

PDA's and Smartphones in the Classroom
Teaching and Technology Trends Symposium
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Introduction

Today's young learners use mobile devices such as cell phones, PDA's, MP3 players, and GPS devices every day. They enjoy learning as part of a group or team, or even in a "smartmob" or "learning swarm." They play computer games, interact constantly with each other on websites such as Facebook and MySpace, and wish their college learning experience matched the learning they do in their everyday lives. Mobile learning technologies give them this opportunity. In this workshop we will focus on how PDA's and smartphones facilitate learning in today's new teaching and learning environment.



What You Will Learn in this Workshop

In this workshop you will learn what mobile learning is: its history, some of the advantages of mobile learning, and about some of the tools used in mobile learning. You will also learn about the features of a PDA, its history, and the ways they are used in education. We will also talk about the challenges of using PDA's in education, with special emphasis on accessibility issues. In the last part of our discussion of PDA's we will talk about future trends in the use of PDA's in education. In the section on smartphones we will discuss what a smartphone is, its features, operating systems, the history of the smartphone, the reasons they are popular in education, and future trends in smartphones. This will **not** be a hands-on workshop.

Goals and Objectives for this Workshop

The goals and objectives for this workshop are:

1. Learn what mobile learning is
2. Learn about the history of mobile learning
3. Learn some of the advantages of mobile learning

4. Learn about some of the tools used in mobile learning
5. Learn about the features of a PDA
6. Learn about the history of the PDA
7. Learn how PDAs are used in education
8. Learn some of the challenges of using PDAs in education
9. Learn about future trends of using PDAs in education
10. Learn what a smartphone is
11. Learn about the features of a smartphone
12. Learn about the history of the smartphone
13. Learn why they are popular in education
14. Learn about future trends in smartphones

Prerequisites

You need only basic word processing skills to complete this workshop.

1 Introduction to Mobile Learning

1.1 Mobile Learning Defined

A search on the phrase “mobile learning: definition” yielded 3,720,000 hits in Yahoo and 17,300 in Google. The two definitions listed below were selected at random:

- “M Learning is the intersection of mobile computing and e-learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment, E-Learning independent of location, time, or space.” (1)
- “Three ways learning can be considered mobile: learning is mobile in terms of space; it is mobile in terms of life; it is mobile in terms of time.” (1)

1.2 Some Advantages of Mobile Learning

Some of the many advantages of m-learning are:

- It can empower and engage
- The engagement and motivation can continue for a long time
- Learners are more comfortable when communicating concerning private or personal subject areas using a mobile device rather than using traditional learning tools
- A mobile learning device can be a powerful tool for self-evaluation and reflection (2)

Mobile Learning Perspectives

The JISC (Joint Information Systems Committee of the United Kingdom distinguishes between these three learning perspectives on mobile learning:

- Learning as acquiring competence
- Learning as achieving understanding (both individually and collaboratively)
- Learning as social practice (2)

