

Tablet Computers in Education

This document has been written to provide teacher-leaders and decision-makers with a historical perspective of how tablet technology has evolved to meet the specific technology needs of students and schools, what solutions are now available, the advantages and disadvantages of each, and what should be considered before deploying tablets within our schools.

Early Tablet Computers

Tablet computing has been around for many years and has taken many forms, from PDAs and handheld devices to touchscreen laptops, tablet PCs, slates and most recently “post-PC” tablets. Early tablet computers were predominantly versions of existing hardware and operating systems adapted to recognize an additional input device, usually a stylus or “pen,” or simply a physical touch or press. In early 2002, Microsoft released the Windows XP Tablet edition, supporting a new generation of laptops that had touch sensitive screens that could rotate and flatten against the body of the laptop. This created a surface that could be used for direct input and often supported new functionality such as handwriting recognition. However, these devices failed to gain widespread acceptance, so traditional laptops and PCs remained the primary computing device for education, reinforcing the concept of the K-12 environment as a “Business Centered Training Ground” focusing on the interfaces the students would encounter in the “real world”.

Post PC Tablets

The launch of the Apple iPad in 2010 had a significant effect on tablet computing. There was a widespread adoption of the Apple device, and from this a new generation of post-PC tablet computers began to appear. From this, tablet computing took on a new form based on the growing popularity of Smartphones

and the functionality that these devices and their operating systems provided. In essence, the tablet computers that emerged were larger, more functional versions of the smartphones that preceded them and provided a new use scenario focusing on the tablet being an adaptive tool that adjusts to the need of the user in a mobile setting/environment.

Leading the field through 2010 and 2011 was Apple's iPad, based on its iOS mobile operating system. Also appearing in 2011 was the first generation of tablet computers produced by industry-leading hardware manufacturers—including Samsung, Motorola, Lenovo, Toshiba, Acer and Asus. These devices utilized Google's mobile operating system, Android. Several other tablet devices were also launched based on proprietary operating systems, including Research In Motion's Blackberry Playbook and HP's TouchPad.

Following the earlier traditional Tablet PCs, several hardware devices were launched that ran Microsoft Windows 7 OS, but these struggled to gain market share against the iPad and Android tablets.

Understanding the Needs

Today, there are many tablet computing devices on the market. Before selecting a tablet computer for use in schools, decision-makers today need to have a clear understanding of exactly what their learning community needs with respect to Information Technologies, and the role that tablet computers can play to increase student learning, in particular. Questions to consider might include:

- Why do we need tablet computers in education and how will they serve to increase student learning in our schools?
- What purpose and function will tablets fulfill?
- How will the tablet technology be used and managed?
- How will these devices fit into our existing information technology resources and at what cost?

Considering all of these questions, and fully understanding how tablet computers can be used in an educational institution, is essential. Further important considerations are noted below.

How will this technology help enhance learning?

Learning should never be technology led.

Teachers teach; technology assists.

These are important statements that are oftentimes under-emphasized. The primary focus should rarely be on the technology tool itself, but rather on how the technology can be used to increase learning opportunities. There are a number of educational advantages to using tablet computers in class—increased student engagement being perhaps one of the most significant advantages. This goes far beyond the traditional “replacement” model of typing a paper instead of writing a paper. These advantages explore the more “transformative uses” of technology in the classrooms. Most specifically what can I do “now that I have the technology” instead of “how can I do the same thing I’ve always done?”

There are clear educational advantages that come along with increased engagement and more time on task, including increased stimulation, increased intrinsic motivation to learn, and enhanced knowledge retention. Additionally, tablet technology offers a revolutionary change to the use of traditional information technology like fixed computers and laptops in education.

Touchscreen technologies allow for more varied and interactive usage scenarios, and the inclusion of learning activities that were not possible before touchscreen technologies became widely available to education.

How will tablet computers be used?

Tablet computers provide a unique opportunity to create a truly portable, immersive, and interactive learning experience for our students. Because tablets are lightweight and offer a long battery life, students can experience a far more

dynamic information technology experience that has not been previously possible with “desktop” computing solutions. For example, quick access to reference materials throughout a lesson—previously difficult to achieve with existing information technology—can bring key advantages and enhance learning, especially when using tablets in atypical learning scenarios, such as on field trips, during workshops or in physical education lessons. Couple the mobility of tablets with the vast resources a tablet computer can provide—including instant access to up-to-date text and reference books, audio and video resources, internet research, document preparation and review programs, and specific interactive learning applications and activities—what you have is a truly enriching, immersive, ubiquitous learning tool that can morph and change into the learning tool that is needed at that particular time, in that particular place.

