Handheld Computers and Education

by

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Abstract
The following paper discusses the use and implementation of Personal Digital Assistants (PDA) or handheld computers into the educational setting. The paper discusses how PDAs might be the solution to the one-to-one computer to student ratio that educators have been looking for. It explains how PDAs can be used in the classroom, as well as ways they can enhance the educational setting.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>ii</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>PDA's a Solution to the One-To-One Computing Problem</td>
<td>2</td>
</tr>
<tr>
<td>PDAs in the Classroom</td>
<td>4</td>
</tr>
<tr>
<td>PDAs in the Hands of Educators</td>
<td>9</td>
</tr>
<tr>
<td>Conclusion</td>
<td>12</td>
</tr>
</tbody>
</table>
Handheld Computers and Education

Introduction

It's another day of school for Amanda as she unpacks her bag and takes her seat at her desk. She takes out her portable keyboard and connects her Palm M130 to it. As she turns on her Palm, she is greeted with today's schedule. She sees that she has P.E. in 45 minutes, and that if she doesn't finish her math work today in class, it will be assigned as homework. She then clicks on an icon and starts working on today's writing assignment. Her teacher, Mr. Smith, comes over to check her progress on her assignment. Using his Palm M515 he grades her progress. Later he will beam the grade to his laptop where it will enter directly into his grade book program.

This scenario and many others are possible because of the use of handheld computers such as Palm's PalmPilot, Handspring's Visor, Sony's Clie, and many others. Handheld computers or Personal Digital Assistants (PDAs) are becoming increasingly familiar to educators and students. "Handheld computing once associated with only the most gadget-prone teachers and business people, are cropping up in classrooms all over the country." (Trotter, 2001) Just where does this new technology fit into the education environment, and how do we take what we've learned about integrating other technological advances to help us successfully integrate PDAs in classrooms around the nation? "PDAs are the next wave of technology with 21 million handhelds predicted being sold in 2003." (Pownell & Bailey, 2000) With this new technology expanding so fast, education needs to move quickly to teach students the skills they are going to need in the business world.
This paper will discuss the use of PDAs in education. It will begin by looking at the one-to-one computer to student ratio and the solution PDAs offer. Next, it will discuss the different roles PDAs can play in the classroom and in schools.

PDA's a Solution to the One-To-One Computing Problem

Many teachers will tell you that the perfect student to computer ratio would be one to one. At the same time almost every school technology coordinator will tell you that this is impossible to accomplish given the price of computers.

"Due to lower costs, increased functionality, and the availability of new software designed specifically for education. K-12 schools are beginning to take a serious look at handheld computing for teaching and learning, administrative tasks, and communication and collaboration. In fact, the potential for using handhelds in education is almost limitless." (Byron & Bingham, 2002)

PDAs might be the answer for schools that are looking for increased student-computer ratios at a more economical cost. "Devices are relatively cheap, with popular models priced between $250 and $550, depending on their memory and screen capabilities." (Trotter, 2001) PDA's are increasing in functionality, not only will they perform the three basic functions of word processing, spreadsheets, and database, but they keep an address book, a calendar, can be used as a graphing calculator, and a thermometer. The high end PDAs can also take pictures, shoot movies, connect to the internet, send and receive e-mail, and send faxes. (Pownell & Bailey, 2000) The most useful feature that is included on all PDAs in the use of wireless communication through an infrared port (IR). This port can be used to beam documents, programs and information to other PDAs. All of the previously mentioned have a place in the classroom and in the learning environments.
Pownell and Bailey (2000) list four characteristics of PDAs that set them apart from desktop computers. These are: portability, accessibility, mobility, and adaptability. A discussion of each follows:

*Portability* refers to the size of PDAs. They are small enough to fit in a shirt pocket or a purse and can be taken anywhere with little limitation.

*Accessibility* refers to the ability to access information any time. Users are able to access information instantly any time they need it. No longer do they need to wait to find a computer at school or home to access the information they need.

*Mobility* refers to the greater movement that PDAs offer. Users are no longer tethered to one place or need cords to transfer and access information due to IR transmitting capabilities.

*Adaptability* refers to the ability of the user to change his or her behavior because of the technology. PDAs will change the way people access information. PDAs are not just an extension of the Internet and the user's desktop computer, but are an extension of the person themselves.

These four characteristics along with their economic cost not only make PDAs a solution to the one-to-one computing problem, but allow educators a whole new way to integrate technology in the classroom.
So how can these devices impact learning, and what can an educator do with them in the classroom?