1.3 Mobile Learning Tools

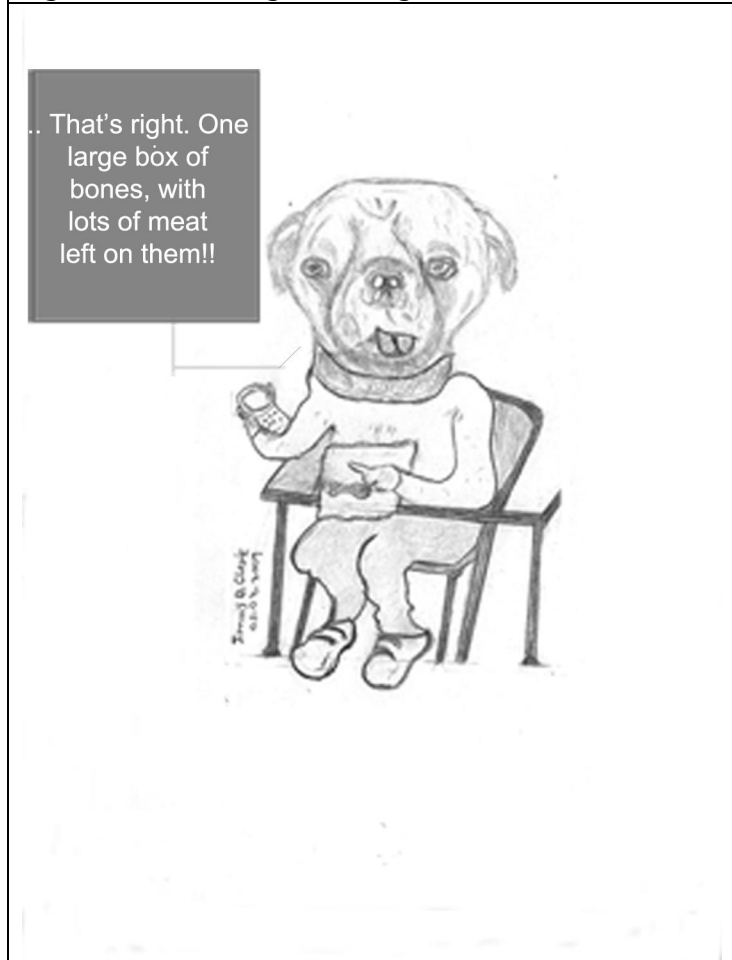
A few of the many tools that may be used in m-learning are:

- **SMS** (text messaging) – Application: skills check, or to collect feedback
- **iPods and other MP3 players** – Application: audio-based learning, including podcasting
- **Color screen phones** – Application: Java quizzes
- **PDA** – Learning modules
- **MMS** (multimedia message service), **cameras**, **email**, **Web** – Application: online publishing or blogging
- **GPS** – field trips (2)



[Frodo Pugman is hungry. He picks up his PDA and dials his favorite store, Bonz 4 Us, and arranges for a box of fresh bones— don't spare the meat - to be delivered to his house. While he is on the phone he is downloading tunes to his iPod, surfing the Web for pictures of foxy poodles, watching the Canine channel on his TV satellite, and studying for an exam in his Fundamentals of Human Speech class. Forty minutes later he arrives at the Canine Obedience School his master insists he attend five days a week. He trots into the crowded classroom, lies down on the floor and falls fast asleep.]

Figure: 3 - Frodo Pugman Using PDA to Order Treat



2 Personal Digital Assistants (PDAs) in Education

2.1 Introduction to PDAs

2.1.1 PDA Defined

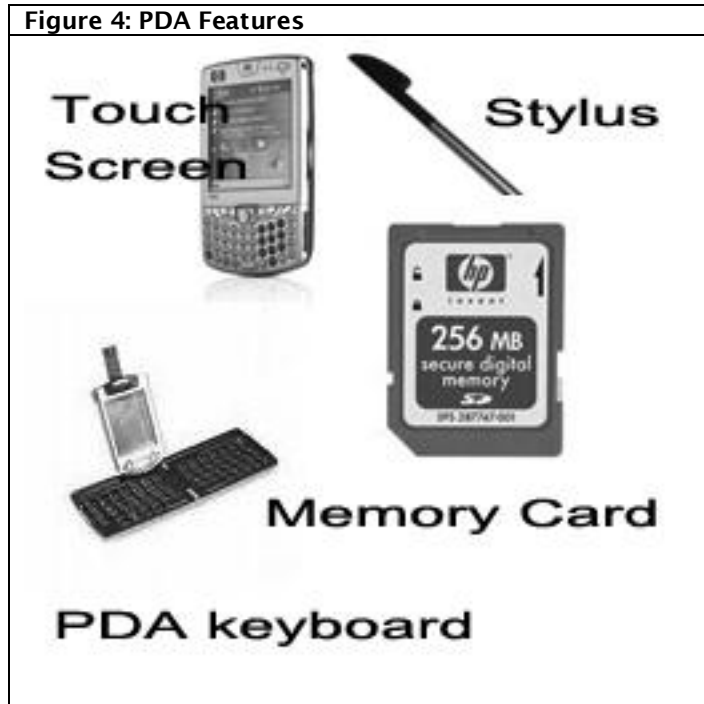
Wikipedia defines PDAs as, “small handheld computers that were originally designed as personal organizers, but became much more popular over the years.” (3) Most definitions of PDAs focus on their features rather than their functions (see University of Washington article, 1). A more complete definition is given in an article on the Webopedia website, which states that PDA is, “short for personal digital assistant, a handheld device that combines computing, telephone/fax, Internet and networking features. A typical PDA can function as a cellular phone, fax sender, Web browser, and personal organizer.” (4). Ted Smith in his article, Personal Digital Assistants (PDAs) in *Further and Higher Education*, offers this definition: “PDAs are small, handheld computers

