PDAs: Revolutionizing The Way We Learn and Teach

Kimberly McDONOUGH
Associate Professor Zane L. BERGE Ph.D
Baltimore MD 21250 USA

ABSTRACT

Miniature handheld computers called PDA's are not only bombarding corporate America, but they are also noticeably making their mark on college campuses. The question is, how much impact are they making on the way students learn and instructors teach. These devices were born from a simple calculator and over two decades have transformed into a walking computer complete with Internet access. This paper identifies how PDAs have transformed over the years as well as their benefits and limitations.

Although there are many pros and cons to using PDAs, it was clear that they can be used to enhance both learning and teaching if used and accepted in the appropriate manner. With the advancement in technology and data speeds it is evident PDA's will continue to add value to education in the future.

Keywords: PDAs (personal digital assistants), using PDAs, Instructional Design Methods.

PDAS: REVOLUTIONIZING THE WAY WE LEARN AND TEACH

"Buzz, Ring, Beep, Vibrate" are all common sounds now radiating from college campuses. Gone are the days where students walk to class chatting and making eye contact with fellow students. Now more than likely most are talking to someone else on their mobile phone or doing the "PDA prayer" by staring down at their digital gadget. What has taken this generation by storm you ask? Technology.

And more specifically PDAs (personal digital assistants) also commonly referred to as handheld devices or mini PCs. Computers are a common household necessity and children are being exposed to the digital world at a very young age. Video games and toys aggressively simulate real life images and scenarios.

As a result children are entering school with vivid imaginations and the need for constant stimulation to gratify their cyber world craving. PDA's are just one of the many technology devices being used to make connectivity, communication, organization and learning occur anytime, anywhere. Using PDA's for learning is also referred to as m-learning, short for mobile or on the go learning. This paper will outline the current uses of PDA devices and m-learning in the higher education environment, including the technology behind PDA's, benefits and limitations, applications for learning, instructional design methods, and the future of m-learning.

TECHNOLOGIES AND INFRASTRUCTURE

PDAs have evolved over the last two decades starting in 1974 with Hewlett Packer's release of the HP-45 calculator, which could be programmed, included a timer, and had

removable storage. Fast forward a few years to 1978 where Toshiba designed the LC-836MN, which is what some refer to as the "official first PDA device" (Koblentz, 2005). Its main function was to store phone numbers, notes and be used as a date book. From there the PDA exploded each year with the device becoming more robust and functional. Today the PDA can fit in the palm of your hand and is made up of many different services to include:

- Phone and email capabilities
- Internet browsing: WAP and HTML sites
- GPS (Global satellite positioning)-the ability to track the device and receive driving directions
- SMS (short messaging services)-similar to text messaging
- MMS (multi-media messaging)- the ability to send messages with video and digital pictures
- Instant messaging-synchronous communication
- Digital camera and camcorder
- MP3 Player
- Infrared beaming-to share documents
- Bluetooth technology- wireless technology to transfer data between other Bluetooth devices

All of the features mentioned above have created the hype and wonder about how m-learning can benefit students in a learning environment. There are several different types of PDAs in the market place today. The most common operating systems are Palm OS and Microsoft Windows Pocket PC (Wood, 2003). Most PDAs can be synchronized with desktop computers using software and a USB cable that comes with the device. This synchronization allows data that is currently stored on the desktop to be transferred to the PDA and vice versa.

Another way to connect a device to a computer on an internal network is through a wireless environment, which is the untethering of hardware from wiring (Alexander, 2004). This type of connectivity is not common today, especially in higher education environments. Most campuses are hard-wired, meaning you must plug your computer into a specified data source to have connectivity into the network. Cost is a major barrier to moving to a completely wireless environment. However, some universities are recognizing the benefits of m-learning brought on by PDAs and are using more creative solutions to work around the budgetary factors. Designated learning spaces such as the campus library or common areas have been turned into wireless spaces or hot spots.

This is similar to how *Starbucks* and *Panera Bread* establishments offer customers Wi-Fi connectivity to conduct personal or business needs. Since computer labs are here to stay, there has been recent talk about the design and development of mobile chairs and desks (Alexander, 2004). This would make the computer lab much more conducive for learning. Instead of sitting behind a stationary terminal the class could move the wireless chairs and desks around to form groups for project work and classroom discussions. This is where PDAs can take learning to the next level.

