, Greaves found that in schools where every student at a particular grade level was given a computing device, the students significantly outperformed those from schools where every student did not have his or her own device. This better performance was consistent across a



While the potential for learning with smart phones is huge, many challenges remain.

year, the students’ average math test scores were 30 percent higher than the average scores of students taught by the same teacher in a different class.

“These were students who were struggling in math ... and now some of them are even thinking of pursuing careers in math. Some of the students originally in the program are seniors now, and they’re taking calculus,” says Kristin Atkins, director of wireless reach at Qualcomm Inc., which funded the Project K-Nect program.

Having a one-to-one ratio of mobile devices to students is a key to moving education forward, Soloway believes.

“Up to now, schools have spent billions of dollars on technology, and the result is zero,” he says bluntly. The question is why. “First, we’ve used computers as supplements to existing curriculum. We’ve taken the existing pedagogy, the existing curriculum, and added some computers when we could. Teachers couldn’t count on the devices

variety of other factors, from teacher attendance to demographic characteristics.

Those same benefits are available with laptops as well, Atkins acknowledged, but she said students in the pilot projects funded by Qualcomm vastly preferred smart phones, even compared to laptops or netbooks.

Overcoming hurdles

While the potential for mobile learning with smart phones or other portable devices is huge, many challenges remain before “everywhere, all-the-time learning” becomes a reality.

One such challenge is how to police the devices to make certain students are using them only for tasks that have to do with learning and are not accessing inappropriate content.

A simple way to do this is via identity management,

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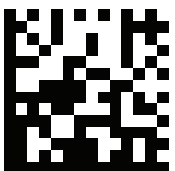
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says Phil Emer, director of technology planning and policy at The Friday Institute, which is housed within North Carolina State University.

Emer says it's inevitable that students eventually will be allowed to bring their mobile devices into school, and identity management can help make this happen. Each child should have an account, and any time students use a wireless device, they should be required to log into the school's wireless network, just as enterprise users do, where they can be monitored. "You can even put it all together on a website for parents," he says. If a student is doing something inappropriate, either the parent or the

school sees it and can put consequences into place.

"People over-interpret CIPA [the Child Internet Protection Act]. They do little or no monitoring, they just filter the whole internet," Emer says. Instead, he suggests, schools should filter the "clearly unsavory stuff" and leave the rest flexible.

Still, students will always look for ways around security. "It's almost like an ongoing arms race between students and administrators," says AT&T's Flood. But there are solutions, such as "middleware" software that AT&T and other companies provide.

In a mobile device environment, "you can force all traffic from mobile devices to route back through the district, so you have some assurance that access is as good as it is on campus. You can also implement a filtering system through the mobile network, through the carrier," he

says. Mobile device management (MDM) software also can help solve the problem. "Some districts require that MDM be installed on any student- or faculty-owned device if they want to use it at school," Flood says.

He adds that some school leaders look at the issue simply from an "acceptable use" perspective, addressing it purely from a policy standpoint and not a technological one.

That viewpoint is similar to what Eric Williams, superintendent of the York County School Division in Virginia, believes. Dealing with mobile devices in the classroom, he says, is a classroom management issue.

"Teachers have always dealt with classroom management issues like off-task behavior, cheating, and inappropriate materials," he says. Technology simply offers new versions of these same issues. "They exist separate from technology, and they exist with technology. It's a challenge for teachers regardless of whether cell phones are allowed in the classroom or not."

Greaves says there are two camps: advocates of "lock and block" solutions, who want to lock everything down and block all inappropriate content, and advocates of giving students some responsibility. The latter camp is gaining in popularity, largely because students will, eventually, have to learn how to use discretion and make smart decisions regarding their online use. Besides, says Greaves, "if a student has done his homework, is finished with what he needs to be doing, and is watching ESPN Sportscenter for five minutes, is that the end of the world? I think the issue is going to resolve itself."

Another challenge is whether to allow children to bring their own device to school—or whether they should be given school-issued devices. If students bring in their own, there could be equity issues: Some students will have a device, while others may not. And not all devices are created equal.

