

# Best Practices for Enabling BYOD in Education

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## EXECUTIVE SUMMARY

Industry analysts estimate that there are over 1 billion smartphones in use worldwide and that in 2013 tablets will outsell desktop computers.<sup>1</sup> As mobile device ownership becomes more pervasive, students and teachers want to bring their own devices into classrooms. This trend towards consumerization of technology has influenced schools around the world to consider bring-your-own device (BYOD) as a way to leverage technology for enhanced teaching and learning.

The use of mobile devices in educational institutions has the potential to cause a truly disruptive shift in pedagogy. Teachers will have the ability to deliver information in multiple formats such as videos or come up with creative ways for students to learn in a way that is unique to their individual styles. Whether schools choose BYOD, 1:1 computing (where each student is provided with the same laptop or tablet), or a hybrid approach to enable mobile learning, there are policy, security, safety, training, and IT infrastructure issues that must be addressed. An increase in the number of internet-enabled devices will have performance implications across the entire IT infrastructure, not just the wireless network.

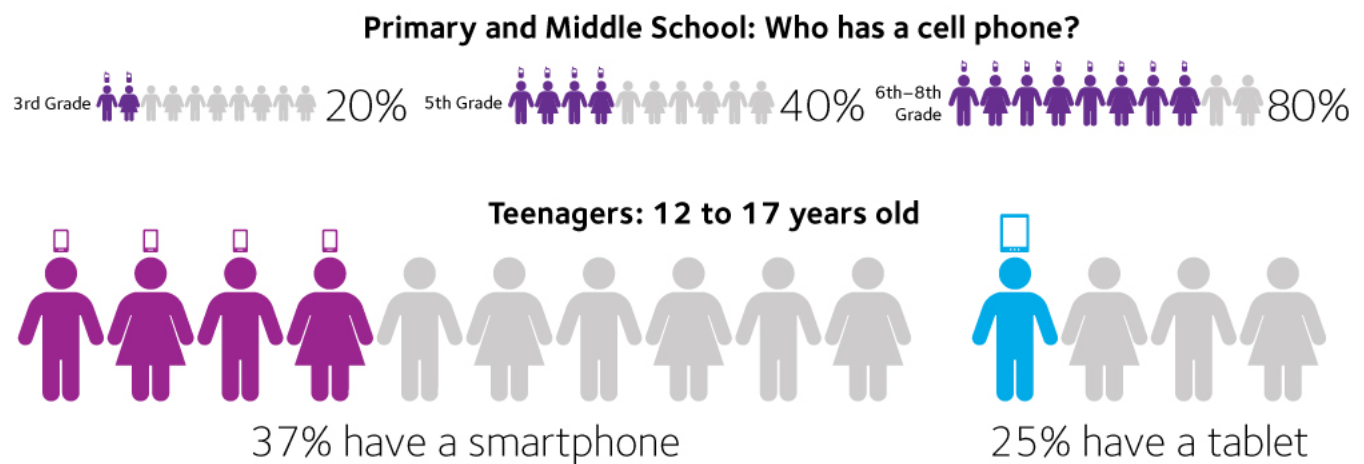
A recent Forrester report confirms that providing faculty and students with access to school resources regardless of where they are located is the top priority for IT decision makers in education today.<sup>2</sup> This whitepaper will help IT and teaching professionals understand the BYOD trends, benefits and challenges of supporting mobile learning in schools and universities, and provide best practices for ensuring a successful wireless network deployment.

## BYOD: FAD OR FUTURE?

IDC predicts that 959 million smartphones will be sold on a worldwide basis in 2013. At a time when the market is growing at 33% annually, average selling prices for mobile phones have rapidly declined, dropping 8% in 2012 with another 9% price drop expected this year.<sup>3</sup> Global tablet shipments are expected to reach more than 240 million in 2013, exceeding sales of notebook PCs for the first time.<sup>4</sup> Retail prices for tablets have also declined significantly, with the introduction of more affordable Android based devices driving anticipated growth of 66% over last year's sales.

This rapid, broad based adoption of mobile devices has led to the consumerization of technology where faculty, staff, and students bring their personal devices to schools. From K-12 to universities around the world, stories of mass BYOD adoption point to a new way of teaching and learning, but is this trend a fad or the future for the education industry?

