PDAs in Teacher Education: A Case Study Examining Mobile Technology Integration


Abstract (Summary)
The independent research institute, SRI International at Stanford University, recently released the final results of a two year study, which was the "first objective, large-scale study of the use of handheld computers" (SRI International, 2002, ¶1) involving 102 elementary and secondary classrooms in which teachers had received Palm Education Pioneer (PEP) technology grants.

Full Text (6770 words)

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[Headnote]
The classroom computer is no longer confined to a box on the desk. Mobile handheld computing devices have evolved into powerful and affordable learning tools. Handheld technologies are changing the way people access and work with information. The use of Personal Digital Assistants (PDAs or handhelds) has been an evolving part of the business world for more than 15 years and the implementation of these devices in higher education has often followed that business model. This article will provide research findings from a case study concerning the use of PDAs to support the integration of technology into a Teacher Education program at a midwestern university’s College of Education.

The classroom computer is no longer confined to a box on the desk. Mobile handheld computing devices have evolved into powerful and affordable learning tools. These devices are becoming smaller, cheaper, more reliable, and more connected. Educators and students need to begin to identify the advantages of these emerging technologies for enhancing lifelong learning. The small size and versatility of personal digital assistants (PDA) such as the Palm® (see trademark notice at the end of the article), HP iPAQ® and others beg the question: Can this small device provide the pedagogical and technological support in the classroom for research and teaching in similar ways as the desktop computers in higher education? Although the handheld has found increasing use in K-12 settings and undergraduate nursing, medical, and law schools across the country, limited application into the humanities, social sciences, and education has been made in higher education (PalmOne Education Solutions, n.d.a, Jl).

Handheld computers were first introduced as the electronic version of the daily planner. The first handholds arrived with schedule, address, and task list software. Today the handheld is seen as a "universal-access devices, able to ferret out essential information wherever it happens to be stored-on the desktop PC, the home-office server or the Internet" (Frauenfelder, 1999, Jl ). Many companies are examining ways in which handheld computers can be used with the Internet and are "repackaging" software to maximize the smaller screens and memory. Other developers are concentrating on making these small devices exchange information between desktop computers, servers, and other handholds. Telecommunication companies are creating wireless digital networks and integration with cell phones and handhelds to provide greater mobility and increased communications between the office, home, and field (Frauenfelder).

While at first the handheld was used mostly by upper management and mathematicians for number crunching, the handheld of today is carried by business people, housewives, and school children. Handhelds have become less expensive than some scientific calculators with a greater capacity to compute, store, and retrieve information. The use of the handheld has also changed, as the handheld can now successfully navigate the three major functions of word processing, spreadsheets, and databases, which are standard applications of desktop computers in the home and school. Development continues to produce more powerful software for the integration of graphics and video with the newest stage of handheld development supporting access to e-mail and the Internet to make communication universal. Handheld technology provides a way to extend the use of desktop computers to field
environments in which a smaller, mobile technology can be used to collect data and content to be returned and further expanded through the desktop computer.

To date, much of the research surrounding handhelds comes to us from K-12 settings. The independent research institute, SRI International at Stanford University, recently released the final results of a two year study, which was the "first objective, large-scale study of the use of handheld computers" (SRI International, 2002, ¶1) involving 102 elementary and secondary classrooms in which teachers had received Palm Education Pioneer (PEP) technology grants. Schools which participated in PEP were selected through a rigorous competitive grant process in which teachers proposed how they would implement the use of the handheld during an entire school year. Teachers participating in PEP grants implemented handheld technology during the 2001-2002 school years (SRI International).

Dr. Barbara Means, director of SRI's Center for Technology in Learning states, "Schools that have adopted handhelds to date have done so without the benefit of research to guide them. Now, through the results of the PEP program study, teachers and schools can make informed decisions about adopting and implementing handhelds. Twenty-five (25) years of research on desktop computers has shown that, when used appropriately, technology can have a beneficial impact on teaching and learning" (Vahey & Crawford, 2002).

