

Mobile Learning

A Handbook for Developers,
Educators, and Learners

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WILEY

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Preface

Mobile learning is an exciting and important movement, in our opinion. We, the authors, are not in-service teachers. We are all employees at SAS Institute, a prominent statistical software company. We work on Curriculum Pathways, educational software that SAS provides for free to any educator. We work closely with teachers in the development of this web and mobile content, and our research and work provides us with an altogether unique perspective. Like scores of educators, researchers, developers, legislators, and thought leaders, we think that mobile learning holds tremendous promise for our educational system, with the potential to unlock a new world of educational opportunities to today's kids.

We know, foremost, that to have quality educational apps that improve education, developers need teachers, and teachers need developers. This symbiosis is vital to the field of mobile learning, yet we find little written on the topic. In our development practice, feedback from in-service teachers is so valuable, and frequently leads to new features or new apps being created. If there is one takeaway from this book, it'd be that developers and teachers, though their education and talents are likely very different, should work together to make mobile learning tools that accomplish the goals of today's classroom. We believe that mobile learning holds true promise for improving the educational system, the economy, and the future success of our country. But make no mistake; actually delivering on the promise of mobile learning is wholly dependent on having excellent teachers with excellent educational resources, such as apps, at the service of our students. Through this partnership, it is our

hope that a shared understanding of what makes a great educational app can take hold, shaping the future of mobile learning.

To facilitate this meeting of the minds, this need for mutual understanding and communication, we've structured this book as a handbook for both teachers and developers. In Section 1: The Mobile Classroom, we offer a pedagogically based discussion of what mobile devices offer in terms of how students learn, fundamentals from the science of learning that apply to mobile devices, as well as logistics and tips for various implementations and technological set-ups that schools might offer. While this section is geared toward educators, the content provides valuable insight into how and why students learn, the demands and limitations of the modern classroom, and the strategies used to integrate mobile devices into education; therefore, there is quite a bit developers can glean from this section to better serve their audience and its needs.

Section 2: Creating the Mobile Learning Experience is designed to provide developers with the information they need to enter the educational app market and develop quality resources for teachers and students. We offer discussions of business models, design principles, best practices for development cycles, the unique team structures that enable educational apps to come to fruition, and how data analytics can optimize learning. We also present the technological features and offer some guidelines on how to include what is necessary to make an app do what it's intended to do and not be unreasonably large. Again, while the intended audience for Section 2 is developers, we feel there is a benefit for educators as well: an awareness of how educators fit into the software development process, the rationale behind business models in the education market, and how developers go about evaluating and refining their product, just to name a few.

One of the exciting things about mobile learning, in a general sense, is the wide-reaching opportunity it presents. In Section 3: Mobile Learning for Everyone, we present three niches that are especially primed for impact from mobile devices: informal learning, preschool, and special populations. The accessibility features that mobile devices offer are unprecedented, and developers and teachers will find valuable information on how to optimize app features and how to choose accessible apps in this section. We finish this section with a discussion of data privacy and digital citizenship, two pressing issues to ensure safe mobile technology use for all of today's students.

In our Appendices section, we provide a list of all the apps mentioned in our book, for easy reference. Additionally, we offer a definitive checklist for educators to use when determining if a new app meets their needs. The Great App Checklist aims to help educators sift through what's out there and determine what makes a good app.

For this book, we've interviewed dozens of in-service educators, to bring their perspective to you, alongside academic research, popular press articles, and our experience as developers of educational resources and apps. The mix of practical advice, experience, academic research and methodology is a unique way to frame the field of mobile learning, but one we feel is essential to fully comprehending the potential and realizing the promise of it.

Acknowledgments

The journey of writing a book is, not surprisingly, long and laborious. When we started our research and writing, we felt well prepared as a team of writers and experts in our fields with cross-disciplinary perspectives. We were excited to fill a void we saw in the field: take the world a step closer to having a theory of mobile learning and create a resource for teachers and developers in the process.

While we trusted our own experience and skills, we knew we'd also rely on others to complete this book. Reviewers, artists, editors, educators, and interviewees give this book a level of credibility and expertise we alone couldn't have. We derived so much value from the folks listed here. We are deeply grateful for the help, insight, and feedback we received along the way. This truly shaped this book into what you hold before you.

