

Anytime

Anywhere

Learning



Mobile Education
& the Wireless Industry

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Mobile Education & the Wireless Industry

“Anytime, anywhere learning”

In the current 21st century education ecosystem, the explosive growth and benefits of mobile technologies are changing the face of learning for the better. As smartphones and tablets become ubiquitous,¹ schools and educators are beginning to embrace the power of wireless technology for a more involved and tailored learning experience.

“With more than 1.2 billion new mobile devices produced each year, the pace of innovation in the mobile markets is unprecedented,”² and combining that innovation with the evolving field of education is a natural fit. Mobile education, or “the leveraging of small, portable devices to facilitate anytime, anywhere, un-tethered learning,”³ has become prevalent in schools across the country. Thanks to tablets and smartphones, students can have 24/7 access to education resources. The true value of mobile learning comes primarily from its key attributes: collaboration, individualization, and innovation. This paper looks at the multiple layers of mobile education, beginning with the devices used to engage students in their education. The next layer is the content that is provided on those devices, specifically, digital textbooks and mobile apps for education. The final, all-encompassing aspect that will be examined is the benefit to students and teachers of using this inventive approach to learning.

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Mobile Learning: An Overview

Mobile education began, to some extent, with the introduction and integration of laptops into the classroom experience.⁴ Students were given access to technology, which was used primarily for word processing and some Internet browsing. However, there was little interaction among students or with the computers. Email and online classroom message boards were steps in the direction of a more engaged learning tool, but still provided only the opportunity to send standard messages back and forth.

In recent years, however, educators are realizing the potential of mobile phones and tablets. With the proliferation of wireless mobile devices and the subsequent increase in capabilities, the concept of mobile learning has been revolutionized. Digital textbooks and interactive apps have resulted from this new mobile-centric pedagogy. Students are no longer confined to preset material, with little individualized feedback or opportunity for interaction. Whether a school provides the devices or takes advantages of the devices already owned by students, the availability of this technology is changing the face of education.

Adoption of Mobile Devices in an Educational Setting

One of the early adoptions of the mobile learning model began in 2007 with Project K-Nect, a program made possible through a partnership between Qualcomm and the North Carolina Department of Public Instruction.⁵ The project

provided ninth grade students with smartphones loaded with content to assist them in learning Algebra I. By aligning the supplemental material with the lesson plans of the teachers, students were able to learn both inside and out of the classroom, in a more collaborative and focused way. After two years of the program, participating students achieved test scores that were 30 percent higher on average than those of non-participating students.⁶ The project has since expanded to include several other math classes and grade levels, as well as two additional school districts.

Given the demonstrated success of Project K-Nect and the current technological climate, the time is now for further adoption of mobile learning initiatives. Access to mobile technology in classrooms has more than tripled over the last three years, and all signs indicate that this trend will continue.⁷ School-provided devices are becoming more common, thanks in part to grants from states or private businesses. One school district in Michigan gave all 1,800 high school students an iPad to be used for in class learning, homework, and interaction with classmates.⁸ Even if schools don't provide the devices, many students have access to some mobile device of their own. According to a recent survey, nearly 50 percent of middle and high school students already carry some sort of smartphone—a figure up 47 percent from the previous year.⁹ Students also have a strong interest in learning through mobile devices—62 percent of students in a recent study said they would prefer using a smartphone to a laptop for learning purposes.¹⁰

Digital Textbooks

Digital textbooks are one of the innovations at the forefront of the mobile education movement. President Barack Obama and Chairman Julius Genachowski have identified widespread adoption of mobile textbooks as an important goal, with the ultimate result of an e-textbook in every student's hand by 2017.¹¹ In order to facilitate this, the Commission convened a meeting of several major participants in the textbook arena to discuss the necessary steps for achieving the milestone and the importance of transitioning to digital formats.



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The replacement of paper textbooks with digital versions offers many advantages to students, teachers, schools, and textbook publishers. Digital editions are more portable and convenient for students. Mobile devices also serve as a consolidated repository for academic resources. Instead of carrying around textbooks, notebooks, dictionaries, and other study aids in a backpack, a mobile device provides students instant access to a multitude of resources.