How well will tablets integrate with our current Information Technology resources?

Tablet devices may have a different operating system than solutions currently in place in schools. This leads to several important considerations and questions, including:

- Will tablets support current eLearning content & activities?
- Can we access our existing network resources?
- Will the tablets work with our other information technology devices?
- How will we safely control individual user access and usage?

As we continue to shift toward more cloud-based, software-as-a-service models of technology use in education, the question of compatible operating systems could become less and less germane to the conversation. However, fully understanding how tablets will be deployed and how they will fit with existing infrastructure and resources is still a key consideration. A school might have made significant investment over the years on information technology provisions and eLearning resources, so ensuring a device's compatibility with these existing resources is critical. As more connected devices are introduced, it will likely

become necessary to upgrade the school's wireless network to accommodate increased demand for bandwidth. Online or localized resources such as learning management systems, testing and assessment requirements, and existing eLearning content are likely to already be in place, so compatibility with these resources should be given careful consideration.

Will the tablets simplify information technology access and implementation for teachers and students?

Tablet computers offer some major advantages and hold great potential to simplify technology implementation within schools. However, when deploying new devices, new questions inevitably arise, such as:

- How will we keep our students safely connected on the new devices?
- How will we manage and monitor the new devices remotely?
- How will we deploy new content and applications to the devices during the school day, particularly for differentiated instruction?
- How will we provide access to students' existing work, and provide formative assessment and guidance during lessons?

Deploying a large number of tablet devices, just as with computers and laptops, requires a system to manage, monitor, maintain and control them. Without such a solution in place, the management of the tablets would surely create an unreasonable burden for Information Technology staff and prevent roadblocks to allowing teachers to interact with the students during classtime.

What is the Total Cost of Ownership?

The question of Total Cost of Ownership (TCO) is an important one, and is sometimes overlooked. Tablets devices can be expensive items themselves per unit, but what about the cost of managing and maintaining them? What happens when these devices break or are damaged? With some devices, only proprietary

content can be used, so what is the overall cost of adding new activities should the tablets not support existing content? How much time and effort must be spent finding new “replacement” curriculum pieces to use in the place of already existing and tested curriculum pieces.

What social and legal implications are there?

Most tablets available today are consumer-based devices, and so are designed to have wide-open integration with social networking applications that may not be appropriate or legal for use in schools. How does the addition of mobile devices with cameras impact Cyber-Bullying efforts and privacy concerns of minors? How can this be monitored and controlled? Email services and online social media sites are prohibited by federal law from allowing children under 13 create accounts without the consent of their parents or legal guardians. How will the schools police this? There are a number of key legal implications that should be thoroughly researched before deployment is considered.

How can tablets be provisioned for multiple students?

Currently, tablet devices are primarily focused in the consumer space, with each device being owned by an individual user. This approach makes it difficult to provision devices for use by multiple students of differing abilities. Typical deployments of tablets in schools are not yet 1:1, and so there is still a need for each tablet device to be shared. This can lead to complications when provisioning and deploying content, applications and resources, leading to an “all or none” scenario where either every student has access to ALL apps which can lead to distractibility and off-task behavior or teachers keep a very minimal set of apps to “control” the students usage and narrows the scope of pedagogical relevance or the content and turns the tablet into an e-reader device. So, finding a way to allow multiple students to access individualized content on shared devices is an important consideration.

Tablet computers hold the potential to change the way in which eLearning resources are delivered and consumed by students. The tablets’ versatility and

flexibility are unrivalled, and the number of tablet deployments is set to grow fast. However, technology should adapt to teaching and learning needs, not the other way around. It is critical to ensure that bringing any new technology into the educational environment improves and increases opportunities for learning, fits with the teaching needs of the faculty and students and, most importantly, leads to specific, desired learning outcomes.

Deploying & Managing Tablets

While tablet computers have clear benefits for use in schools, deploying, monitoring and managing them requires careful planning and consideration. It is likely that new tools will be needed, as well as a change in the way the new tools are used and supported. Many new issues will need to be overcome in order for large-scale deployments of mobile devices to achieve their greatest potential. Some key considerations are noted below.