First and foremost, we are grateful to Jim and Ann Goodnight for supporting us in this project, and for their generous support of education (mobile and otherwise). We are so appreciative of the leadership and guidance provided by Armistead Sapp. We are thankful for the amazing group of reviewers who were candid and helpful with their feedback: Elliot Inman, Robert Epler, Kristin Hoffmann, and Tim McBride.

We are so grateful for the artwork from the incomparable duo, Tammi Kay George and Lisa Morton, who came up with the cover for the book and so many creative renderings of concepts based on our confusing notes. Thank you so much for the drawings that make this book so unique.

We are grateful to Wiley Business Press and SAS Press for guiding us in our efforts to get the book we were envisioning published, especially Stacey Hamilton. We also are very grateful for the research expertise of Jennifer Evans.

We made efforts to contact as many teachers as we could in our research for this book, and we are very grateful for the following educators who indulged us by giving us a glimpse of their world. They were honest with us about the realities of mobile learning in the classroom, what is lacking, what is amazing, and what they wish was different. These are also, incidentally, the educators and specialists who are shaping the minds of our youngest Americans, which is a comforting thought to the authors. Thanks to: Amy Wilkinson, Julie Stern, Rebecca Goddard, Tara Brooks, and Tricia Hudacek, to the team of teachers at Brentwood Elementary in Raleigh, North Carolina (Sean Russell, Linnea Czerney, John Silverthorn, Emily Hardy), and the teachers at Research Triangle High School in Durham, North Carolina. Thank you to all of the respondents to the online surveys, and the teachers who attended our focus groups. We are also very grateful to the scores of educators who are sharing their experience on blogs and Twitter in the effort to improve others' usage of educational technology.

We'd like to thank the other experts we consulted through our writing: Ed Summers, Diane Brauner, Erica Roberts, Greer Aukstakalnis, Carrie Grunkemeyer, Kelly Stewart, Jamie Hall, and Aaron Massey.

The feedback from countless educators with questions, suggestions, comments, and recommendations regarding the mobile apps from SAS Curriculum Pathways has built, and continues to build, our understanding of what makes a good app. We are particularly grateful for the development

partnership with Garrett-Keyser-Butler Community School District, and their leadership from Dennis Stockdale and Tonya Weaver, which continue to inform our own development efforts.

At SAS, we're thankful for the help of our coworkers, specifically Keli Lloyd, Ottis Cowper, Connor Hickey, Ada Lopez, Trena Brantley, and Phil Issler. We are fortunate to work with the SAS Curriculum Pathways team that has fundamentally shaped our understanding of mobile learning development and practice.

And finally, each of us is grateful to our families and significant others for their support and understanding through the writing of this book.

Chapter 1

Changing Education with Mobile Learning

We cannot always build the future for our youth, but we can build our youth for the future.

—*Franklin Delano Roosevelt*

In our ever-changing marketplace, today's students are being educated, largely, for jobs that haven't yet been invented. Technology is being created and updated at a frenetic pace, and growing more pervasive and useful with each stride. As schools face dwindling resources and higher stakes than ever, does mobile technology hold the key to improving the educational system and reengaging students? Mobile technology offers a plethora of features and benefits that enable it to break the educational system wide open, engaging students in new ways and making educational experiences more meaningful, if schools can effectively utilize structured, integrated approaches for implementation of this new technology.

This interest in smartphones, tablets, and laptops is a major opportunity to present new and exciting educational experiences. To what extent are schools capitalizing on this, though? And how often are they getting in their own way in reaching students? One teacher notes with frustration that her school has several iPad carts that teachers are encouraged to use, but cellphones are banned categorically. “There are certain times we might be doing a lesson and someone asks a question and I think ‘This'd be a great time to all get out our devices and look something up,’ but we can't use cellphones and have to reserve our iPad carts in advance, so the moment passes. It's

frustrating because almost all of the kids have phones and their parents are paying for data plans anyway, but we can't use them.”¹ In effect, schools with policies like these end up ignoring the technology and the skillset necessary to effectively use it in learning and life, leaving students not fully prepared for the real world.

In another school, eighth-grade teachers have access to iPads the school has purchased and encourages them to use in their classrooms. Teachers are excited to have the devices, but don't really know what to use them for, and they often sit unused. When asked what she uses them for, one teacher suggested they can be used as calculators. Clearly handing a device to a teacher with no guidance or training is not a way to make the best use of this expensive, Internet-connected device.