that are designed essentially to be personal information managers (PIMs) (5).

2.1.2 Features of a Typical PDA

Let's look at some of the features of a typical PDA to help us become familiar with them. Some PDAs, such as the Blackberry and Palm Treo, have full keyboards as well as touch-screen functionality. Many of the first PDAs, such as the Palm Pilot, featured touch screens for user input. Typical features of a PDA include:

- Touch screen – Stylus and handwriting recognition
- Memory cards
- Connectivity – IrDA port or Bluetooth port
- Synchronization of data with a PC
- Customization by adding additional software or hardware such as memory cards
- May come with built-in keyboard or can be attached to a keyboard
- Some play MP3s (3, 5)



2.1.2.1 PDA operating systems

The primary operating systems for PDAs are:

- Blackberry – 25% and increasing
- Palm OS - 15% of market and declining)
- Windows Mobile – 49% and increasing(Wikipedia article on PDAs)
- Others – Approximately 10% of market

2.1.2.2 Some popular PDAs

Some of the most popular PDAs are:

- Psion (<http://en.wikipedia.org/wiki/Psion>)
- BlackBerry (<http://en.wikipedia.org/wiki/BlackBerry>)
- hp iPaq Pocket PC (<http://en.wikipedia.org/wiki/IPAQ>)
- Palm Pilot (http://en.wikipedia.org/wiki/Palm_Pilot)
- Various PDAs running Windows Mobile OS



2.1.3 History of the PDA

In the 1970s Alan Kay and other pioneers of learning technology envisioned a small portable computer called the Dynabook that would be

used for creativity and learning (2), but the history of the PDA actually begins in the mid-1970s with the release of advanced calculators, electronic organizers, and palmtops. 1989 the Atari Portfolio was released. Technically, it was a palmtop computer, some of the early PDAs which followed it used the same form. One

of the earliest PDAs, though it was not called a PDA, was the Psion Organiser (1984). In 1988, Sharp Electronics released its first Sharp, which was called not a PDA, but an electronic organizer. In 1990 Phillips introduced the Velo. It ran “pocket” versions of Microsoft Office software. Apple CEO John Sculley coined the term “personal digital assistant” in 1992 when the Apple Newton was demonstrated at the Consumer Electronic Show in Las Vegas. (3).

Figure 6: Phillips Velo



2.1.4 Ways PDAs are Used

PDAs are often used to access data when the user is in a location that makes it difficult or impossible to use a desktop or laptop computer. Examples might include deliveries, inventory control, reading utility meters, and especially, health care. Other uses are:

- Entering contact information
- Taking notes and writing memos
- Keeping track of appointments
- Doing calculations
- Surfing the Web
- E-mail
- Word processing
- Playing MP3 music files
- Playing MPEG movie files
- As a digital camera (Source: <http://yourpage.blazenet.net/georgen/pda's.htm>)
- Playing games (7)