Findings from the SRI International PEP Final Evaluation Report indicate that teachers and students participating had a high acceptance of handhelds in the classroom. The teachers were enthusiastic about the support to teaching and learning handhelds had to offer. SRI reported the following key findings:

* 89% said of the teachers found the handhelds to be an effective instructional tool for teachers;
* 93% of the teachers believe that handhelds can have a positive impact on students' learning;
* 95% of the teachers said their students were "very" (66%) or "fairly" (29%) comfortable using the handhelds;
* 90% of the teachers plan to continue using handhelds in the classroom post-study; and
* 72% of the teachers said handhelds are more easily used in the "flow of classroom activity" than desktop computers (Vahey & Crawford, 2002).

The Palm Education Pioneers Program Final Report (2002) stated that:

PEP teachers were overwhelmingly positive about the use of handheld computers in their classrooms. Approximately 90% of PEP teachers stated that handhelds are an effective instructional tool; that handhelds have the potential to have a positive impact on students' learning; and that they will continue to use handhelds in the future. Although teachers across all grade levels were positive about the use of handheld computers in their classroom, elementary school teachers were more positive than middle and high school teachers. Teachers who used handhelds for science-based curricula or for writing-based activities found handhelds most effective, although handhelds were found to improve learning activities across many curricular topics and instructional activities, (p. 6)

The use of handhelds in higher education has been demonstrated most often in the areas of nursing, medicine, and law. Columbia University's School of Nursing is using handhelds to reduce the risk of medical errors and to help advance evidence-based medical care. Columbia University provided to its Entry-to-Practice students a handheld to use when interacting with patients. The handheld are being used to allow students to capture data during care of the patient. There are no notes to transcribe or handwriting to interpret and the handheld provides a common language for data collection allowing the data to be aggregated for decision-making (PalmOne Education Solutions, n.d.a, ¶1).

Columbia faculty are working with the Columbia Center for New Media Teaching and Learning to develop a program based on the Home Health Care Classification (HHCC), which provided a consistent classification and reference for nursing. Supervision of nursing students can also be supported during this process. By creating such a database, the students can provide the safest, most evidence-based care as well as document their nursing assessments, interventions, and outcomes.

Dr. John Kues, Assistant Dean for Continuing Medical Education and professor of Family Medicine at the University of Cincinnati, suggests that the body of knowledge in modern medicine is constantly changing and that the ability to memorize the endless drug interactions is nearly impossible. He believes that the usefulness of PDAs is as a portable knowledge repository. Resident physicians (new doctors continuing in specialty training) need current information to make decisions. The large repository of medical information that can be stored on a Palm provides a foundation for decision-making by new doctors with limited clinical experience, knowledge, and background. When the resident leaves the hospital at the end of his/her shift, it is easy to sync the information about a patient case and

Students are using their handhelds to receive e-mail, download web clips, schedule appointments and organize their time. As I am seeing a patient, I can be looking up what I need to let them know to do... My Palm's much lighter than carrying four different books around" (Campus Technology from the Syllabus Media Group, 2004, p. 9).

Faculties are also finding that the flexibility of a PDA in handling papers to be distributed to students, a major benefit. The PDA can be used to carry course syllabi, class notes, and schedules of exams, assignment due dates, and clinical expectations; areas in which students often have trouble keeping track of obligations and papers. With the variety of formats in which documents can be exchanged among PDAs, a solution that works in a variety of environments is usually easy to obtain. Adobe Acrobat files are readily converted to use on the PDAs. Software such as Documents to Go allows the common Microsoft products of Word, Excel, and PowerPoint, to be shared to the Palm. Many applications are now available by download from the Web and more appear to be on the horizon. Software such as 4.0 Student allows students to track assignments and due dates, and can integrate course information which can be beamed to students for use by the instructor. Students are then able to track their performance in individual courses or GPA by entering their graded coursework scores. This allows the student to project their possible GPA in the event a certain score is obtained on an exam (Peterson, 2002).

Clinical supervision is an area in which teacher education has a major responsibility. The National Council for Accreditation of Teacher Education (NCATE) 2000 Standards have made documentation of clinical supervision a major concern for institutes of higher education seeking accreditation. The standard states that "candidates observe and be observed by others, engage in group discussion and reflection on practice with faculty and other candidates..." (Crippen & Brooks, 2000, p. 207).