"Many high school students already own a graphing calculator that costs about the same amount as many of these handheld devices. So why provide a student a handheld computer? In addition to being a graphing calculator, a handheld computer can serve as a time-management tool, a graphic organizer, a word processor, a web browser, an e-mail device, and much more." (Byrom & Bingham, 2002)

Pownell and Bailey (2002) give six uses of PDAs in the classroom setting. These are: Teaming and Collaborating, Communicating, Learning and Self-Improvement, Gathering and Analyzing, Reference Information, and Organizing and Planning. Each one will be discussed and a scenario will be given on how a student might use their PDA in a school setting.

Teaming and Collaborating

Teaming and Collaborating refer to the use of PDAs to communicate within a team setting, and collaborate and share information between team members. "Unique technical characteristics such as infrared beaming offer opportunities for real-time student collaboration." (Shields & Poftak, 2002) Students can make a plan for a project with due dates listed along with each team members responsibilities. The sharing of information becomes easy as team members beam information back and forth using the IR port on their palm.

Scenario for Teaming and Collaborating

Jessica and Mark are working on a project together. Their teacher has beamed them all of the necessary components that must be completed along with due dates and scoring rubrics.
Jessica and Mark sit and talk about who is going to research and who is going to start an outline for their PowerPoint project.

The next day Jessica and Mark meet again and exchange information. Mark beams Jessica the research he found and she beams him an outline of their PowerPoint presentation. They then discuss and create a To Do List on their PDA of everything that needs to be completed by the time they meet tomorrow.

*Communicating*

Communicating is the exchange of information. Students can share important information with each other as well as their teacher. This can be done through e-mail, faxing, or beaming information from one PDA to another.

*Scenario for Communicating*

Sami was excited after leaving school today. They had just started a new unit on endangered animals in Africa and Sami was interested in learning more about them. She goes home and logs onto the internet to start looking for more information on the endangered animals. She finds an excellent web page that talks about all the endangered animals of Africa and what people can do to help them. She decides she wants to share the information with her class, so she hot syncs the web page to her PDA to take to school the next day.

The next day Sami tells her teacher she has some information on endangered animals in Africa to share with the class. Sami beams the information to her teachers PDA and then starts beaming the information to her classmates. The students take a minute to read the information and then the teacher holds a discussion on the information they have just received.
Learning and Self Improvement

Learning and self improvement is what teaching is all about. PDAs allow students to access information any time anywhere, allowing the learning process to continue outside the walls of school.

Scenario for Learning and Self Improvement

Today in his fourth period class Geetak was introduced to an exchange student from Germany. He has always been interested in Germany and sees this as an opportunity to make friends with the new student as well as further his own knowledge of Germany. When Geetak gets home, he logs onto the Internet and finds a German to English and English to German dictionary that can be downloaded to his PDA. He downloads the program and takes it to school the next day. He shares the program with the new exchange student and they start a conversation on a couple of basic German words.

Gathering and Analyzing

Gathering and Analyzing refers to the collecting and/or manipulating of information to answer questions or make decisions. Students can use form programs, databases, calculators and other software to gather and analyze data. All of these functions and others similar to them can be used on PDAs.
**Scenario for Gathering and Analyzing**

Farheen is excited today. Her math class has been studying angles and geometric figures in class. Today her class is headed to a vacant lot where they will have to gather information and then design a business and building to be built on the lot. When Farheen finally gets to the site she starts gathering information such as road names, length and width of the lot, and location from other businesses. As she starts to format a plan she jots down notes and talks to other class members about what information they are gathering. When they return to the school, the teacher beams the students pictures of the vacant lot so that they can view the lot as they work. Farheen starts to analyze the data she has gathered and creates a plan for her business building.

**Reference Information**

Reference Information is a knowledge base that students can draw from. References for students can come in many different forms. They might have a list of math terms and definitions, or maybe research writing references for their high school classes. There are many ways in which schools can use PDAs to make sure students have the information they need to be held accountable for their learning.

**Scenario for Reference Information**

It is the first day of school and Maria has just been handed her PDA for the year. The teacher instructs the students on how to turn on their PDA and then goes through useful information for the students. First, Maria notices a document called "Students Rights and Responsibilities" here the teacher explains are the expectations of our school and the rights that students have. Next the teacher instructs them to click on the school calendar icon. Here Maria
sees a calendar of the school year complete with final exam schedules and holiday breaks. She also notices the hours of operation for the school, and a schedule of all school sports events. The teacher instructs her to click on the "Writing Scoring Rubric". Then the teacher explains to her that this is the Six-Traits writing rubric that has been adopted by the school and will be used in all classes to grade written assignments. As Maria explores the rest of her PDA she realizes that all of this information is just a click away any time or any place she might need it.