Stories like these, of school policy being dictated to teachers and ineffective mobile technology use, are, sadly, not difficult to find. Policies that categorically ban certain devices that are used in everyday life are lazy, failing to see the possibilities that they have to change and improve pedagogy. However, schools realize boundaries and acceptable uses of mobile technology need to be clearly defined, but they may not know where to begin. Rather than reimagining education and figuring out how to integrate modern technology to effectively reach students, administrators too often ignore and put up walls against new technologies. We present these stories not to discourage or say that there are simply too many hurdles and poor implementations of mobile technology. We offer these examples to illustrate the widespread misunderstandings about mobile learning and our need to address some key challenges.

Ignoring mobile learning because of potential distraction or misuse results in missed opportunities for teaching

tomorrow's citizens how to find and use a seemingly limitless source of information at their fingertips. Mobile technology offers a huge opportunity to revolutionize education and learning, if knowledgeable, creative, and open-minded teachers and administrators embrace it.

A Brief History of Educational Technology: What Will Revolutionize the System?

A new classroom tool promises to improve student learning and enable a more enriching learning experience. In a video promoting this tool, a student is seen answering questions in class at his own pace, and receiving immediate feedback to know if he was wrong or right. An expert notes some benefits of this tool: "There is also a motivating effect. The student is free of uncertainty or anxiety about his success or failure. His work is pleasurable. He does not have to force himself to study...it generates a high level of interest and enthusiasm." This expert notes that technology could enable students to cover more than two times the information when compared to traditional classroom techniques.

B.F. Skinner gave this forecast on the potential for technology to revolutionize learning and classroom procedures in 1954.² His teaching machine sounds strikingly similar to predictions today on how mobile technology can revolutionize classroom learning for students, though these were based on Skinner's teaching machine, a clunky early computing machine that offered students a new way to learn independently using targeted, self-paced lessons. Similar predictions have since been made about personal computers, netbooks, and other technologies. So, the question is, why were those

predictions wrong in 1954, and subsequently, and why are they different with mobile learning?

While mobile technology offers a distinct difference from other technology, technology itself is hardly a stranger to the educational setting. Computers have been in the classroom and have been promising to revolutionize education for decades, though they haven't changed education much. It's fair to say that while Skinner's teaching machine was novel, it didn't do as much as he imagined it would to shake up the traditional and inefficient classroom structure.

Over the past half century, as computers developed and became smaller, more efficient, and easier to use, they increasingly found their way into the classroom. This technology has changed the experience in schools, as well, as noted in [Figure 1.1](#). Computers have been in schools since the 1960s: first to store student data and eventually, for student use. This changed in the early 1980s with the Apple II. Before the Apple II, large mainframe computers had some presence in schools, though they were not very widespread.³ The first affordable and widely adopted personal computer was the Apple II, which also happened to be a watershed moment for personal computer technology. It offered a computer for everyone, not just the hobbyists and folks who wanted a computer to tinker with. The Apple II was ready to run for anyone, and it was widely adopted by educational markets (which were also heavily marketed to⁴). By the mid-1980s, the Apple II was the predominant computer in K-12 settings.⁵ In the 1980s, much of the curriculum surrounding computers in the classroom related to teaching how computers worked (programming languages, for instance) or for games (i.e., Oregon Trail) and less on using them to perform other nontechnical educational functions.