Often the university supervisor and student teacher candidate miss important moments for reflection and documentation of classroom practice due to handwritten notes, length of time between transcription of notes and observation, and the length of time needed to transcribe and then share and discuss the observations. With a handheld, a university supervisor is able to more quickly document observed lessons and provide an electronic transcript to the candidate for discussion with the student teacher immediately. The transcript can then be easily downloaded to a desktop computer to email to the student teacher for reflection (Crippen & Brooks, 2000). When the student has a handheld as well, the observation can be "beamed" to the student on site. The convenience of the handheld encourages faculty to record information about students, create lesson plans, and conduct onsite student assessment in a more timely manner (Samis, 1994).

The University of South Dakota (USD) has added a new requirement for first-year students: Palm handheld computers. All first-year undergraduates as well as first-year law and medical students are required to use Palm handhelds. USD believes that the Palm will provide a learning environment designed for the mobile society in which our students now live and extend the learning beyond the classroom. USD provides applications such as financial calculators, reference books, literature, organizers, word processors, and much to the student by way of the Palm. Students are using their handhelds to receive e-mail, download web clips, schedule appointments and organize their days (PalmOne Education Solutions, n.d.a. ¶I).

So what is to become of this emerging technology? As software is created and handhelds become cheaper, faster, and as connected as laptops and desktops, it may be that handhelds will once and for all allow every student in the classroom to have access to the information that has in the past been controlled by the number of personal computers found in the classroom and to provide the needed mobility of the classroom without boundaries.

THE STUDY

The use of handhelds to support the pedagogical aspects of the teaching and learning of technology integration in teacher education classroom is an intriguing idea. This research examines the use of PDAs in two different settings within a midwestern College of Education to determine if the PDA can support technology integration and transfer of technology skills as well as the pedagogical instruction in Teacher Education courses. The two research settings included preservice teachers in an EDEC 340-Science for Young Children taught by a College of Education Science faculty member and preservice teachers in EDCI 203-Technology Applications in Education taught by an Instructional Technology faculty member. (In this text, preservice teachers are students who are enrolled in the College of Education and have not earned a degree in Education or licensure to teach in public schools.)

The 20 students (3 male and 17 female) enrolled in Science for Young Children were Early Childhood Education majors who plan to teach PreK to 3rd grade in U.S. public schools. The 21 (2 male and 19 female) students enrolled in Technology Applications in Education were various majors from across the College of Education...
including early childhood, secondary math, science, and art, and middle childhood education. Permission to use lesson plans produced, documentation, video, and pictures was secured from each participant in the study. Funding was sought through the Institute for Schools of the Future to purchase 50 Palm® m130 handhelds to be used in these two settings. At the time of the research, the decision to use the Palm rather than other available handhelds was formed around two concerns: (a) the cost to purchase Palms for the students was almost half the price of the Pocket PC, HP iPAQ, and other devices that were examined as possible handhelds for the project and therefore allowed us more devices for the students and (b) the software available for the Palm could be identified to match the educational needs of the students more readily than the software available for the other PDA devices.

It was decided that the Palms would be loaned to the students for the quarter (11 weeks) in which the courses occurred and then returned to the faculty teaching the courses at the end of the quarter. The students were given all installation software, cradles and instruction booklets that would typically come with the Palm when purchased. A keyboard and carrying case was also provided to each student participant. One class period (two hours) was used to help the students become familiar with basic operations of the Palm with the majority of the time spent on learning to sync the Palm with the desktop computer and explanations for downloading software from the Internet to the Palm. The researchers were somewhat surprised at how easily the students learned the different functions of the Palm. Students quickly moved through the default software found on the Palm. After that two hour period, problems concerning the device were dealt with on an individual basis. The researchers hoped that the Palm would be inviting enough and useful enough that students would come to class talking about their experiences using it, which did occur over the 11 weeks of the research.

