# PDA IN THE CLASSROOM PROJECT

## Michelle Perry[1] and J. Michael Jacob[2]

[1] *Purdue University, West Lafayette, Indiana;  Email: shellpry@purdue.edu*
[2] *Purdue University, West Lafayette, Indiana;  Email: jacobm@purdue.edu*

## 1. INTRODUCTION

The PDA (personal digital assistant) in the Classroom project was created to explore the potential of placing the computational and communications power of the pocket pc PDA into the hands of students during traditional lecture-classes and technology laboratories.  It is believed that a classroom system utilizing pocket pc handhelds (PDAs) and wireless communications will be productive to both the instructor and students. (Holmes and Schmidt, 2002)  However, while currently available handheld devices do offer the ability for "anytime, anywhere" learning techniques, the only notable use in the classroom to date has been in the fields of medicine and law. (Jones, Johnson, and Bentley, 2004)

It is anticipated that properly configured and managed, these popular, relatively inexpensive tools will allow the teacher to actively engage all of the students, even in large classes, delivering graphics, sound, questions, problems, and simulations that illustrate the point under discussion in a real-time fashion. This paper will discuss work completed in other projects on the subject, ground work completed previously in this effort, and the design of the next phase of the project.

## 2. RELATED WORK

The number of papers investigating the educational use of the PDA is ever growing as the functionality of the PDA increases and the cost of the PDA decreases.  With this increased interest, the educational applications of the PDA studied are also expanding. There is not, however, a consensus on the advantages of the PDA in the education field. Some of the ambiguity seen within this field of study can be attributed to potential confounding or extraneous factors such as the focus student populations and the specific classroom application investigated.

A couple of the common educational functions for the PDA found in the literature are note-taking and collaboration.  The note-taking function investigated in Landay (1999) compared the ability of the PDA as a note-taking device to paper-based electronic note-taking devices, such as the Cross® Pad.  In the Landay (1999) article a separate PDA application was designed to capture the note-taking of the students.  In addition to the application created and the different platforms studied, Landay (1999) studied the ability of the application and platform to increase

the effectiveness of collaboration between the students.  Landay (1999) concludes the Cross®
Pad was found to be more intuitive for novice users then the PDA.

Other studies have also examined PDA devices functioning as collaboration tools.  Tatar,
Roschelle, Vahey, and Penuel (2003) explored the use of PDA devices in collaboration
experiments using math and science for middle school students.  This study also used
specifically designed applications on the PDA.  "The teachers reported greater student
engagement, more effective collaboration, and increased student autonomy on lessons that
integrated handheld computer use." (Tater et al., 2003)

Another paper investigating PDAs as collaboration tools was authored by Zurita and Nussbaum
(2003).  This study compares collaboration effects on learning when either a PDA or traditional
pen-and-paper is implemented.  The activities used to explore this interaction were math and
language for 6- and 7-year old children.  Applications were also created specifically for these
activities on the PDA.  The findings of this study show that "handhelds are tools that facilitate
coordination of a greater number of members transparently, apart from transparently supporting
mobility to members who need it." (Zurita and Nussbaum, 2003)

The creation of specialized software applications to be used on the PDA for specific activities is
a common thread found throughout the current literature on the subject. In contrast the PDA in
the Classroom project investigates the uses of commercially available software for the PDA in
the collegiate educational setting.


## 3. COMPLETED GROUND WORK

The PDA in the Classroom project has provided the installation and availability of the PDA
software tools commonly used to support distance education over the World Wide Web.  With
editorial changes to existing distance education assessment software, students in ECET 207 at
Purdue University are able to complete assignments and quizzes that are posted on-line and to
access all course related materials inside and outside of the classroom.  Some of those course
related materials obtained on-line by the students include, but are not limited to, syllabi, quizzes,
homework, grade reports, lecture slides, spreadsheets, laboratory instructions, data sheets,
executable files, video clips, and web site links.  Course related software packages such as
MATLAB® are also available on the course website. This allows students to manually follow
along using the software package being used for in-class examples.

The project has created a PDA friendly course website through modifying the current course
website (http://www.tech.purdue.edu/eet/courses/eet207/).  In addition to the tools listed above,
the site provides the information needed for the students to access the software tools for
installation on their PDAs, and the modification of existing file types to be compatible with PDA
applications.

The PDA website allows students to access everything available to a typical PC as can be seen in
Figure 1.  The first link, PDA Tools, on this page allows the students to configure their PDA for
use with the course software – Adobe Reader® Mobile, Real Player® Mobile, an email client,

NetFront™ Internet Browser, VTI Pocket Emulator, and network drive access. Subsequent links provide the course information and assignments to the students.  The PDA Tools page can be seen in Figure 2.
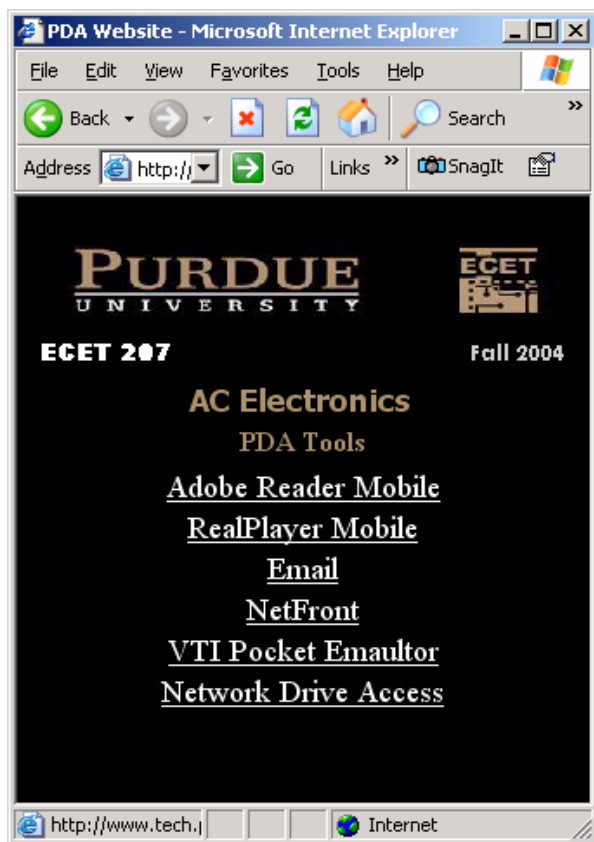