For now, schools that are encouraging the use of a child's own device in the classroom for learning purposes are taking a laid-back approach. For example, next year the Katy Independent School District, in a suburb of Houston, will allow students to bring their own personal devices; the district is installing public Wi-Fi at every campus.

"Public Wi-Fi does not address the equity issue, of every kid having a device, but it does leverage the personal investment parents have made," says Lenny Schad, the district's chief information officer. "If not every student has a device, we have mobile carts, so teachers can supplement that way. [Or,] they can pair up with students who do have a device."

The York County School Division also allows students to bring in their own devices and use them for instructional purposes. Recently, a middle school forensics science teacher had students taking photos of mock crime scenes using their cell phones. Students sent the photos to the teacher, who displayed them on a screen in the classroom for use in analyzing the crime scenes. When a student doesn't have a device, he or she simply works with a student who does.

At this point in time, at the high school level, a very high percentage of students do have their own mobile devices, says Schad.

Additionally, Project Tomorrow's Speak Up survey indicated that 67 percent of parents said they would be willing to provide their child with a smart phone if the school allowed it to be used for education. That number was pretty stable across urban and rural districts, says Julie Evans, CEO of Project Tomorrow.

"Parents are thinking of smart phones as different from a laptop. It's like paying for violin lessons, paying for a field trip or a calculator," Evans says. "It's a whole different category."

In fact, Soloway predicts that by 2016, nearly every K-12 student in the U.S. will be using a mobile handheld

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Innovative mobile content

Though many educators believe there needs to be more content developed specifically for mobile devices in order to take full advantage of mobile learning, some excellent sources of content already exist, with more on the way. Here are a few sources to get you started.

For Apple devices: 10 of the best apps for education

<http://is.gd/WDqJH3>

eSN readers: Here are our favorite apps for education

<http://is.gd/DljCzA>

Opera Mobile: Smarter mobile browsing for phones

<http://www.opera.com/mobile/>

Android Manager Wi-Fi

<https://market.android.com/details?id=com.mobileaction.AmAgent>

Edmodo: A secure social learning network for students and teachers

<http://www.edmodo.com/>

Discovery Education

<http://www.discoveryeducation.com/>

Algebra.com

<http://www.algebra.com/>

Learning in Hand's podcasting tool

<http://learninginhand.com/podcasting/>

iPod Touch Projects: The blog at this site contains helpful ideas

<http://tinyurl.com/iPodprojects>

IEAR.org: A community effort to grade educational apps

<http://www.iear.org/>

Cellphones in Learning: A conversation about integrating cell phones into classroom curricula

<http://www.cellphonesinlearning.com/>

Useful apps from Android Market (<https://market.android.com/>)

- Math Blitz game app
- Math Attack
- Dictionary.com
- Thinking Space
- ColorNote Notepad Notes
- StickDraw
- FX Camera
- Mind Map Memo
- Typing Zombie
- AnDrawing
- Wordoid



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device as an important part of his or her education. Greaves agrees: "I think the issue of whether it's a student-owned device or a school-owned device is in migration. I think in five years or so, it will shift to student-owned devices. It's like calculators: bringing a calculator to school is your own responsibility."

Pricing is another major hurdle. The devices themselves often are subsidized by wireless providers; second-generation devices can be given or sold cheaply to schools once a new generation of device is released to the market. And besides, the devices are significantly less expensive than PCs or laptops. But the data plans that enable students to access the internet anytime, anywhere—that is, via a 3G or 4G network, allowing students to go online even when they are not connected to the school's wireless network—can cost as much as \$35 per student, per month.



To make the most of mobile technology, teachers must have proper training.

Part of the challenge for schools is that the federal e-Rate program, which provides telecommunications discounts to eligible schools and libraries, does not discount the cost of the data plan—although there is an e-Rate pilot program for wireless internet services for off-campus student use planned for next year (see the sidebar "Where are we going?").

Cost might not be an issue for long, Norris believes. "Eventually, you'll get to the point where every student will be able to use [his or her] own device" at school, she says—the implication being that parents will be paying for the data plans themselves.

Content, curriculum, and pedagogy

But if learning with mobile devices is really to take off, the challenges of finding good content and changing classroom pedagogy will need to be addressed.