Teachers are able to customize the books to their lesson plans, so that they contain only the relevant information in the order that it will be taught. For both the teacher and student, there is a higher level of interaction with the text. In some digital texts, students can highlight the text and access additional information directly through the book, and teachers can view what the students are noting or struggling with, so as to better adapt their teaching style. Abilene Christian University, in conjunction with Alcatel-Lucent Bell Labs, conducted a study to examine the use of digital textbooks, and reported favorable results in the areas of student engagement and interaction.¹²

For the administrators and publishers, there are measurable benefits to using and creating a digital format as well.¹³ The cost of the books tends to be lower for the schools, and unlike print editions, they can't be damaged. Additionally, the publishers are able to keep the contents current at a much faster rate and with much lower costs than it takes to revise and republish a new edition of a textbook. In Virginia, a textbook on the history of the Commonwealth was discovered to have factual errors. The digital versions of the book were updated with accurate information quickly, while the publishers were still considering how best to approach the problem in the print editions.¹⁴ As Chairman Genachowski recently pointed out, "We spend \$7 billion a year on textbooks, and for many students around the country, they're out of date."¹⁵

There are also opportunities for publishers to create supplemental materials that can be linked to the text and easily integrated into student learning. Digital textbooks are no longer simply a digitized replacement of the print edition. Instead, they often incorporate interactive content that creates a multimedia experience for the student.

Mobile Applications

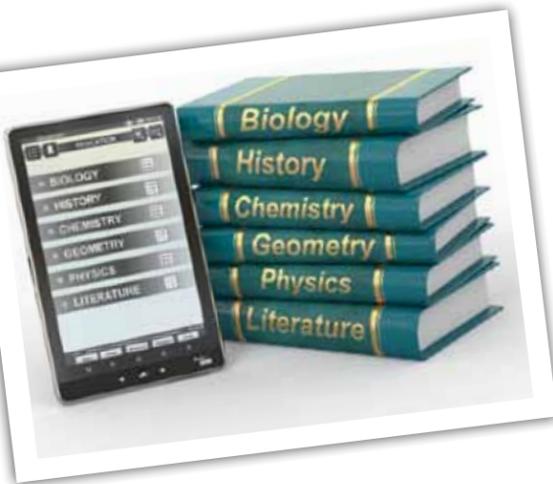
Another area that has been particularly prolific in the mobile education arena is the development of educational apps for mobile devices. There are innumerable apps that have been created for a variety of uses both in and out of the classroom, for everything from elementary school state history quizzes to simulated pre-med anatomical dissections. These applications vary in their degree of involvement in the actual learning process—some completely replace traditional lesson plans and teaching methods, while others supplement the more familiar in-class instruction.

With the iOS iPad app "Virtual History Roma," students are able to tour 3D, 360-degree models of the structures of ancient Rome, while learning the history of the city.¹⁶ The app uses maps, timelines, videos, and other interactive multimedia features to bring history to life, giving students the chance to explore a far away city without ever leaving their classroom. Thanks to applications, field trips are no longer limited to taking the school bus to the nearest museum.

The Android app "Star Chart" gives students a window into the world of astronomy.¹⁷ Using the app, the smartphone can be pointed at any spot in the sky to provide identification of the star or constellation. The app contains extensive information on all aspects of the night sky, including planets and other celestial bodies. Even without an expensive telescope or observatory, students can get an up close look at the stars. Used in conjunction with classroom instruction, the app offers teachers a way to liven up a course in astronomy.

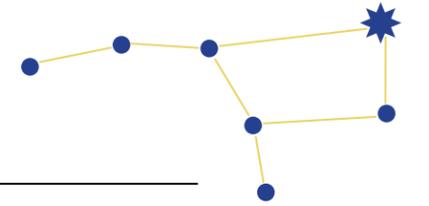
In addition to providing educational content, mobile applications can also assist teachers and students in organization and time management. The Windows app "My Study Life" creates an easy organizational scheme for students to manage study schedules, due dates, tests, and other activities.¹⁸ Students can request a compiled timetable of their daily schedule and receive reminders about upcoming deadlines. With the busy schedules that students so often have, a tool like this can be invaluable. The Blackberry app "Teacher Aid PRO" helps teachers track classes, manage student lists and grades and also allows teachers to send text messages and emails to parents or students.¹⁹

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Applications such as Blackboard Mobile are designed to make learning convenient. Blackboard, an online service that acts as a message board and drop box for students and teachers, has developed applications that allow students to access any of the content on their smartphones.²⁰ The application, which works on the iOS, Android, and BlackBerry platforms, includes instructional videos uploaded by teachers and discussion boards with other students.

Last year, MIT and Google teamed up to create an app inventor for Android operating systems that allows for the creation of apps—potentially providing teachers the opportunity to tailor an app even more specifically to their curriculum and objectives.²¹ MIT took over the project and plans to allow public use of the service in the first quarter of 2012.²²

These are just a few examples of the thousands of applications that have been developed for educational use on smartphones or tablets. Appendix A lists more notable apps from iOS, Android, Windows, and BlackBerry platforms.

Benefits of Mobile Education

With the proliferation of mobile devices and the development of digital textbooks and applications, the necessary elements are in place for successful implementation of mobile education. Employing a mobile learning strategy benefits students and teachers in three primary ways: individualized learning, student interaction, and innovative teaching.