Once connectivity is established for a PDA, other important areas are bandwidth, memory and storage capacity of the device. Since most PDAs have the ability to surf the web and download files, it is important for a consumer to know how fast these transactions will occur. Most PDAs are built with 3G technology, that has a data transfer rate of about 2 megabits per second (Wood, 2003). PDAs have a typical memory capacity between 32 and 64 MB with 128 MB of total storage capacity. Most devices are now made with expansion slots where a consumer can purchase a memory card and increase the capacity of the unit. Some applications such as the MP3 Player require the additional memory in order for it to function. As PDAs continue to evolve, so will the enhancements of the data transfer speeds and memory capacity.

BENEFITS AND LIMITATIONS

There are many advantages to using PDAs for m-learning in the higher education realm (Wood, 2005):

- Most PDAs have a memo pad and voice recorder that allow the user to record notes easily
- Easier to work in groups with PDAs than with desktop computers that are stationary
- Quick and easy access to data (Just in Time Learning)
- Assisted technology for people with learning and other disabilities
- Customized software is available for facilitators to teach using PDAs
- Most PDAs have an easy to use Qwerty style keypad or a stylus which allows the user to touch the screen
- Data and research gathering
- Learner tracking

There are also drawbacks to using the PDA for learning purposes (Lockitt, 2005):

- Small screens
- Limited storage capacity
- Slow data speeds
- Battery life is short and requires daily charging
- Less robust than a desktop computer
- Security issues
- Cost of Connectivity
- Easy to lose

One advantage of PDAs is how they can assist students with disabilities. The size factor is a huge asset for students in wheel chairs. Carrying a PDA can easily fit into a bag versus a heavy lap top. However the small screens and keypad can be frustrating. Peripherals such as larger keypads or screens, can attach to the PDA to aid in these limitations.

A disadvantage of the PDA is that it is less robust than a regular desktop. One would not want to completely abandon the computer but rather use it in conjunction with the PDA for maximum learning. Although there are limitations to using the PDA, keep in mind the device continues to evolve. As it develops, some of the drawbacks will no longer be an issue. They will only continue to get better and easier to use.

APPLICATIONS FOR LEARNING

Because PDAs are affordable (currently ranging anywhere from $200-$400), small and light weight, they are very portable and easy for students to carry around on or off campus. Most consumers are "emotionally invested" with their device already since they use it to communicate via phone, email and to keep track of their daily tasks and meetings. The convenience of PDAs can enhance the current learning taking place in the classroom. Learning on the go has the advantage that student learning is not confined to the four walls of a classroom, but can occur between classes, during a lunch break, or sitting in a doctor's office. This flexibility allows student to have total control of when and how they learn.

The ability to access the web and download files and attachments is a huge learning benefit. The infrared beam allows for the sharing of documents. In a moments notice a teacher can "beam" a document to students to read or discuss in small groups. Students can send electronic files to one another, which could make project collaboration easy and convenient. Vahey and Crawford (2003) discussed how a teacher has organized her class into "beam teams" meaning she sends a file first to designated students who in turn beam the other classmates. This makes for fast and easy file transfers.

If students are out of the classroom, in lab or on a field trip, they can use their Internet capabilities to search for any topic of interest. Some students will also use it while in class to expand upon the teacher's discussion or look up a definition to an unknown word. This kind of "just in time learning" is extremely beneficial to the learner.

PDAs are also being heavily used in the workplace to stay connected, drive business, and remain competitive. If students are familiar with the PDA devices early on, this will give them an advantage when starting a new job. In 2004 the Business School at the University of Maryland deployed Blackberry devices to their full time graduate students. The dean stated "in order to succeed as business executives in today's digital economy, business students must learn how to leverage always on communication and manage a 24/7 access to data and people" (Heebner, 2004, p.1). Medical colleges are also using PDAs to show students that in their profession, instant communication and up to date information is vital to the care of their patients. Not only is it valuable for students to utilize PDAs on campus but also it is essential for them continue using them to learn and advance in their careers.

PDAs allow students to access information 24/7, 365 days of the year, wherever they are. This is a significant advantage over laptops and desktops. An ideal situation may be for students to be connected into the school network through a wireless environment. This would allow students the ability to communicate with peers and instructors, access course information, take quizzes, provide feedback to peers when working in groups, and access campus resources such as the library anywhere on campus (Dominick, 2002). Facilitators could build the use of PDAs into the course curriculum. Bluetooth is also an up and coming technology typically built into PDA devices. Bluetooth is a wireless technology that would allow students to use wireless headsets as well as take advantage of wireless print and fax capabilities (Wagner, 2005). But regardless of how students are connected, PDAs can be used to enhance learning, collaboration, and communication.