Students were instructed to go home, "play with the Palm and explore how they might use it personally." In both classes, students were expected to learn how to download additional software from the Internet, beam information to one another, develop lesson plans for using the Palm in their discipline, teach someone else how to use a particular feature of the Palm and to determine ways in which the Palm could be used in school settings both at the higher education level and at the K-12 level. These tasks were modeled by the faculty during coursework in each class throughout the 11 weeks although they were not specifically taught in the course. Students were free to e-mail the faculty for help and to ask questions about their Palm, however, only 11 e-mails asking for help were received by the faculty. These e-mails focused on syncing and downloading software to the Palm. Students were soon able to identify classmates that they could ask for help when needed.

Software, which comes standard on the Palm was used as well as Imagimath and Imagiprobe software. The Imagimath and Imagiprobe can be used in an elementary math and science classroom and were added when the Palm arrived. The expectation was that the software would be modeled in the science education and technology methods courses for preservice teachers and then these students would teach a handheld enhanced lesson in K-12 classrooms using the Palms and probeware.

Data collection included weekly journals of the "trials, tribulations, and joys" of using the Palm in their daily lives as well as classroom applications, e-mails concerning technical or pedagogical questions about the Palm, a pre and post survey of technology skills, classroom observation and application, and personal interviews with students at the end of the quarter. Data collection was ongoing over the 11 weeks of the course. Often questions raised in one week of journals prompted questions asked in the next week of journal entries.

In examining how students create and use information in the classrooms to be studied, an examination of the syllabi of the two courses was made as well as review of the projects and presentations to be completed. While the EDEC 340-Science for Young Children course was a science methods education course and the EDCI 203-Technology Applications in Education was a technology methods course, both had as a common theme concerning the integration of technology into the teaching and learning of preservice teachers. To determine the criteria for evaluating the use of handhelds in the two courses, the Six Leadership Functions of the Pownell-Bailey Model of Handheld Computing Literacy was selected (Pownell & Bailey, 2000). It was determined that this set of six criteria represented the pedagogical classroom themes each faculty member hoped to see occurring in their classroom. Additionally, the instructional technology faculty member hoped that these six criteria would help determine if the Palm added value to the curriculum due to its portability and versatility. The following six research questions were established using the Pownell-Bailey Model of Computing Literacy (2000). A seventh question was added to determine the extent to which technology skills learned by using the Palm were transferred between the desktop and handheld and into the development of handheld enriched lessons for the PreK-12 classroom.

1. Organizing and planning: Can the Palm help students better organize and plan their schoolwork and time?

2. Reference information: What sites do the students download to the Palm and what is the application of the site to their education?

3. Gathering and analyzing: What tools and other software do students' use with the Palm to gather and analyze information for school work?
4. Learning and self-improvement: Does the Palm provide opportunities to students for self-improvement and continued learning outside the classroom?

5. Communicating: What types of communications do students use...social versus educational communication?

6. Teaming and collaborating: Does the use of the Palm promote teamwork and collaboration?

7. Technology integration and transfer: Are skills from the Palm transferable to the desktop and vice versa. Are students able to develop lesson plans and implement the use of Palms in PreK-12 classrooms?

The frequency in which these themes occurred was used in evaluating classroom observations, personal interviews, and journal entries. A survey was also used to determine the technology skill levels in the two courses and whether students had previously used a Palm. The survey consisted of 20 questions concerning skill ability of the use of technology and five questions were added that asked about Palm skills. The survey had been secured from the U.S. Department of Education, Information Technology web site in 2000 and had been used as a pre/post survey in the EDCT 203-Technology Applications in Education in the past to provide faculty with information about student technology skills. The sections of the survey contained questions within the categories of hardware use (which included questions concerning saving, and file organization), productivity (which included questions on the use of word processing, spreadsheets, database, and presentation software), communication (which included e-mail, listservs, and attachments, searching the web and using web sites), and the added questions concerning the Palm. The survey questions ask students to self report their ability to work with hardware and software that related to these categories noted. The students had a four point scale to select from with 1=no experience; 2=novice; 3=intermediate; and 4=expert. The results of the pre/post survey given at the beginning of the 11 weeks indicated the following for each course (Table 1).