Figure 7: Some Ways PDAS are Used



2.1.5 User Statistics

An article on the silicon.com website says 7.4 million PDAs were sold in 2005. Smart phones are eclipsing PDAs. In 2005, 37.4 million units were sold. It is becoming harder and harder to distinguish between smart phones and PDAs, however. (7)

2.2 Using PDAs in Education

Many teachers now use PDAs in the classroom to provide a collaborative learning environment for their students. Some of the educational uses of PDAs in the classroom are:

- **Digital note taking** – Students can quickly spell-check and modify their class notes. Mark Szuchman at Florida International University encourages his students to take their classroom notes on their PDAs. He was given a grant to carry out a two-year project in which his students used Palm Pilots in the classroom. The objectives of the project were to
 1. Guide student behaviors toward digital note-taking
 2. Improve note-taking skills
 3. Accumulate and use notes to enhance cognitive skills
 4. Create mechanisms that will continue to yield benefits
 5. Strengthen the quality of research papers, in particular, the analytical components. (NOTE: I have been unable to find any references online about the outcome of this study, which he did in 2002-03. He makes no mention of it on his website). (8)
- Teachers can **distribute course material** via PDAs through the Internet or IRDA connections.
- Teachers can use educational software that runs on PDAs in their classes.
- Students can download **electronic textbooks** to their PDAs. (Wikipedia article)
- Jeremy Roschelle in an article published in 2003, discusses the use of wireless mobile devices in **participatory simulations**. One possible scenario he mentions is an exercise in which one student's mobile device is "infected" with a disease. The disease is spread from device to device as students exchange messages. The students are tasked with controlling the spread of the disease.
- Roschelle also mentions how mobile devices could be used in **collaborative data gathering**. He discusses how students could use their Palm Pilots and probes to gather data on water quality. (9)
- Carol Savill-Smith and Phillip Kent published a paper in 2003 which reviewed the literature on the use of palm top computers in education. They give several example of using them for learning, including:

- The Cooties Game – (Yes, those cooties!!) – Focus: Explore the spread of communicable diseases through handheld computers
- Geney – Focus: Collaborative problem-solving application to help children explore genetic concepts
- The Dockhands Learning Acceleration Project – Focus: To increase the amount of children’s reading and writing
- Science fieldwork – Example: A visit to a botanical garden after which the children created databases of technical terms and botanical information
- Physical and sports education – Example: Students can use their palmtops to record and analyze their own physical performance and send their reports to their teachers.
- Reflective logs – Students record their observations in the professional situation they are working in. (10)
- David R. Rawlinson and Kimberlee Bartel published an article in the *Educause Quarterly* in 2006 in which they listed the following uses for PDAs in education:
 - Note taking
 - Data collection
 - Digital imaging
 - File and data sharing (12)

2.2.1 Reasons PDAS are popular in education

In Ted Smith’s article he says PDAs are popular for general users because:

- The hardware is reasonably mature
- They are very useful for managing calendars and contacts
- Medical and nursing students find them very useful to record patient information and medical reference and learning materials on the ward
- Users can attach them to a keyboard and input large amounts of data
- They are more convenient for students to carry around than laptops
- It is easy to synchronize them with laptop or desktop computers
- Wireless communications are easy to configure and use
- Users do not have to wait for an operating system to boot up
- They have a much longer battery life than laptop computers
- They can hold large amounts of data

- Data can easily be kept up to date
- They are less expensive than laptops (5)

2.2.2 A Pedagogical Perspective

Smith identifies the following reasons why PDAs are popular with instructors:

- They are a useful tool for discussions when used with exercises or lectures.
- Students can use PDAs to access reference material.
- Students can access interactive quizzes and exercises on their PDAs.
- In classes with wireless connections they can provide instant feedback to instructors.
- They can help motivate students (5)

Mark Prensky, the educational gaming guru says that handheld computers are important tools for digital game-based learning and mentions their use for language learning and in the medical education field. (10)

2.2.3 Challenges in Using PDAs in Education

Some of the challenges encountered with the increasing use of PDAs in education are:

- Cheating – Sometimes students share test answers over their PDAs. Scantron Corporation has created a program for distributing digital quizzes that disables the infrared function on PDAs and eliminates information sharing among students during exams
- Students sometimes use their PDAs to gossip during class. (3)
- Bob Little wrote a report for the eLearning Network on a conference he attended in 2002. One of the presenters was Christiaan Heyning of ICUS. Heyning pointed out these limitations (in 2002 remember) of m-learning:
 - The variety of PDA operating systems on the market
 - The variety of screen sizes, supported by fonts and graphics
 - The lack of network connectivity standards (11)
- Ted Smith, writing in 2003, identified the following disadvantages in using PDAs in education:
 - Short battery life (Now batteries for PDAs last much longer.)

- When a PDA's battery expires data will be lost if the user does not have a back-up system.
- The user can input only a limited amount of data with a stylus.
- If the user does not have a laptop or desktop computer, he or she has to be provided with a synchronizing station so that the PDA can be updated.
- Security of personal information
- They are easily lost, damaged, or stolen.
- Small screens
- You cannot print from a PDA unless it is on a network.
- The costs of software and accessories (5)
- Rawlinson and Bartel published an article in 2006 on the use of wireless PDAs in an IT curriculum. In their article they note the following limitations on the use of PDAs in the classroom:
 - The small screen and use of the stylus may be difficult for students with vision problems to use.
 - Cost to students
 - Lack of technical support
 - Need to schedule instruction on the use of PDAs
 - Delivery time- If a teacher orders or has his/her students order PDAs, they may not be delivered by the time the class starts.
 - Built-in storage is usually limited on a PDA. (NOTE: I did not list other limitations listed in this article that were covered in the articles by Bob Little and Ted Smith). (12)

Mark D. Szuchman in his article *Palm Pilots and Critical Thinking Skills in Higher Education* makes some important points regarding the use of PDAs in education. His most important point is that students do not develop their critical thinking skills simply by entering data into a device. The challenge to educators is to guide their students in comparing, contextualizing, differentiating, and synthesizing the data. (8)

2.2.4 Accessibility Trends

An article on the University of Washington accessibility website discusses the accessibility problems involved in the use of PDAs in the classroom and some solutions to them. The issues noted here include:

- Having to use a small stylus for input and a small screen for output
- Often assistive technologies were developed for the Palm OS or Microsoft PocketPC operating system, but not for both.
- PDA operating systems have minimal or no built-in support for larger fonts or alternate color schemes.
- None of the PDA versions of major media players currently support closed captioning.



Some of these accessibility problems may be partially overcome by speech recognition, text-to-speech, and Braille output, but the products currently on the market are all limited. (13)

2.3 Future Trends in using PDAs and other Mobile Technologies in Education

Ellen Wagner, director of worldwide e-learning at Adobe Systems Inc., says that, “the explosion in broadband networks and the increased reliance on broadband networks is ushering in a new era of training education. Some of the most obvious benefits are equal-opportunity access, ubiquitous connectivity, multigenerational users and uses, expanded services for mobile workers and enhanced access to services for mobile learners.” (14).

Some of the trends she identifies are:

- More users will adopt mobile devices as prices drop.

- The growing diversity of mobile learners will drive demand for a greater variety of mobile learning content.
- The changing demographics of mobile users, such as multigenerational users and the demand for tools that can be used regardless of the physical location of the user, are driving the development of new types of support and services.
- Mobile learning environments must be reliable and relevant, and they must engage users through more personalized experiences.
- Mobile learning programs should be developed that are reliable, use media players that are widely available to users that utilize rich applications that are secure, and that load quickly. (14)

Some future trends listed by Ted Smith are:

- As smart phones become more inexpensive, students will migrate to them rather than PDAs.
- Students studying for professions such as medicine and law where PDAs are heavily used will be more likely to purchase PDAs.
- Tablet PCs will probably never be widely adopted since most students will have access to a desktop or laptop computer at home. (5)