Figure 1: Mobile Device Ownership by Students



According to a recent study of IT leaders in education, the percentage of employees engaged in BYOD will increase from 20% in 2010 to 60% in 2014.<sup>5</sup> Among students, mobile device usage spans the K-12 spectrum. A survey conducted in Massachusetts among K-12 students found that 20% of third graders, 40% of fifth graders, and over 80% of middle school children have mobile phones.<sup>6</sup> Of the nearly 80% of US teens that have mobile phones, 37% have smartphones (up from 23% in 2011) and 1 in 4 now own a tablet computer.<sup>7</sup> Approximately 75% of US teens access the internet on cell phones, tablets, and other mobile devices.<sup>8</sup> On the collegiate level, 62% of students own smartphones and nearly twice as many of these students said they use these devices for academic purposes more than they did in 2011.<sup>9</sup>

Interest in supporting BYOD in schools is on the rise driven by growing support from students, parents, and teachers. According to a US survey conducted by Project Tomorrow, over 60% of middle and high school students prefer to use their own devices for learning vs. school supplied laptops or netbooks, while 62% of parents of these K-12 students agreed that they would be likely to purchase a mobile device for their child if the school allowed them to be used for educational purchases.<sup>10</sup>

This data confirms what IT professionals already know: we are living in the era where affordable, easy-to-use, and readily accessible technology is fueling the adoption of BYOD in education. Mobile learning is not a fad, but the future.

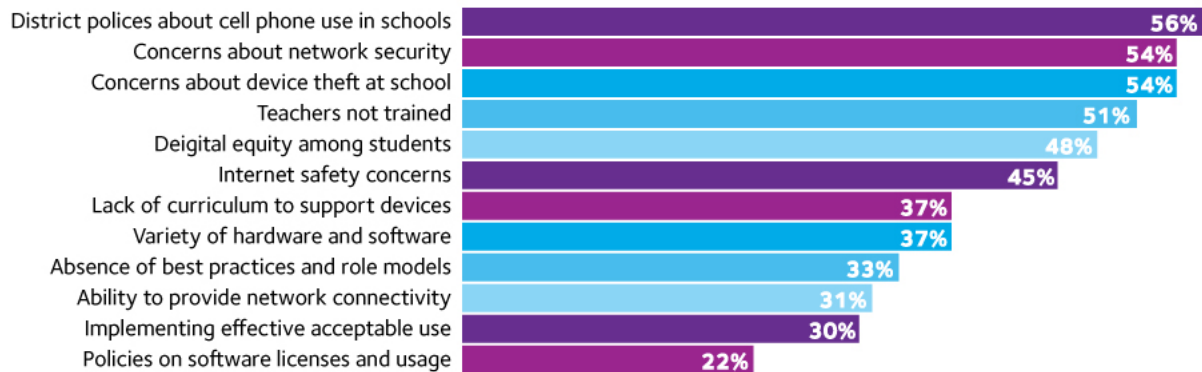
## **BENEFITS & CHALLENGES OF MOBILE LEARNING**

The most successful mobile learning environments involve close collaboration and a shared vision between key stakeholders: teachers, administrators, IT staff, learners, and parents. Administrators and teachers surveyed in the Project Tomorrow study overwhelmingly agree that using mobile devices in schools can increase student engagement, help prepare students for the world of work, improve communications, and personalize instruction for each student.<sup>11</sup> Educators in mobile learning environments can monitor and track individual progress on a real time basis and come up with creative ways to accommodate different learning styles. Students with special needs such as visual or written comprehension challenges can be supported through the use of applications that transform characters into the spoken word or devices that display text in low-contrast for easier viewing. For many schools, helping foreign language students keep pace with the curriculum is an issue when they cannot read or write the native language. Laptops or tablets can help to break down these barriers as it enables non-native students to search for information on keywords picked up during lessons. These are just a few examples of how the use of mobile devices in the classroom is enabling a new pedagogical model of pupil-lead learning.

A recent poll of IT leaders revealed that they are most excited about opportunities to facilitate student engagement, extend teaching and learning environments, and promote a happy and productive faculty/staff.<sup>12</sup> Based on recent case studies, students who are given the ability to use laptops or tablets in school are more motivated and eager to learn and their parents are better able to relate to school work.<sup>13</sup>

Although there is widespread enthusiasm for mobile learning, the move away from textbooks and chalkboards towards technology-based tools raises many concerns. In a study of school administrators, numerous barriers to implementation were mentioned surrounding best practices, policy issues, curriculum, and the impact on IT infrastructure such as network security and connectivity (See Figure2).<sup>14</sup>