FINDINGS

In examining the journals and class discussion, it became apparent that there were two distinct sides to the use of the Palms in the two courses. Some students were very excited about using the Palms and others did not want to use them at all except for an occasional game of Solitaire. The number of students excited (EDEC 340=16; EDCI 203=19) or not excited about the Palm technology (EDEC 340=4; EDCI 203=3) in each course was similar. The more enthusiastic students arrived at each class period with unsolicited stories about using their Palm for various tasks in the personal and school life while those less enthusiastic arrived with talk of being too busy to use the Palm. The less enthusiastic students often cited technical difficulties or belief statements about lack of need for technology in younger grades as reasons for their lack of enthusiasm. A faculty member in another course even commented that he had seen students as he walked on campus using their Palms to take notes and write while they sat on the College Green during the warm fall weather.

In examining the research questions presented in the Six Leadership Functions of the Pownell-Bailey Model of Handheld Computing Literacy (Pownell & Bailey, 2000), a discussion of each of the six functions follow. Table 3 at the end of the article contains a summary of these findings as well.

To answer the pedagogical questions concerning a student's use of the Palm in organizing and planning their school work, 38 of the 41 students who participated indicated they had used the Palm to better organize and plan their schoolwork and time. Their journals and conversations indicated that using the "To Do List" and "Datebook" were their favorite features of the Palm. Many comments were similar to the ones below:

This past week I entered all of my classes and due dates for projects and assignments. It is really nice to be able to put all of this information in such a small device because I can put it in my purse and take it everywhere. I take the Palm to class and if I need to turn in a specific assignment or meet my group on a certain day, I can just write in my Palm. I set the alarm to beep for reminders. It is cool the way the Palm turns on and lets you know that it is time to do something.

Another student proclaimed,

I have been using my Palm a lot lately. It is homecoming week and I have a lot of things going on with marching band and with the sorority I just pledged. There are so many different ways to store the information and I have used the to-do-list many times. This makes my life a lot less stressful.

A third student noted,

The Palm is useful when you need to remember to be somewhere for a lab or go to a meeting on campus. I have missed lots of meetings because I did not write down the time and date so I didn't remember and then found out later I was supposed to be at the meeting and missed some important things.
The next research question concerned the use of reference information by asking, what sites do the students download to the Palm and what is the application of the site to their education? Every student was able to download a variety of sites beyond those introduced in the short introductory lesson on using the Palm. The average for the group was 8.5 sites downloaded over the quarter. The most often downloaded pieces of software were The Teacher Organizer, ChemTable, Pico Map, and Sketchy. Several students used The Teacher Organizer software, which contained checklists and a simple grade book during their clinical work. Many of the students downloaded the software out of curiosity. The science methods students stated that downloading software such as ChemTable helped them in the preparation of some of their science lessons and in the delivery. In that regard, they had a quick reference to the elements in the Periodic Table, which they could look back on if need be during the delivery of the lesson.

The students found that the Documents to Go versions of Word, Excel, and PowerPoint to be sufficient to complete assignments in courses. Students were asked to design lesson plans completed in Microsoft Word to beam to one another and to the faculty instructor over the eleven weeks for peer review with a partner. Students conducted the review on the Palm or downloaded the document to their desktop then completed the review, uploaded to the Palm with the suggestions and beamed it back to their student partner. Students became quite proficient at using Word on the Palm and in moving it from one device to another.

One student indicated, "I have kept my grades on the Palm so that I can see where I am this quarter. I want to student teach next fall and need a certain grade point to move to professional standing. It is easy to use the spreadsheet to do the math and keep the list of grades."

Another student confessed,

I also played Scrabble on my Palm this weekend. This would be a great device to use on a road trip because it takes up so little space and you can just about put any kind of game on it!...I have learned to sync with my home computer so that I can take notes in my classes using the Word on the Palm and then go home and put them on my computer to finish or study for the test.

Students noticed that the Pico map was similar to the software Inspiration that was taught in the technology course. Students began to include the concept map in their lesson plans as a type of organizer for where they needed to develop more content. Sketchy was found to be interesting to the art education majors and generally interesting to the students for drawing examples of data in the field.