Figure 1: PDA website main screen.



Figure 2:  PDA website tools screen.

Adobe Reader® is necessary for the students to be able to open PDF files posted by the instructor.  Lecture notes, homework assignments and solutions, quiz and exam solutions, laboratory procedures, and simulation assignments and solutions are all posted to the website in this format.

Most lectures have also been video recorded and converted to a Real Player® format for access from the website.  This allows the students to revisit a lecture at their convenience.  Usage reports suggest that these videos are used both before and after the scheduled lecture.

NetFront™ was chosen as a secondary web browser for the students to employ.  The Internet Explorer version available for mobile devices does not allow all the java applications necessary in the software package used by the students for homework and quiz submission – Test Pilot™. Netfront™, although it must be purchased by the student, does allow limited java functionality.

An emulator software program, Virtual TI Pocket Emulator, for the graphical calculator used by the students in this class has been created for the PDA. This allows the students to use the PDA as a graphing calculator.

And lastly, the email client and network drive access are included to facilitate the students' ability to utilize resources provided by the university. An @purdue.edu e-mail account is provided to all students enrolled at Purdue University. The students also receive 500MB of storage space on University provided equipment. Students may also create publicly published personal websites using that same storage space.


# 4. PROJECT DESIGN

## *4.1 Classroom Network Infrastructure*

The creation of an in-class network between the students and the instructor, using a PDA-laptop communication cluster, is in the design phase. This will create a restricted network, allowing the PDAs to connect only to the instructor's laptop. Such an environment should mitigate the commonly argued disadvantages of in-class computing; off-point web surfing, and unauthorized communications.

## *4.2 Lecture Implementation*

Resources are being sought to provide student teams with a PDA from the department for use during this class. The students will be able to follow the lecture via PowerPoint® presentation wirelessly on the PDAs. As the instructor comes across certain points in the lecture, the students will be instructed to click on links embedded in the power point slides to complete problems or quizzes using the Test Pilot™.

Test Pilot™ is a commercial software package that allows instructors to generate versions of homework and quizzes that can be made available over the web to students. Test Pilot™ enables the instructor to create assignments with multiple choice or computed answers for the questions to the assignments. Test Pilot™ even allows for the ability to randomly assignment various values to components within the questions. The instructor can configure the assignment so that the student has the opportunity to practice before submitting the assignment for a grade. The instructor can limit the practice to one attempt or allow multiple attempts by the student. The students are able to log in to a server that contains the specific file for the homework or quiz once it has been created by the instructor. Test Pilot™ collects grades for the submissions from the students for the instructor. The instructor can then login and obtain the scores for any assignment after it has been completed.

In this project the student will work through the problems presented *during* the lecture using Test Pilot™ and submit the answer wirelessly back to the instructor's laptop. The instructor will be able to view statistics in real time summarizing the student teams' performance.

The instructor will also be able to embed visual information, such as graphics or Visual Basic® programs, into the PowerPoint® presentations. The student will then be able to follow along as the instructor discusses the examples or later outside of class for verification. It is envisioned that the instructor will be able to custom fit the lectures based on the responses gathered from the students in real time.

*4.3 Laboratory Implementation*

Another portion of this project is the implementation of a *hardware* control system using the PDA as the embedded controller and wireless communications platform to control a small mobile robot. This project will allow an introduction into the specialized areas of study in ECET (Electrical and Computer Engineering Technology), such as communications, power circuits, analog circuits, and digital circuits. The robot project will include the construction of the robot, the control of the robot via sensors and the connected PDA, and the wireless control of the robot via an external PC.

The students will encounter this project early in their career in their first project course. The students will be given already constructed portions of the project such as, the power circuitry for the robot, the sensors, and the motor controls. The students will be required to interface each of these blocks and the PDA correctly on the robot base. It is envisioned that the interface between the robot circuitry and the PDA will be obtained using a LabVIEW™ 6062E Data Acquisition Card (DAC).

The students will then "program" the PDA using a symbolic language such as LabVIEW™ to control the robot and Visual Basic® to create wireless connectivity to an external PC and remote control from the PC. This keeps the new student from becoming overwhelmed in the details of the behind the scenes functionalities. The students are then able to focus on the basic functionality and communications of the interconnected blocks. Subsequent courses could then explore the details of the individual blocks utilized in the robot project. It is anticipated that this integrated, top-down systems approach could improve freshman retention, and success rates in later courses.

## 5. CONCLUSION

This project explores the capabilities and uses of the PDA in the collegiate classroom and laboratory using the PDAs and wireless communications to advance "anytime, anywhere" learning techniques in college education. A variety of traditional computing and communication features have already been integrated into on existing web supported course.

Future directions plan to address common weaknesses of in-class computing and to facilitate a systems implementation survey course.

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