Mobile Connectivity

With the portability of tablet devices, there is an increased need for mobile connectivity. Many schools have already implemented wireless networks that support a set number of devices, most likely within a limited area or location such as a classroom or building. Providing abundant wireless connectivity for a greater number of devices across a wider geographical area will likely require modification and expansion of the existing network.

Network & Bandwidth

With the possibility of thousands of mobile devices requiring wireless connectivity across the school grounds, it is essential to understand how this level of access can be supported. How will existing Wi-Fi infrastructures handle a significant increase in connected devices? How much additional broadband bandwidth will be required to adequately support mobile access to media-rich Internet websites and resources? Can the fixed network structure support the needed level of

expansion? Should we consider “on-device” content deployments so this infrastructure is less impacted? Most mobile devices now require reliable connectivity to be effective, so supporting an expanded, ubiquitous network will be an important consideration for any widespread device deployment.

Geographical & Physical Coverage

While many issues with wireless networks can be addressed with ease, there are some issues that might be far more difficult to solve. Many schools are located in old buildings; with solid stonewall construction, numerous corridors and unusual floor plan layouts. There may be remote classrooms with no wired connectivity, temporary portable classrooms and areas on the school grounds where neither wired nor wireless connectivity is easily achieved. Providing consistent, reliable connectivity can prove very challenging and costly. Additional Wi-Fi boosters and drops along with careful considerations and prioritization of which bandwidth-hungry resources to use and at what times will allow for a more consistent use of mobile devices as a learning tool. What about if the student takes the devices home? What consideration for access to instructional content must be made in order to enable home access to the instructional materials for the student to use when away from the “school network”?

Device Management

Monitoring, managing and maintaining mobile devices, irrespective of the number involved, is a critical consideration when integrating technology in schools. One of the key aspects of device management is to provide a simplified yet powerful range of features to ensure that the devices remain operational and available to their users. This can range from a simple inventory of connected devices and their status, to deploying system changes, updates and controlling activities. Ensuring that you can manage these mobile devices and maintain their operational status is critical if they are to be used as integrated learning tools.

Security & Control

Traditionally, computing in school has involved some form of security and control to help protect both the students and equipment. This might range from content filtering and anti-virus software, to restricted desktop access and required sign-in. Because historically, tablet computers in schools have been predominately consumer devices, the safe integration into an educational environment and the necessary support for securing and controlling access to applications, content and device settings was not of primary concern during their design. It is essential to ensure that the needed levels of security and control can be applied to every school-issued mobile device that gives students access to network resources and content. Additionally, because these devices are more portable than ever and offer flexibility to access the Internet away from the school's filtered network, additional security should be put in place to protect the student when connecting to other networks.

Content & Application Management

Along with the emergence of tablet devices, came a new method of sourcing and delivering applications and content — the “app store”. App stores have been designed for the consumer market and as such do not allow schools to use traditional methods of purchasing and licensing, and may not provide content aligned to the teaching curriculum. Apps are only one type of potential digital resources for use in the classroom. Best when used as a reinforcement tool, there still also remains the need for easy and simple content management for files, assignments, resources, etc. Furthermore, without specific content and application management and deployment solutions, delivering new content to multiple devices can be problematic and time consuming. Ensuring that devices can be updated and new appropriate content deployed en-mass is a very important logistical consideration.

Network & Resource Integration

It is likely that students may have been storing and accessing their work on existing servers and expect to have access to other network-connected resources such as printers. Providing access to these existing resources, rather than having to source additional “web-based” storage solutions, from tablet devices may not

be supported or may be difficult to achieve. Again, understanding how access to these necessary resources will be provided for tablet users should be a key consideration.

Examining Existing Devices

There is a range of different tablet-based devices available, each with key benefits and limitations. Understanding each device, its key features, and how it can be used within the school environment will assist decision-makers with their choice of tablet computer deployments.

Apple iPad

Built on the success of the iPhone and Apple iOS, the iPad has been a hugely successful, market-leading tablet device since its launch in 2010. The iPad has created a massive demand for tablet computing and has seen early adoption by schools due mainly to its consumer brand awareness, intuitive interface and the range of new applications.

Advantages	Limitations
High quality, easy to use device	Proprietary, single source hardware
Large selection range of apps	Limited support for existing content, connectivity and network resources
Reliable operating system	Limited configurability: difficult to secure and costly to manage and provision multiple devices
Good battery life and performance	

Android Tablets

Appearing a little later, Android based tablets are challenging the market created early on by Apple's iPad. Based on Google's open source operating system, many top manufactures including Samsung, Motorola, Lenovo, Toshiba, Acer and Asus have released high quality tablet computers running the Android OS.