A. Individualized: Tailored to the student

Use of a mobile device or application results in a far more individualized educational program for both students and instructors. Students are better able to work at their own pace than if they are following along with an instructor. Responses to a Virginia survey following the implementation of mobile education projects in several

classrooms indicated that students appreciated the ability to complete the lessons at the pace best suited to them, with the opportunity to look up additional information or search for answers to their questions and not impede the rest of the class.²³ If teachers upload videos of their daily lesson or instruction, students are able to watch it later and review if there was a concept they missed or didn't understand the first time.²⁴ The opportunity to do so in the privacy of their own home or on their own digital device eliminates student concerns about being embarrassed in front of their peers.²⁵ It also gives students the chance to take control of their own education and make decisions based on their personal learning style and speed.

B. Interaction: Engagement in Learning

Interaction between students and their peers, or between students and teachers, is facilitated by the use of mobile education. Mobile education renders factors such as geographical location irrelevant, making it easy for students to interact with peers or others who can take part in the learning process.

Mobile education allows for connections over long distances as well. Nokia Research Center collaborated with the Joan Ganz Cooney Center at Sesame Workshop to create a distance learning tool called Story Visit.²⁶ The project allows children to read along with relatives or others who are far away. The video conferencing feature provides interaction while encouraging literacy.

Similarly, the project TeacherMate, created by Innovations for Learning, connects students with tutors or mentors through software that can be used on any device with computing capabilities.²⁷ The program allows students at schools like P.S. 55 in the Bronx to interact easily with their tutors located elsewhere, despite not being located together and mentors' busy professional schedules.²⁸

C. Innovation: Improved Educational Experience

The immediacy of feedback when using mobile devices provides teachers with a real-time gauge of students' progress and understanding. One wireless carrier developed an application that can be used on a smartphone to facilitate student polling and in-depth analysis of the responses.²⁹ This solution is designed for

Employing a mobile learning strategy benefits students and teachers in three primary ways: individualized learning, student interaction, and innovative teaching.



See our visit to a public elementary school in Virginia.



both a traditional classroom setting and distance learning, and works with any web-enabled device. By immediately assessing students' understanding of a topic, the teacher is then able to make a decision about how to proceed based on the results and whether there appears to be a need for further instruction. This sort of adjustment, known as a "data driven decision making," helps reduce the number of students who are left behind or confused at the end of a lesson.

In Arlington, VA, several schools have adopted mobile technology in the classrooms to supplement their teaching.³⁰ One elementary school uses a digital version of the traditional textbook to teach students Virginia history. The interactive app allows the students to explore the settlement of Jamestown, as well as create a multimedia project related to the historical lesson which will then be uploaded to a library that all students using the application can access. Mobile devices are also used in a variety of other subjects by the elementary students, including math classes, one of which gives students access to iPads, Nintendo DS handhelds, and iPod Touches (<http://youtu.be/Ft4jPJpcG3g>). In addition, middle and high school students were given iPads containing applications, textbooks content, and other interactive media. The applications for the high school students included engagement apps, designed to encourage interaction with the material, and assessment apps, providing students with opportunities for review and subsequently, immediate feedback on their progress.³¹

The multimedia nature of mobile education supports cross-platform learning. When one carrier provided smartphones and mobile broadband service to an elementary school class in Ohio, the students were able to use the devices in several ways to enhance their existing learning experience.³² On a field trip to a museum, students took pictures of exhibits, then uploaded them to a school website and wrote commentary, all while on the bus ride home. The teacher then graded the assignments and provided feedback online. In addition to experiencing a more integrated education, the students who were given devices also improved their test scores in a variety of subjects.³³

Mobile education is taking hold in higher education as well. At Abilene Christian University in Texas, the school has an entire program devoted to mobile learning and distributes an iPhone or iPod Touch to each incoming freshman.³⁴ The university houses the "Learning Studio," a multimedia facility used by students to further their education using a variety of technology, including mobile devices.³⁵ In addition, the university is integrating the concept of mobile learning into its curriculum for those majoring in education. Student teachers are using the technology in their classrooms, and the school hosted a K-12 Digital Learning Institute focused on bringing digital technology to students.

Conclusion

In addition to the benefits described above, integrating mobile devices into education will serve children in the long term now that "[i]ncreasingly, technology skills are... critical to success in almost every arena, and those who are more facile with technology will advance while those without access or skills will not."³⁶ Maximizing the potential of wireless is crucial to creating a generation that is familiar and adept with current and future technology.