Figure 2: Barriers to BYOD in Schools



Source: Project Tomorrow: Speak Up National Research Project

Limited budgets are always a consideration for educational institutions, and moving to a digital learning environment does involve some investment to support/update/upgrade IT infrastructure. However, the savings that accrue from moving to mobile device based learning can be used as a platform to offset expenses related to the transition. Some examples are:

- **Printing** – if a school district could halve their printing needs by converting to digital lessons, assignments and tests, it could realize significant savings on ink, paper, printer, and photocopying expenses that could be applied to supporting investment in a wireless platform for mobile learning.
- **Textbooks** – schools converting from a physical textbook to an e-book model can benefit from an increase in the quality and quantity of accessible information, while driving down costs related to wear/ tear and content updates. iTunes University recently saw its one billionth download and has over 75,000 education apps – providing an abundance of resources for students and teaching staff alike.
- **Facilities** – as the student population continues to grow, schools will need more space for classrooms. As physical book inventories are replaced with digital content, schools can convert prime space formerly occupied by libraries to classrooms without impacting limited capital budgets.

A Forrester report on technology in education substantiates the notion that teaching focused on interactivity and engagement sparks creative learning and emphasizes the importance of pupil-lead learning in effective personalized learning experiences.<sup>15</sup> Riding the tide of BYOD and mobile learning has its challenges, but the payoffs in terms of enhanced teaching and learning, improved student engagement, increased operational efficiencies, and higher staff productivity for schools are significant.

## ENABLING A MOBILE LEARNING EXPERIENCE

Enabling mobile learning is a top priority, as evidenced by a survey of IT leaders in education who ranked “supporting the trend toward IT consumerization and BYOD” second in The Top Ten IT Issues for 2013.<sup>16</sup> IT leaders’ biggest concerns are how to address the impact of BYOD on bandwidth, network connectivity, and security.<sup>17</sup>

Once the decision has been made to adopt mobile learning, there are several approaches to the provisioning of devices. With BYOD, there are no direct hardware and maintenance costs for schools and students can work with the tools they need and prefer. However, not all learners can afford to purchase their own devices and supporting multiple devices and operating systems can present IT with challenges in terms of compatibility, support, and integration.

Alternatively, schools can choose to supply each student with a standard issue only device (SIOD). Although there are capital and operating expenses associated with an SIOD-based program, it ensures that all students have equitable access to mobile devices, streamlines faculty/staff training, and simplifies IT support and maintenance. Choice of laptops is critical here, as inexpensive laptops can potentially undermine network performance. The lowest price laptops are apt to have older generation wireless technology, degrading the wireless experience for users and necessitating the installation of more access points.

Many schools and school districts have chosen a hybrid-approach in which BYOD is supported while standardized laptops are made available for general use. This combination approach enables schools to trial, evaluate, re-align, and refine their digital learning strategy as the need evolves.

When it comes to device management, there are numerous platforms available to manage user access and traffic. With a wireless management controller, a host of options exist including:

- **Limiting the number of devices that are allowed to connect to the network** – via MAC authentication, secured SSID, guest authentication/captive portals, etc.
- **Regulating the types of devices that are allowed to connect to the network** – e.g. tablets allowed, but not smartphones, smartphones allowed, but with bandwidth limits in place.
- **Using dual band access points to balance the use of the network** – e.g. placing heavy/priority users on the 5GHz wireless spectrum and lighter/less important users on 2.4GHz, or teaching staff on one spectrum with students on another.

A significant increase in the number of internet-enabled devices in schools will have performance implications across the entire IT network (See Figure 3) not just the wireless infrastructure. Firewalls and applications security must be re-evaluated to ensure safe and secure access to the internet. Using popular social networking sites such as Facebook as an example, schools may impose age restrictions for access or grant user access to all students but restrict access to online gaming applications inside Facebook that draw on vital bandwidth across the network.

The convergence of voice, video, and data on mobile devices can degrade network performance. More traffic coming from the edge may necessitate an upgrade on the backbone from 1 Gigabit to 10 – 40 Gigabit switches. Additional voice traffic stemming from both mobile and connected computer devices will create incremental demand for higher speed, lower latency links necessitating switching upgrades to accommodate the additional traffic across the network. Rapidly rising bandwidth requirements due to the use of streaming videos on YouTube in classrooms or the expanding popularity of MOOCs (massive open online courses) for onsite and distance learning at the university level will drive the requirement to increase from Fast Ethernet to Gigabit network at the edge.