Advantages	Limitations
Multiple hardware manufacturers and varied price points	Smaller but growing collection of apps available via Google Play and other sites
Supports Adobe Flash content	Market applications are not curated
Supports external USB devices and storage	
Supports SD card storage	
Greater support for network resource and connectivity	
Flexible OS allows customization and easier management and control	

Windows Tablets

Slower to market than other tablet solutions, early Windows based “slates” did not offer the same level of “touch” interaction that was achievable on other tablet devices and experienced poor adoption rates.

Advantages	Limitations
Closer integration with existing network infrastructure	More expensive than other solutions
Greater support for existing content	More system intensive OS
Multiple hardware vendors and good external device support	Many existing applications are not suited to the tablet format or may not run on specific hardware

Other Tablet Devices

In addition to the devices listed above, there are a number of other tablet-based solutions that could be considered for use in education.

E-Book Readers

A number of low-cost devices have been produced to provide access to eBooks and publications. These include the Amazon Kindle, Nook, Sony eReader, Kobo and BeBook. These devices offer limited functionality but are effective reading devices.

Kindle Fire

This second generation device from Amazon is based on the Android OS and offers users more functionality than just an eBook reader. It is a good low cost device with added functionality that supports access to web resources as well as android applications.

Blackberry Playbook

Research In Motion's Blackberry Playbook runs a proprietary OS but provides support for Android applications. It can also run Flash based content and websites.

HP Touchpad

Launched in 2011 and withdrawn only two months later, HP's entry into the tablet market was brief to say the least. The TouchPad was based on HP's proprietary WebOS, but it failed to meet consumer expectations and in the face of strong competition from the iPad and Android tablets, was quickly withdrawn.

LearnPad - a School Specific Solution

Toward the end of 2010, Avantis saw a huge need for an education tablet device designed specifically for use within schools, and developed LearnPad to address this need.

LearnPad Design & Development

The design goals for LearnPad were simple: To provide a high quality, safe and secure tablet computer to allow students to access existing eLearning content as well as other school network resources. Additionally, LearnPad was designed to

take full advantage of the new generation of apps and content being developed for mobile devices. Furthermore, LearnPad's essential design requirements include easy managing and deploying of new activities and applications to devices, as well as ease of monitoring and controlling them from a central web-based location.

Learnpad Deployments and Awards

LearnPad was launched in January 2011 and has rapidly been adopted in schools around the world as the educational tablet device of choice. LearnPad deployments range from preschools and daycare facilities, to mainstream state and private primary and secondary schools, as well as higher education institutions and colleges. In addition, LearnPad is uniquely well-suited for Special Education because it is so easy to provide a safe and secure platform to deliver inclusive activities for children with learning disabilities while allowing for greater focus by removing other distracting options from the interface.

In March 2012, LearnPad won the prestigious BESA Educational Resource Award for Best Primary ICT resource and was nominated in two other categories: Best Secondary ICT resource, and the coveted Innovation Award. Since then, LearnPad has been recognized in the prestigious Bett Awards, where it was awarded the prize for Best Digital Device of 2013, and was a finalist for the "Best Educational App" in 2014. **The LearnPad is now the most awarded tablet solution for global education.** LearnPad continues to be adopted by more and more schools and educational institutions across the globe.

The LearnPad Solution

At the heart of the award-winning LearnPad solution is the ClassConnect Portal which serves as the bridge between the student LearnPad device, the teacher driven content and in and out of class device monitoring. The ClassConnect Portal is web based and is accessible on any internet ready device.

Learnpad Student Interface

Controlled User Interface

The LearnPad user interface provides a fully customizable, secure and intuitive way for students to quickly navigate to subject related activities. It locks out access to device settings, prevents accidental changes such as modifying the Wi-Fi connection, and allows students to only access pre-approved applications and content. Approved applications can be selected on the device itself or via the web-based ClassConnect Portal.

Secure CIPA compliant Web Browser

LearnPad also features an integrated secure web browser, with an “on-device” and user defined white list of approved websites. This web browser presents a full screen experience of any website and removes the URL bar, thus preventing the student from navigating away from the specified site and providing CIPA compliance. This helps the student to maintain focus on the activity at hand and prevents accidental or deliberate navigation to other sites. This whitelist is applied irrespective of any additional network filtering, thus should the LearnPad be connected to an unfiltered network, such as a home Wi-Fi, the integrity of the device (and the lesson) is maintained.