By taking advantage of the resources made available by wireless technology and devices, a new age of education is well underway. Mobile education is a clear example of the "virtuous cycle." The smartphones and tablets are the backbone for all of the content, networks, and operating systems that provide valuable educational resources. It's also important to keep in mind the practical considerations of mobile education—the wireless industry is an integral part of this movement, and in order to facilitate the virtuous cycle, it's essential that there be enough spectrum available to fully support the consumer demand for devices,

The multimedia nature of mobile education supports cross-platform learning.





Appendix A

Popular Education Applications on the leading Mobile OS Platforms

iOS Apps for Education

- 1. Blackboard Mobile Learn³⁷:** interactive resource that allows students to post content to a classroom discussion board and view content uploaded by others.
- 2. Cram³⁸:** study tool that uses flashcards and quizzes to help students prepare, while also providing feedback based on scores.
- 3. eClicker³⁹:** allows teachers to poll students during class and view aggregated polling data.
- 4. Essay Grader⁴⁰:** assists teachers in the grading of essays and assignments through a feedback document that has room for individual comments and grades.
- 5. Math Ref Free⁴¹:** contains formulas, examples, tips, and figures for multiple math subjects.
- 6. Molecules⁴²:** displays three dimensional models of molecules that can be rotated or magnified.
- 7. PI83 Graphing Calculator⁴³:** replaces the traditional graphing calculator.
- 8. Star Walk 5⁴⁴:** explores the night sky, identifying stars and constellations when the device is pointed at particular spots.
- 9. Today in History⁴⁵:** provides history and trivia on events that occurred on each day.
- 10. Word Lens⁴⁶:** translates printed text from one language to another.

Android Apps for Education

- 1. Blackboard Mobile Learn⁴⁷:** interactive resource that allows students to post content to a classroom discussion board and view content uploaded by others.
- 2. Chemical Equation Balancer Pro⁴⁸:** balances chemical equations based on information entered by students.
- 3. CoursePro⁴⁹:** tracks homework, assignments, test dates, and other due dates.
- 4. Flashcard Maker Pro⁵⁰:** creates flashcards for a variety of subjects and tests students on their comprehension and speed.
- 5. Google Sky Map⁵¹:** uses the device to identify segments of the sky and the constellations or planets contained within that area.
- 6. Gutenberg eReader⁵²:** allows students to read e-books from the Gutenberg library.
- 7. Grade Book for Professors PRO⁵³:** manages grades for teachers by organizing them into Google spreadsheets and emailing them to students.
- 8. Tick⁵⁴:** includes an easy to use timer perfect for classroom activities.
- 9. Trippo Mondo⁵⁵:** translates and speaks any phrase.

Windows Apps for Education

- 1. Deluxe Moon⁵⁶:** provides extensive information on the Moon and its features, including the moonrise and moonset time based on current location.
- 2. Periodic Table Pro⁵⁷:** an interactive periodic table that uses games and activities to assist in the memorization of a table.
- 3. LearnA⁵⁸:** teaches students the alphabets of numerous languages.
- 4. Hello Spanish⁵⁹:** learn basic Spanish with an interactive app that can be used anywhere.
- 5. Dict-English Version⁶⁰:** dictionary app that is available in several different languages.
- 6. Graphing Calculator⁶¹:** app version of the much more expensive traditional graphing calculator, featuring a high definition display and full calculator capabilities.
- 7. Spelling Practice⁶²:** practice spelling skills with personalized and encouraging feedback.
- 8. My Study Life⁶³:** helps organize study time for students by creating timetables based on assignment due dates and test dates.
- 9. Stack the States⁶⁴:** learn the states, their capitols, nicknames, and other facts through a series of games and flashcards.
- 10. AB Vocabulary Builder⁶⁵:** expands vocabulary, whether for a standardized test or everyday knowledge, by quizzing on definitions and tagging missed words.

BlackBerry Apps for Education

- 1. Blackboard Mobile Learn⁶⁶:** If you are a college teacher, and your campus has Blackboard, you can access it with the help of this BlackBerry app. A great addition to your arsenal. Cost
- 2. Learn to Read⁶⁷:** helps elementary school kids learn how to read.
- 3. Behavior Tracker Pro⁶⁸:** helps keep track of student behavior and progress.
- 4. Agendus⁶⁹:** Teachers can integrate notes, calendars, create lesson schedules and keep track of meetings with students.
- 5. Science Trivia⁷⁰:** With over 300 science questions this app helps teachers put together lesson plans.
- 6. Scientific Method App⁷¹:** Teachers can use this app to reference different formulas for science and math.
- 7. MoonAlmanac⁷²:** Teachers can use this app to prepare lessons related to the moon.
- 8. Pocket 10C SE Scientific Calculator⁷³:** Teachers and students can this calculator in science and math lessons as a reference tool.
- 9. Teacher Aid PRO⁷⁴:** Helps teachers who want to track classes, and manage student lists and grades.



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