Geoff Stead in his 2006 article for BECTA identifies the following technology trends:

- The power of CPUs, memory, and batteries are increasing and the physical size of mobile devices is decreasing.
- The costs of core ingredients such as screens, batteries, and memory are going down.
- Operating systems, file formats, and media used for transferring files are standardizing.
- Mobile devices are getting better at communicating with each other. (2)

Jeremy Roschelle in an article in the Journal of Computer Assisted Learning in 2003, discusses these issues regarding wireless mobile devices:

- More research needs to be done to help us understand the lack of surface resemblance between enabling technology and desirable social practices of learning.
 - We need to more clearly identify the roles of technology-based communication and non-technology-based interpersonal communication, and how they are bound together in excellent teaching and learning.

- We should adopt a critical attitude about whether it is plausible to develop a ubiquitous mobile, personal teacher and learning platform that will run all the best pedagogical applications. (9)

Agnes Kukulska-Hulme of the Open University in the UK says that in 2004 the mobile learning research community was reflecting on these issues:

- Collaboration and community
- Content for mobile learning
- Technical innovation
- Reaching new kinds of learners
- Understanding the field of mobile learning. Under this point she mentions ethical and moral issues and the use of scenarios. (15)

Carol Savill-Smith and Phillip Kent in their review of the literature on the use of palmtop computers in learning, say the following topics should be taken into account in research and design activities:

- Information literacy
- The design of both collaborative and independent learning activities
- The use of palmtop computers for activities outside the traditional classroom
- Reflective logs and blogging
- Guidelines for the design of interfaces and the presentation of material on handheld devices (10)

Chris Dede, a professor in the Harvard Graduate School of Education, discusses these future trends in an article he published on “neomillennial” learning styles propagated by wireless handheld devices:

- How can we measure how technology reorganizes cognitive activity, in other words “learning to be” as opposed to “learning about”?
- We need to identify learning measures that are aligned with and sensitive to the types of learning that may occur when students work with computers.
- We need to develop performance-based assessments to measure students’ learning with these new technologies.
- Research needs to be done on how to best blend real world and virtual experiences. (16)

3 Smartphones in Education

3.1 Introduction to Smartphones

As I stated earlier in this article, it is becoming more and more difficult to distinguish between PDAs and smart phones because they are very similar. This section of this report will be much briefer than the section on PDAs because of the similarities and because the two devices share the same advantages and disadvantages for mobile learning, and they are used much the same ways in mobile education.

3.1.1 Smartphone Defined

Bitpipe defines a smart phone as, “A wireless telephone set with special computer-enabled features not previously associated with telephones, such as wireless e-mail, Internet access, web browsing, and faxing capability.” (17). Wikipedia offers this definition: “Smartphones are voice-centric devices that offer PDA-like capabilities, ... are generally capable of one-handed operation.” (Wikipedia article on smartphones)

3.1.2 Features of a Typical Smartphone

The Wikipedia article on smartphones lists several features most of them have, including:

- Internet access
- E-mail access
- Scheduling software
- Built-in camera
- Contact management
- Accelerometers
- Some navigation software
- Occasionally they have the ability to read business documents in formats such as PDF and Microsoft Office (3)

3.1.2.1 Smartphone operating systems



The most common operating systems for smartphones are:

- Symbian 73%
- Linux 17%
- RIM Blackberry 2.8%
- Windows Mobile 5.5%
- Mac OS X (iPhone)
- Palm OS 2% (3)

3.1.2.2 Some popular smartphones

Some of the most popular smartphones are:

- iPhone
- Sony Ericsson w701i
- Nokia 5500 Smartphone
- BlackBerry Pearl
- BlackBerry 8700c
- Sony Ericsson P910
- Motorola Q