To make the most of mobile technology, teachers must have proper training, and schools must go through a change management process, says Greaves.

Technology-rich schools whose principals "have formal training in change management far outperform the technology schools where [principals] don't have this for-

mal training," he says. "At a lot of schools, they just provide the technology and think that, by itself, will carry the day. But if you don't actually give [educators] the training of what to do with it, nothing changes."

A change management leader looks at the students within a class and evaluates to what extent they are working on a fully personalized basis. "If 30 kids in class are all doing the same thing, that's a clear sign that you haven't changed anything," Greaves adds.

Greaves suggests not starting a mobile technology implementation without having a plan: "If you don't know what the right way is, don't start. You'll have a failed project, cost a lot of money, and set back the movement." Don't know how to begin? Go visit schools that are successfully implementing these projects, he says.

A strong curriculum must be built around the use of mobile devices, rather than the devices simply being integrated into an existing curriculum.

At the Katy Independent School District, where 1,500 smart phone devices were handed out to fifth graders, the district has a group of people whose sole responsi-

bility is the integration of technology into the classroom, with three people dedicated to mobile learning devices. That group works with curriculum specialists, and together they are writing the curriculum for the district's mobile learning initiative. Meanwhile, the fifth grade science teachers who are having the students use the mobile devices in the classroom are sharing ways they're using the devices via Adobe Connect sessions online.

Qualcomm's Atkins acknowledges that the industry needs more instructional materials developed specifically for mobile devices.

"What we learned from Project K-Nect is that we need more content that fits on the small screen," she says.

But as mobile technology continues to advance, that's changing, too, and ed-tech companies are beginning to respond to this demand.

For example, the Houghton Mifflin Harcourt division SkillsTutor is about to release a version of its software that is tailored for use on iPhone and iPad devices. SkillsTutor provides cloud-based diagnostic and prescriptive software for building skills in reading, writing, language arts, math, and science.

The company's mobile version of SkillsTutor won't

be just a scaled-down app, but a completely new platform and interface for using the software anytime, anywhere on an Apple mobile device, says company president Adam Hall. He describes the benefit of true mobile learning as "increasing the time students are learning without increasing the cost."

Not a panacea

Despite the excitement among many educators that smart phones and tablets could change the way students learn significantly, others warn that such mobile devices are not a panacea for education.

"You're not going to do your dissertation on a cell phone," says Eileen Lento, government and education strategist for Intel Corp. "A cell phone enhances a tiny piece of what we need to address. What we're really trying to do is move students up the learning curve. I certainly wouldn't go to a school and say, 'I think you should buy everybody a cell phone.' I don't think that would be the best use of their money."

School leaders need to pinpoint the results they want to achieve, Lento says, and then make smart buying decisions from there. And part of what will move education forward, she adds, are robust learning platforms that allow for rich content creation—something not easily done on a mobile device.

But the potential for mobile devices to deliver information to students' fingertips no matter where they are has many educators intrigued—and this could help students learn to take ownership of their education.

Teachers could begin encouraging students to find information on their own, for example, and to incorporate what students are learning on their own in the classroom. If a student has a question, instead of raising his hand to ask the teacher, he might Google it and find the answer on his own. What's more, he might learn something the teacher didn't know, and raise his hand and share this newfound knowledge with the teacher and the rest of the class.

"The model of teaching where the teacher is the sole source of information is changing," says Norris. "Teaching is not telling, and learning is not listening—it's doing. So curriculum changes need to take place. And if we can pull it all together, the U.S. will no longer be 15th in the world."

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LINKS:

Project Tomorrow

<http://www.tomorrow.org/>

Project RED

<http://www.projectred.org/>

Project K-Nect

<http://www.projectknect.org/>

The Friday Institute

<http://www.fi.ncsu.edu/>

The Greaves Group

<http://www.greavesgroup.com/>

GoKnow

<http://www.goknow.com>

Katy ISD

<http://www.katyisd.org/>

York County School Division

<http://yorkcountyschools.org/>





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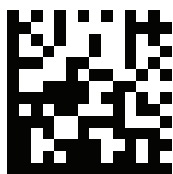


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