Customizable Student Interface

LearnPads can be completely customized, allowing teachers or administrators to design their own backgrounds, icons and categories and define exactly which applications and content are available within each. Teachers can easily create differentiated lessons for individual classes, students, reading groups, and/or subject areas. Once created, lessons can be transferred to the device via either automatically-generated OrKeys (OrCodes) or deployed to a group of LearnPads by the teacher via the ClassConnect Portal.

Content Synchronization

Running silently in the background is the LearnPad content updater service, which reports into the ClassConnect Portal on a regular schedule to look for new content, applications and lessons. The content updater service will silently install any new content it receives, so the user is never prompted or interrupted. It also

provides important information to the management system, such as battery charge level, location, storage capacity, Wi-Fi details and current usage, so that the administrator has a constant view of device deployments within the school.

LearnPad ClassConnect Portal

Web Based Secure Portal

The LearnPad ClassConnect Portal is a powerful solution for managing mobile devices, yet is simple to configure and use. It is web based, so there is no need to install any software or purchase expensive hardware—it can be accessed from any web browser on any device. The Portal allows teachers and administrators to manage mobile devices, upload and store content and documents, roll out applications and content to connected devices, and create custom interface layouts and lessons for individual or groups of LearnPads.

Mobile Device Management

The LearnPad ClassConnect Portal allows a teacher or administrator to manage the deployment of LearnPads and easily monitor and report on their status. Device reporting includes managing content storage capacity, battery and Wi-Fi status, location and current device lesson. The LearnPad Dashboard highlights problem areas in an easy to understand graphical layout, such as devices with low battery charge, or devices that have failed to report in after a defined period of time. All of these functions afford the administrator a quick “birds-eye” view of device status within the school, allowing them to quickly and efficiently address issues to maximize device security and reliability.

Lesson Customization and Differentiation

The LearnPad ClassConnect Portal allows for the easy creation of custom lessons based on student needs. Teachers and administrators can set background images and icons to design a layout, then, using a graphical interface, can simply “drag & drop” the activities they want into each category. Once a lesson is defined it can be applied to as many devices as needed. It is fast and easy to update the lesson with a new activity that can be automatically sent to each device. The Portal can also be used to transfer individualized content to students with special needs quickly and seamlessly.

LearnPad Standards Based Content

Existing Curriculum Content

LearnPad was designed specifically to allow schools to utilize their existing eLearning content and network resources, and as such, LearnPad supports access to online and local Flash-based content, and connects directly to network resources and servers. In addition, LearnPad comes pre-installed with a range of eLearning activities and applications; all aligned to the teaching curriculum and the Common Core standards. These activities can be added via the Portal's online content tab.

LearnPad Curated Content

All of the content in the LearnPad Content Tab has been vetted, curated and aligned specifically to the teaching curriculum and standards. Content is filtered by subject area and age range, and then tagged with relevant topics. So, if you are searching for an application to help teach decimal fractions for 10 year olds, simply use the content filtering menus to quickly search the store. Many applications have a trial version, or can be viewed online, so you can quickly determine if that activity will fit your teaching needs. The Content area contains eLearning activities in many formats, including applications, flash activities, presentations, documents, videos and audio resources.

Summary

The growth of tablet computing in recent years has been near meteoric, and appears to be on course to revolutionize the way we interact with technology and with each other on a daily basis. As this cultural transformation plays out, tablet computers will undoubtedly take on an increasingly important role in education, offering our students unique and deeply meaningful learning opportunities that were not possible before tablet touch screen technology became widely available. In order to fully leverage the promise of tablet technology for education, it is essential that teacher-leaders and decision makers give the utmost consideration to the appropriate use and content, ease of manageability

and deployment, and to the supervision and security of both the devices and the students.

Maintaining a sound strategy for device adoption, control and manageability is essential when leading a successful tablet deployment in schools. Understanding the educational benefits and ensuring there is a clear and easy plan for deployment will ensure that these devices deliver on their promise to increase engagement, intrinsic motivation, and opportunities for learning for all our students.

The Future

Tablet technology will continue to evolve and change rapidly, far faster than we have seen with previous technology. From simple replacement of printed material, to the engaging and interactive world of new educational applications, change will come rapidly. With this change, we can finally realize the “one device per child” scenario, transfer the power of learning from the front of the classroom to each and every student, bridging the digital divide forever. By doing so, we can achieve a brand new level of educational excellence never before possible.