Figure 10: Some Popular Smartphones



3.1.3 History of the Smartphone

In 1992 IBM showed a smartphone called Simon at COMDEX in Las Vegas. This was the first smartphone. IBM started marketing it in 1993. In addition to a phone, it had a calendar, address book, world clock, calculator, note pad, e-mail, and games. It featured a touch-screen instead of buttons for dialing, and came with a stylus. The Nokia 9000 was released in 1996. In 2002 Microsoft renamed its mobile phone OS to “Microsoft Windows Powered Smartphone 2002.” (18)

3.1.4 Reasons smartphones are popular in education

As Ted Smith writes in his article, most students already have mobile phones and if and when they upgrade their systems, they

will probably buy more expensive phones instead of the more expensive and battery-hungry PDAs. He also says most students will probably not buy both a smartphone and a PDA. (5)

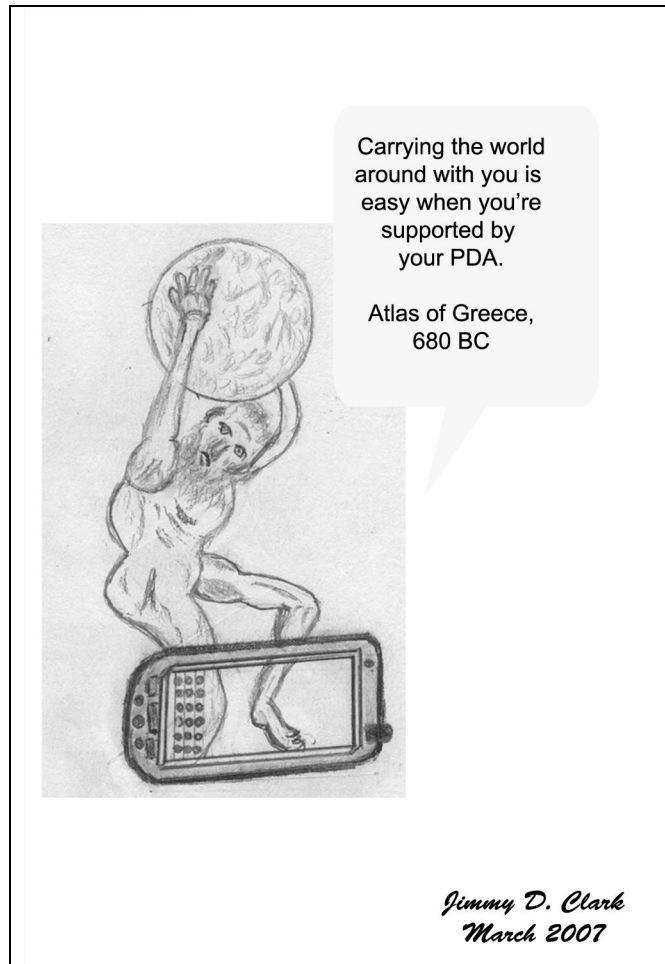
3.2 Future Trends in Smartphones

Ted Smith points out that Microsoft will probably provide more support for Office applications on smartphones in the future. He says it seems likely that Symbian will also provide similar capabilities if the market requires it. (5) In the opinion of this writer the smartphone will eventually become the predominant delivery device for mobile learning. It will probably feature all the features of a cell phone, plus the ability to view and store videos as well as listen to MP3s, a camera, a GPS device, plus calendars, organizers, etc., not available on PDAs and smartphones. Ten years from now smartphones will no doubt have features that do not exist today.

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See my website for podcasts of this workshop and my workshop on wikis: <http://www.austincc.edu/jdclark/podcasts.htm>. The ACC FTP server has been down, and I do not know if I will be able to upload these podcasts by the date of this workshop, so check back later if they are not on the website.

Theme music, "Foxicity," programmed and performed by Jimmy D. Clark, on Yamaha YPT 400. Recorded and mixed at FrodoDarwen Recording Studio, Marble Falls, Texas, March 25, 2007. Jimmy Clark's complete discography is available at website of **Starving Pug Records**: www.starvingpugrecords.com . Check website for tour dates.