INSTRUCTIONAL DESIGN METHODS

It is no secret that more students are entering college with a solid technology foundation. Most have seen or used the multi media tools currently in higher education classrooms today such as SMART boards, streaming video, projectors, blogs, printers and scanners (Stafford, 2005). Some may even prefer an e-learning environment compared to an in-person classroom. PDAs help bridge the gap for these individuals and overall enhance the current course curriculum.

First and foremost it is essential for a teacher to understand and accept this technology if it is to be used. A teacher who is opposed to using technology in the classroom is not a good candidate for m-learning with PDAs. Some universities train and help staff with this transition. For instance, training offered to business school instructors at the University of Maryland dedicated to the Blackberry devices when deployed to their graduate students.

Second, it is important to see and hear examples of how other professors have utilized m-learning to improve classroom activities. This will also help with the adoption of PDAs in the classroom. Not only are professors utilizing the PDAs for learning but they are also taking advantage of the different software applications specifically designed for PDA learning.

There are over 13,000 packages available and many can be found online. For instance, an instructor at the University of Dakota used PDAs to help student's track assignments and their own individual performance. He also used a customized software package called "Quiz App" to help students prepare for upcoming tests (Peterson, 2002).

Another professor at Erskine College used a PDA software application called "Beyond Question" to get instant feed back if his students were absorbing the lesson for the day (Fallon, 2002). This enabled him to proactively plan his next class to review any gaps identified through the quiz. Once a facilitator has seen examples and software on how m-learning can work it is now time to see how it will fit into his or her course curriculum. Lockitt (2005) outlined a few key questions to ask before introducing m-learning into instruction:

> ➢ **Who will be using the device?**
> ➢ **What will it be used for?**
> ➢ **How often will it be used?**
> ➢ **Where will it be used?**
> ➢ **How will it be used**
> ➢ **Why use this technology rather than another?**
> ➢ **Is there an educational benefit?**
> ➢ **Is there additional cost (software)**

Once an instructor has answered these key questions and decided m-learning will be a learning asset, it is also important to remember while PDAs can be beneficial for group projects and collaboration, they also can be used for an autonomous personalized learning. PDAs are becoming so advanced that with the recent additions of robust Internet browsers, a personalized profile can be developed for each student. "Profiled notification" allows a student to enroll in customized learning events and information sharing portals so when information becomes available, the PDA notifies the student (Deviney & Von Koschembahr, 2004, p.). For example a PDA could be customized to alert a student or researcher when any recent article on a specific set of criteria is published.

Another form of personalized m-learning on PDAs is through a new approach called Adaptive Hypermedia Systems (AHS). "AHS enables the learning experience to be tailored to a student's specific capabilities and past history. The techniques frequently employed in achieving this tailored learning are adaptive navigation structuring, adaptive content selection and adaptive presentation. Studies have shown that users of educational AHSs are faster, more goal oriented and take fewer steps to complete a course." (Brady, et al, n.d. n.p.). Teachers can use this to help a student customize and accommodate individual learning needs.

THE FUTURE OF M-LEARNING

What does the future hold for PDAs and m-learning? Super 3G and Fourth generation or 4G phones are already in the planning stages. These phones will have maximum data transfer speeds of up to 10 MB per second. This would allow for streaming video and Flash Media Player on PDA devices. An ill student having to miss class could be sitting in bed watching class from their PDA device. Movies could be downloaded to the device so professors could send students a movie or video to supplement a class lecture.

Connectivity problems will also be non existent in the future. Either college campuses will see the significant benefit of moving to a wireless environment or students will use local or national networks to stay connected (Lockitt, 2005). M-Learning software will continue to improve and enhance personalized learning. Different peripherals (PDA attachments to enhance usability) will include screens, keyboards and sensors to increase the functionality of the device make it easier to use m-learning.

CONCLUSIONS

PDAs have innovated the way a student can learn and a professor can teach. These small, easy to carry devices can do almost everything a stationary computer can do. The major difference is that a PDA allows a student to be a more nomadic learner. The current 3G technology allows a student to be anywhere and surf the web, send an email to a peer about a project, track their progression in a class, check their calendar to see when an

assignment is due, share documents, and control their learning through profiled notification and personalized m-learning. This functionality will continue to increase as Super G and 4G devices are released.