**Organizing and Planning**

Organizing and Planning refers to managing time, keeping track of contacts, and targeting tasks to be done. All of these applications are standard with most PDAs on the market today. These applications also allow students to set alarms and reminders for assignments or appointment they might have.

**Scenario for Organizing and Planning**

As Trevor sits at his desk, his PDA alarm goes off telling him it's time to go to Mr. Bell's room where he works one on one with the teacher to improve math problems solving skills. When he arrives at Mr. Bell's room he beams last nights assignment to Mr. Bell and Mr. Bell beams him tonight's scavenger hunt for numbers in his house. While he is working with Mr. Bell his PDA alarm sounds again telling him it is time for him to take his medication. He walks to the office and gets his medication from the nurse. She checks his PDA to see that the next alarm is scheduled correctly, and then he returns to class. At the end of the day as Trevor is packing to go home the alarm sounds once again, it is a reminder from his mother that he is going to
Handhelds and Education

Grandma's house today after school. Trevor finishes packing his backpack and heads to Grandma's house.

All of the previously mentioned scenarios can be easily accomplished with PDAs today. As the software for PDAs as well as their memory size increases, the way in which PDAs can be used will change and enhance the lives of students even more. Pownell and Bailey's six uses of PDAs is just a starting point of the influence PDAs can have on education. They are good examples of the role PDAs can play to promote learning in the classroom as well as outside the classroom.

PDAs in the Hands of Educators

Many of the aforementioned scenarios not only include the use of PDAs by students, but by educators as well. The best way to get students involved and excited about using technology is for educators to get excited about the opportunities PDAs offer. All six of Pownell and Bailey's functions for PDAs can apply to educators as well as students. Of course their uses will be somewhat different then those of students, but PDAs in the hands of educators are just as powerful.

When technology is first introduced in the classroom and to educators it brings about change. Change in teaching style, in classroom environment, as well as change in student behavior and learning management. "Teachers (did not) completely anticipate the range of student misbehavior, changes in the physical environment, shifts in teachers' roles, and technical problems that would accompany new technology." (Sandholtz, Ringstaff & Dwyer, 1997, pg.
56) Through the Apple Classrooms Of Tomorrow project (ACOT) started in 1985, Sandholtz, Ringstaff and Dwyer developed the "Stages of Concern". These stages refer to the stages of growth educators go through when introduced to new technology in their classroom and the frustrations and successes that come with it. The three stages are: Entry, Adoption, and Adaptation. A brief discussion follows:

Entry

"During the entry stage, project teachers frequently found themselves unable to anticipate problems in their technology-rich classrooms." (Sandholtz et. al. 1997, pg. 56) Problems such as misbehaved students, attitudes, the physical environment, technical problems and software, were the most common problems teachers ran into when the technology was first introduced.

These same problems will occur when PDAs are introduced into the classroom. Students will misbehave by downloading illegal or pirated software or misuse the hardware itself. Students' attitudes will change as they figure out that they can beam anything to anyone willing to except it. This also becomes a hardware issue as viruses are created and beamed to other users. (Trotter, 2001) The physical environment of the room will have to be revisited to make for a more functional room to operate PDAs in successfully. Technical problems and software are always an issue when any new technology is integrated. Overall, the entry stage is a stage of frustration on the part of the teacher, but it is also part of the learning process as educators learn what works and what doesn't work as the new PDA technology is integrated.
Adoption

"In the adoption stage, teachers began not only to anticipate problems but also to develop strategies for solving them." (Sandholtz et. al. 1997, pg. 62) As teachers become comfortable with the technology they will begin to anticipate and problem solve problems that arise in the learning environment. Just as a first year teacher learns to anticipate problems in the lunch line or while getting supplies from the supply desk, teachers too will learn to develop strategies to solve problems they are faced with when dealing with new technology.

Adaptation

"In the adaptation stage, teachers used the technology to their advantage in managing the classroom." (Sandholtz el. at. 1997, pg. 67) As the teachers feel more comfortable with the technology they learn to use it in every day instruction and management of the learning environment. With a PDA the possibilities are endless. Educators can use them for everything from grading assignments to taking role. From setting alarms for special classes such as PE and Music, or reminding them to do their lesson plans for the next week. During the adaptation stage educators start utilizing the technology in a way that influences student learning and lives.
Conclusion

In conclusion, the use of Personal Digital Assistants in the educational setting can be a reality. They hold many educational uses and allow for many opportunities that are not available with desktop computers. Their size and price alone make them a factor for consideration. Their impact on educators can already be seen, as programs are available for giving and grading assignments, checking homework, keeping a planner, and expanding educational opportunities for educators and students alike.
References