The art education majors and several early childhood majors were most vocal in the weaknesses of the Palm. The art education majors were unable to locate sufficiently appropriate software for use in their major. Three early childhood majors indicated that philosophically they did not believe that technology should be used in the PreK to 3rd grade and that the Palm was too difficult for that age group to use. When confronted with the suggestion that the teacher might use the Palm as a means of assessing student work or tracking student tasks, these same students felt that it was too much effort when they could write it on paper or use stickers to present the same assessment. An art education major's comment concerning future use of technology included, "Technology and I do not get along. It just seems to break when I get near it. I really do not see how technology is going to help me with my work in the schools since most schools don't have computers in the art room or even available for the art teacher to use."

An Early Childhood Major's comment concerning her lack of enthusiasm for technology,

We have to be sure they know how to read and I do not see the Palm helping to teach the student to read because the screen is so very small. I know there is software out there for the Palm because we saw it in class that the teacher can use to keep track of students when they read but I do not think that teachers will really use it.

When queried about this comment, the same student replied, "I don't think kindergarten teachers have time to use the technology and they have been using a paper and pencil in the past to keep track so I think that is what I will do too."

This perspective has been voiced before in our university by early childhood majors who are not part of the College of Education but rather another college on campus. Typically, early childhood majors are not expected to integrate technology nor do the students typically see technology used in their early childhood courses until they come to the College of Education for their teaching licensure. The College of Education requires all students seeking licensure to teach to take a technology course and to integrate technology with their methods courses.

What tools and other software do the students' use with the Palm to gather and analyze information for course work provided the next framework for evaluation of the data. Table 2 indicates the software that was identified in the journals and classroom observations.
Other pieces of software were located on the Internet, but either the student had difficulty downloading the software or it proved not to be useful and was deleted from their Palm. It was interesting to note that when the student grew tired of the software, he/she would delete it from the Palm without hesitation. One student stated, "Why keep it [software] on the palm when I can just go out and get it from my computer [by syncing] if needed."

Examining self-improvement and continued learning is always difficult. However, over the course of the 11 weeks students described many opportunities in which they used the Palm to take notes in classes other than the research classroom site, work on papers while waiting for appointments, as an alarm, and finally to show elementary students how to gather data. From the journals and interviews, students liked the portability and the opportunity to work in a variety of places not just at their desktop computer at home. While several students indicated that they owned notebook computers, each stated that the Palm was much easier to carry around, weighed less, and didn't require so much space to use. Typical journal entries included,

I used my Palm as an alarm clock and I haven't been late to my 8:00 class this quarter. That is a first! I really do not want to give the Palm back. How much did this one cost? I am going to ask my parents for one for Christmas with this same setup.

Another student offered this comment,

I have carried the Palm everywhere. I use it as much as possible. I never really thought about using something like this in my own work or my future classroom. I hope I work in a school district that can afford this type of technology because I think it would be very helpful for students in the classroom. I really can't believe I had this chance to work with Palms in this class. It has been a real eye-opener for me.

A student in the Technology Applications in Education course provided,

I have used my palm extensively for my to-do list. I have found myself very busy this quarter and have used this to track all of the things I need to complete everyday. If I had the money to spend I would own one myself. I would definitely use this in my classroom. I found a great teacher organizer that helps the teacher keep a grade book. I used this with my field work and could walk around the class and check off students who had completed the different tasks I assigned on my Palm. I then connected to my computer...no need to retype in the information from paper like before!

Communicating information in various formats is an important skill for students entering the teaching profession. The Palm has offered many opportunities to converse and share information in the social and educational setting of the classroom. Students were eager to "beam" each other software and papers when working and critiquing each other's work. The researchers found that students would come to class with things to share with friends. The sharing of Palm information and beaming allowed some students the opportunity to risk meeting someone they did not know and form new friendships. It was observed that the activity of "beaming" information and the problem solving that often went with using the Palms created a wider circle of people each student knew in the class.