M-Learning also provides teaching opportunities to the instructor. They can utilize current software to test students and receive immediate feedback, help student prepare for the workplace, personalize learning experiences and take advantage of just-in-time" learning. Who would have thought that the simple birth of a calculator in 1974 would turn into a device that would imitate a computer but fit in the palm of your hand? While it is amazing to think the future of technology is unimagined and in many ways unimaginable, students and teachers will be doing as new technology continues to revolutionize the way people learn.

BIODATA and CONTACT ADDRESSES of AUTHORS

Zane L. BERGE is Associate Professor of Education. Ph.D., 1988, Michigan State University, Educational Systems Development (Dissertation: Effects of group size, gender, and ability grouping on learning science process kills using microcomputers). B.S., 1977, Rochester Institute of Technology,Finishing and Production Management Certification in istance Education, 1995, Pennsylvania State University. Honors Received: 1999-Charles A. Wedemeyer Award for distinguished scholarship and publication (Distance Training) 1987 Finalist- Spencer Dissertation Fellowship Competition 1985-present. Phi Kappa Phi National Honor Society, Life Member 1983-1986. Fellowship, Institute for Research on Teaching, Michigan State University

Zane Berge
1000 Hilltop Circle
Baltimore MD 21250 USA
Email: berge@umbc.edu
www.emoderators.com

REFERENCES

Alexander, B. (2004, September/October). Going nomadic: Mobile learning in higher education. *EDUCAUSE Review,*39(5), 28-35. Retrieved on October 20, 2005 from http://www.educause.edu/pub/er/erm04/erm0451.asp.

Brady, A. et al. (n.d. n.p) Dynamic composition and personalization of PDA based elearning-personalized m-learning. Retrieved on November 21, 2005 from http://m-zones.org/deliverables/d234_3/papers/brady-dx3-v1.pdf.

Deviney, N. & Von Koschembahr, C. (2004, February). Learning goes mobile. *Human Resource Executive Magazine.* Retrieved on October 20, 2005 from http://www.workindex.com/editorial/train/trn0402-02.asp.

Dominick, J. (2002, September). Ready or not—PDAs in the classroom. Retrieved on October 31, 2005 from http://campus-technology.com/article.asp?id=6705.

Fallon, M. (2002, November). Handheld devices: Toward a more mobile campus. *Campus Technology*. Retrieved November 4, 2005 from http://campus-technology.com/article.asp?id=6896.

Heebner, J. (2004). University of Maryland b-school gives Nextel 7510 handhelds to MBA students. Retrieved on November 19, 2005 from http://www.rhsmith.umd.edu/news/releases/2004/082704.html.

**Koblentz, E. (2005, May). The evolution of the PDA. *Computer Collector Newsletter*
Version 9.993. Retrieved on November 7, 2005 from http://www.snarc.net/pda/pda-
treatise.htm.**

**Lockitt, B. (2005, January). Mobile learning. *3T Productions Limited*. Retrieved on
October 10, 2005 from
http://ferl.becta.org.uk/content_files/ferl/resources/organisations/3T%20Productions/
handheldcompISBN.pdf.**

**Peterson, D. (2002, November). Implementing PDAs in a college course: One professor's
perspective. *Campus Technology.* Retrieved November 4, 2005 from
http://www.campus-technology.com/article.asp?id=6897**

**Stafford, D. (2005, November). Educating the video-game generation. *NAESP* 14(2).
Retrieved on November 13, 2005 from
http://www.naesp.org/ContentLoad.do?contentId=1775.**

**Thomas, M. (2005, May). E-Learning on the move. *Education Guardian.* Retrieved
October 9, 2005 from
http://education.guardian.co.uk/elearning/comment/0,10577,1490476,00.html.**

**Vahey, P. & Crawford, V. (2003). Learning with handhelds: Findings from classroom
research. *SRI International.* Retrieved December 27, 2005 from
http://www.intel.com/education/handhelds/SRI.pdf.**

**Wagner, E. (2005, May/June). Enabling mobile learning. *EDUCAUSE Review*, 40, 340–53.
Retrieved October 8, 2005 from
http://www.educause.edu/apps/er/erm05/erm0532.asp.**

**Wood, K. (2003, March). Introduction to mobile learning (m-learning). Retrieved on
October 20, 2005 from
http://ferl.becta.org.uk/display.cfm?page=65&catid=192&resid=5194&printable=1.**