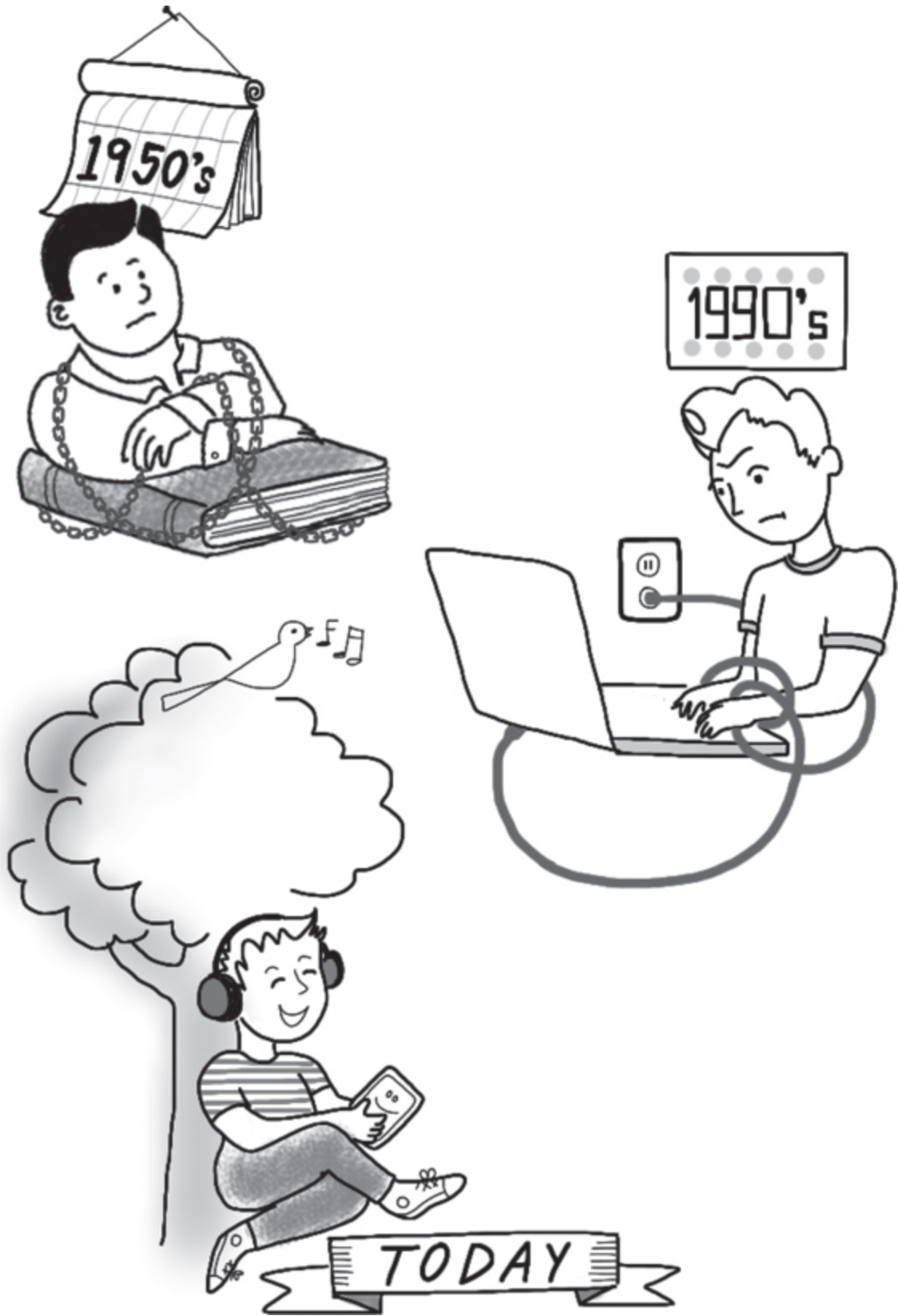


Figure 1.1 Educational Technology Over Time

By 1990, most classrooms across the United States had access to computers in some way, and their use in augmenting and supporting classroom instruction grew as the 1990s went on. These systems provided a self-paced learning experience for each user; however each learning experience followed a set trajectory that offered the same help, the same questions and answers, and the same path. In short, there was no customization to the learning, only an individualized pacing. There was often instant feedback, so it did offer many benefits to old systems, though the true potential for an intelligent learning system was not reached.⁶ Computers used CD-ROM disks, and with the growth and release of new Microsoft products throughout the 1990s (Windows 95, Windows 98, most notably) and the maturation of the software and hardware industries, computers became commonplace in the classroom.⁷ Technological initiatives at the time focused on connecting classrooms to the still very new Internet. As the World Wide Web grew to show its use in homes and offices across America, government initiatives channeled funds to get classrooms wired and students online, as well as to give students technological literacy skills.⁸

Desktop computers, laptops, and netbooks were the most prevalent technologies utilized by schools until early 2010 when Apple released the iPad, which created a new category for mobile devices: the tablet computer. Featuring touchscreen technology, increased portability, Wi-Fi, and an intuitive user interface, the iPad presented a major game-changer for digital learning. Soon after, competing tablets emerged on the Android operating system. Slowly, the tablet stole market share from netbooks, and in early 2013, Acer and Asus, the top two netbook producers, officially phased out production of their netbooks, effectively ending the netbook market.⁹