Does the use of the Palm promote teamwork and collaboration? The Palm offered conflicting results in the area of teamwork and collaboration. When assigned to teams to work on projects, students readily shared information with teammates and collaborated in finding information for the task at hand. Students would also share with friends software located on the Internet. What was interesting, was that when discussing the Palm, students spoke of the Palm as their "personal computer," "my palm," "it's mine and knows me," and did not readily share homework unless instructed to do so. In part this may be due to a fear of being accused of cheating, although SRI research (Vahey & Crawford, 2002) from K-12 indicates that this sharing of homework is one of the fears of teachers when using such devices. It was unique that students appeared to build a personal bond with the handheld that they did not typically demonstrate when using desktops in class.

Technology integration and transfer was observed in the journals, classroom dialogue, fieldwork, and classroom observations. Students negotiated the movement of documents from the computer desktop to the Palm and back to the computer desktop. It was expected that downloading the software to the computer desktop from the Internet and then uploading to the Palm would cause a great deal of anxiety. Once students learned how to unzip the downloaded software and move the document to the Palm Desktop. This "student expert" then shared the process with the class and the need to help students with this activity was no longer necessary. Five students stated at the end of the 11 weeks that uploading and downloading was the most difficult part of using the Palm. Only 11 e-mails concerning technical problems were received in the 11 weeks. Most technical problems were solved by asking friends for help before and after the class ended each week or through e-mails to their classmates. Every student in the EDCI 203-Technology Applications in Education and EDEC 340-Science for Young Children created an age appropriate and standards-based content appropriate lesson involving the use of handhelds. In addition, some students took the handhelds to their clinical elementary classroom and implemented the lesson.
Many students noted the following in their journals, "I found the Palm version wouldn't do everything I wanted to do in Word but then I realized I could just type the text on my Palm and then format later on my desktop. This really saved time."

In examining only the Palm information from the survey, it was noted that 100% of the students were able to use the Palm to send and receive information, create a to-do list, download software from the Internet for use on the Palm, maintain a date book and use Documents to Go to transfer information from the desktop to Palm and vice versa. The area in which the students had trouble was with syncing with the desktop computer and the keyboard.

CONCLUSION

Handheld devices are becoming pervasive in our society. As handhelds gain connectivity to a wider variety of devices and improve their storage capacity, handheld use will increase because of their mobility and flexibility. The results from this study suggest that handhelds are useful in a wide variety of pedagogical and technological applications in a teacher education setting.

The ability to continue to work on projects and assignments when away from a desktop computer, to take notes in class, and to maintain a schedule of life events were welcomed by our students. The mobility of the Palm was the most often noted feature when students discussed their use of this device. Faculties participating in the research were very impressed by the use of the Palm in a wide variety of activities including those supporting the pedagogy and technology integration. Evidence supporting the six research questions established using the Pownell-Bailey Model of Computing Literacy was readily apparent in each of the eleven weeks of the research (Table 3).

Students often noted the similarities and differences between the desktop computer and handheld and could easily identify the strengths and weaknesses of both devices. It was interesting to observe the changes in software usage over the 11 weeks. Students began by downloading any compatible Palm software that they found on the Web to their device. Within three weeks, the researchers observed that the students had become more selective about their software downloads and began to target those specific to their discipline or personal needs. The sharing of information concerning the Palm between students was very different than with the desktop computer. Students would arrive at class with questions for their friends, would e-mail the class for ideas on where software could be found or walked around the room to see what others were doing with their Palms. This behavior was seldom seen by the researchers in previous quarters of instruction.

Problems with the Palms did at times frustrate the students. The Palms can lose their ability to sync correctly with the desktop computer. Palms can arrive new in nonworking order (our orders had a 12% failure rate), and keyboard software did not install correctly each time. Sometimes the device did not fully charge if care was not taken to make sure the Palm was correctly seated on the cradle and therefore limited the time of use.

Software was limited but does continue to improve. As more handheld devices enter the market, the need for a larger variety of software will increase. In a discussion with the students concerning the inherent problems of using emerging technologies one student summed up the experience nicely, "These are great machines and they will get even better by the time I am in the classroom. I hope that I work at a school that embraces the new technologies available to help students learn...just like I have learned from this experience."

Classrooms without boundaries, in which anytime and anywhere learning is a reality, continues to be a hope of educators. It may be that these mobile devices are beginning to open the door a lifetime of learning as students become capable of moving from environment to environment with their "personal" learning devices.

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References
References (10)
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