According to IDC, digital content is expected to double in size every 18 months.<sup>18</sup> The storage needs of educational institutions will grow exponentially due to the unprecedented levels of data production and consumption enabled by mobile devices. In digital-based learning environments, students and teachers will eschew paper materials to save and access core content such as homework, lesson plans, and tests from mobile devices. As students go from kindergarten to 12th grade in schools or from freshmen to seniors at universities, profiles are created for each of them based on their cumulative body of work.

Figure 3: The Impact of Mobile Learning on the IT Ecosystem



## CONCLUSION

Pervasive ownership of mobile devices such as smartphones and tablets has led to the consumerization of technology in today's school environments. Students, faculty, and staff want to bring and use their own devices to enhance teaching, learning, and productivity. Although there are many benefits to BYOD, IT staff and teaching professionals are challenged with figuring out how to ensure safe and secure support for technology based learning. Initiatives such as BYOD and 1:1 computing are driving transformational change in pedagogical education circles as learning moves from being teacher to student led, and closer collaboration is fostered between students, parents, and teachers. Decisions such as whether schools supply each student with a standard device in addition to or in lieu of BYOD have different advantages and disadvantages and varying ramifications for training, IT support/maintenance, and school finances.

Whatever deployment model is chosen, it's critical to understand that wireless networks are not a bolt on or accessory overlay on the IT network, but a critical enabler of mobile learning. The potential for changing pedagogy can only be realized if IT professionals employ best practices in deploying wireless and consider the broader impact that stems from the use of internet-enabled devices as a vital part of the teaching and learning process on the entire network.

## ABOUT NETGEAR

NETGEAR is a global networking company that offers reliable, affordable and easy to use solutions that scale from a handful to thousands of mobile device users across all educational entities from K-12 to colleges and universities with multiple sites/campuses. Our solutions to support a mobile learning environment include:

- Access points and broadband routers to enable wireless networking
- Application firewalls to allow safe and secure internet access
- Storage solutions for managing, protecting, and sharing data
- Switching to support voice, video, and data traffic across the network
- Wireless controllers to centrally manage access points infrastructure

Whether you are in the exploration, project definition, implementation, or expansion stage for mobile learning, NETGEAR can provide guidance and advice to help design robust, secure and flexible wireless networks through our extensive and experienced reseller network. For more information, go to [www.netgear.com](http://www.netgear.com).

## ABOUT PALMER RESEARCH

Founded in 2001, Palmer Research delivers the information and intelligence IT decision makers and high tech companies need to better understand market dynamics and meet their business objectives. The company is located in Los Altos, CA. Debra Chin, the author of this whitepaper, joined Palmer Research in 2006 as Senior Vice President. Her background includes over 15 years of experience in executive level marketing and research positions for leading consumer packaged goods and high tech companies. She holds an MBA from Columbia Business School and a BSE in Economics from the Wharton School of Business. For more information, go to [www.palmerresearchgroup.com](http://www.palmerresearchgroup.com).

### Footnotes:

- <sup>1</sup> Gartner 2012 and Reader Forecast, 2010 – 2014, Forrester Research, Inc.
- <sup>2</sup> 2011 Global Budget and Priorities Tracker, Forrester Research, Inc.
- <sup>3</sup> IDC, June 2013
- <sup>4</sup> NPD Display Search Quarterly Mobile PC Shipment and Forecast Report, January 2013
- <sup>5</sup> Consumerization of Information Technology/BYOD, EDUCAUSE 2013
- <sup>6</sup> Research Findings: MARC 2011 Survey Grades 3-12, Elizabeth K. Englander, 2011
- <sup>7</sup> Teens and Technology 2013, Pew Research Center, March 13, 2013
- <sup>8</sup> Ibid
- <sup>9</sup> ECAR Study of Undergraduate Students and Information Technology 2012
- <sup>10</sup> Project Tomorrow: Speak Up National Research Project, Fall 2009
- <sup>11</sup> Ibid
- <sup>12</sup> Top Ten IT Issues 2012, EDUCAUSE, May/June 2012
- <sup>13</sup> Tablets for Schools Programme, UK Report
- <sup>14</sup> Project Tomorrow: Speak Up National Research Project, Fall 2009
- <sup>15</sup> "Schools Move Beyond the Basics: Competition Will Drive Technology Into the Education Market," Forrester 2011
- <sup>16</sup> Top Ten IT Issues 2012, EDUCAUSE, May/June 2012
- <sup>17</sup> Ibid
- <sup>18</sup> John Gantz, Chief Research Officer for IDC, 2009

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