Computers, and subsequently tablets, began as novelties and eventually went on to create entire markets and ways of functioning that are hard to imagine living without. Have they changed education in the same, fundamental way? Are they being used to enhance instruction and change the way we learn for the better, or are they just another tool in the same old pedagogy? Looking at the past 60 years of computer technology and education, we see a recurring pattern: The belief followed each advance and breakout technology that it would solve all educational problems.¹⁰ Obviously, these promises were not met. While computers have definitely been incorporated into existing structures, their impact hasn't been as great as it has been on other sectors, nor as great as we expect mobile technology to be.¹¹ The benefits that mobile learning enables—personalized, on the go, and novel learning environments—offer a chance to revolutionize the education system. As Bill Gates noted in 2009, “The world of education is the sector of the economy so far the least changed by technology. Ten years from now, that won't be the case.”¹² We're entering a new era for technology and education and mobile technologies. We believe mobile technology with smart implementation and progressive school policies can lead the way.

Mobile Learning: Reaching Kids Today

At Research Triangle High School, a charter school in Durham, North Carolina, the ninth graders are in English class. The BYOD (bring your own device) setup and flipped classroom structure requires that the students watch a lesson the night before, and use their tablet or laptop to supplement the discussion or project that is occurring in the classroom. When you walk in the room, it feels different. It certainly isn't the typical classroom we imagine

with desks in a row and students sitting, looking to the teacher with their hands in the air. Indeed, beside that image, it might even feel as if no one is paying attention, as everyone is illuminated by a screen, and no one is watching the teacher. This perception is quickly shattered, however, when the teacher surveys the students to gauge understanding, and it's obvious that they are all paying attention, all are on task. Beyond that, the use of certain mobile devices (this school prohibits cellphones for classroom use) enables and even encourages students to multitask, collaborate, and teach each other—all skills professionals practice daily in the modern workplace. This school, like many across the country, is embracing the mobile technologies that exist, working with them instead of against them, and giving their students a real-world education rather than clinging to previous paradigms of education and learning.¹³

Mobile technologies offer a new paradigm in connectivity, communication, and collaboration in our everyday lives. For education, these are huge opportunities to provide an experience that is relevant and engaging. Using technology in the classroom is not a new idea at all. Computers, laptops, and netbooks have all been added to classroom settings with the hopes of revolutionizing education, promising vast improvements to student outcomes. These technologies, largely, have left education unchanged and in a continual state of need for improvement. All of these technologies can be thought of like crayons, says James Paul Gee, a thought leader in games and learning: “They are just tools that can make and do good things (e.g., art) or make a mess (e.g., crayon all over the walls).”¹⁴ It matters tremendously not only that they be added to the educational process, but that the educational process shift to incorporate new capabilities.

Ultimately, when considering the value of mobile learning initiatives in education, it is most important to consider what is best and most valuable for the students. What initiatives will provide them with the education that sets them up for a lifetime of success? What technologies engage them and help them learn most effectively? Today's students are fundamentally different from those who came before them. Christened as *digital natives* by educational writer Marc Prensky in 2001, “today's students are no longer the people our educational system was designed to teach.”¹⁵ If anything, the advent of mobile devices has only served to further solidify these digital natives' different needs and expectations when approaching education. Mobile learning offers a novel approach to reach them—it offers flexibility in when the learning takes place, personalized content, and teaches relevant skills for the future. It has the potential to create a generation of learners who see the world as their classroom.

Tablets and smartphones have dramatically altered the technology landscape, and transformed the way we as a society communicate and access information.¹⁶ In the workplace and in homes, these technologies have been incorporated and used to change and increase the efficiency of everyday activities, but traditional schools are still relatively resistant to or untouched by these iconoclastic technologies.¹⁷ As schools continue to negotiate acceptable usage, boundaries, and bans with students and parents over mobile devices, many opportunities for educational innovation may be missed.

What Is Mobile Learning?

For the purposes of this book, we believe mobile learning has little to do with the physical devices themselves. Rather, mobile learning is the experience and opportunity