

MINING WHAT WE KNOW ABOUT HANDHELD COMPUTERS: A REVIEW OF THE [ANECDOTAL] EVIDENCE

Beverly B. Ray
Assistant Professor
Instructional Technology
Idaho State University
Campus Box 8059, 1550 E. Terry
Pocatello, ID, USA
raybeve@isu.edu

ABSTRACT

Handheld computers have gone beyond the world of business and are finding their way into the hands of teachers and students. The empirical evidence suggests that the integration of handheld technology into the K-12 classrooms promotes 1) teacher productivity and 2) student-centered learning. Despite a wealth of anecdotal evidence little research has been conducted to date.

INTRODUCTION

Handheld computers such as *Palms*[™] and *Pocket PCs*[™] serve as organizers of personal and professional information. Handhelds are broadly accepted in a variety of educational settings, including K-12 classrooms. Handhelds come with software that allows educators and students to perform a range of tasks, including synchronizing data with desktop or laptop computers, tracking grades, accessing e-mail, managing appointments and course assignments (Marsh, McFadden, & Price, 2002; Roland, 2003 – 2004; Sprague & Dede, 1999). Handheld computer software can also be used to promote cooperative learning and data analysis activities (Tinker, Staudt, & Walton, 2002) in the classroom. Their inexpensive cost and portability make them an attractive alternative to more expensive notebook computers (Marsh, et. al., 2002; Roland, 2003 – 2004). In fact, their low cost has lead Staudt (2002) to label them *equity computers*, computers that can “open the door for all students, regardless of circumstances, to high-quality education” (p. 36).

TEACHER PRODUCTIVITY

Handhelds are effective classroom organizational tools for educators (Ray, McFadden, Patterson, & Wright, 2001). Pownell and Bailey (2000) agree, observing that handheld computers effectively support how teachers work and use information in their classrooms. Soloway (2000) contends that handheld computers "support cycles of doing and reflecting" (p. 1) by encouraging teachers and students to revisit their written work more often. According to Barfield (2003), organizing information on a handheld computer can lead to a reduction in frustration levels among students, including those with special needs. Handheld computers give teachers greater flexibility in managing classroom assignments and in creating student-specific instructional plans (Ray et. al., 2001; Soloway, 2000).

Assessment

They are effective assessment tools as well (Baumbach, Christopher, Fasimpaur, & Oliver, 2004; Powers, & Janz, 2003; Swenson, 2002). Staudt (2002) supports this assertion, stating “Using the beaming capabilities enables the teacher to make rapid assessment of each students’ comprehension of the concepts and to make adjustments during the lesson” (p. 38). According to Moallem., Kermani, & Chen, (2003), “providing continuous assessment and immediate feedback via wireless handheld computers during instruction yielded a positive effect on students’ learning and their attitude toward various forms of assessment and the use of handheld computers in classroom to assist learning.” (p.1398).

Productivity Software

Spreadsheets. Teachers are using handheld computers to record grades in various spreadsheets, including Microsoft Excel. Keeping an electronic grade book on a handheld computer allows for quick reference when a student asks about a grade. It also allows the teachers to input grades into an electronic grade book stored on the handheld computer. This is particularly useful in classrooms where constructivist and cooperative group activities require teachers to engage in “on the fly” or alternate assessment of students’ work (Baumbach, et. al., 2004; Marsh, et. al., 2002). Handheld computers are helpful for teachers who require students to present oral reports or to participate in class discussion sessions. Quick access to the electronic grade book is useful for keeping up with attendance and tardy arrivals as well. Using the handheld computer allows teachers to bypass

the stationary computer and still maintain an accurate grade book. Handheld computer spreadsheets also can store attendance records and performance assessment charts (Ray, et. al, 2001).

Databases. Teachers can inventory instructional materials using database software available for the handheld computer. Information in the database can be beamed to other teachers. Additional handheld computer databases can be used to store information on individual students. Information such as contact numbers, special health or medical needs, reading levels, or even student hobbies and interests can be stored in the handheld computer and quickly accessed as needed (Ray, et. al, 2001).

Word Processing. Word-processed files such as a class syllabus and other course materials, including primary documents, can be stored on the handheld computer for quick reference in class or during fieldtrips. This is particularly useful when explaining assignments and grading procedures to students who are engaged in complex tasks outside of the classroom (Ray, 2003).

STUDENTS' USE OF HANDHELD COMPUTERS

Using handheld computers allows students to take greater responsibility for their assignments. It also allows them to visually see what is due so that they can organize their work, play, and study schedules more effectively (Barfield, 2003; Ray, 2001). Knowing the details of an assignment, including its point value and due date, can help students set priorities. Additionally, using the handheld "effectively [gets] 'rid' of all the additional pieces of paper or additional notebooks" (McFadden, 2001, ¶ 5).

Reading, Writing, and Thinking in a Digital Environment

Handheld computers assist students in the writing process (Baumbach, et. al., 2004). Students can write, edit, and revise stories, papers, and journals on the handheld. They can also use the handhelds to take class notes. Students working in groups can beam work to one another. Individual reading and writing exercises can be completed on handheld computer (Mark, 2003).

Electronic Texts. Many publishers offer electronic versions of their textbooks. Access to texts is no longer limited by what books are available in the school library. Teachers and students can easily download and read a variety of free, age appropriate classic texts from the Internet as well (Lockard & Abrams, 2004). The *Electric Book Company*TM (see web site, <http://www.elecbook.com>) is one example. Software such as *eReader*TM (see web site, <http://www.palmdigitalmedia.com/>) and *Documents To Go*TM (see website, <http://www.dataviz.com>), supplement a variety of free text readers that are available online.

Developing Digital Research Skills

Web-clipping. Students and teachers can keep up with current events by clipping a variety of newspaper articles daily. Primary documents, including the United States Constitution, the Declaration of Independence, and the Bill of Rights, can be "clipped" as well (Bull, Bull, & Whitaker, 2001).

Reference Materials. Newer handheld computers can store a variety of dictionaries, thesauruses, or other reference tools. Storing these materials on the handheld computer provides teachers and students a source for quick reference materials.

Dictionaries, Thesauruses, and Other Writing Tools. Several freeware dictionaries and thesauruses are available for download. For example, the *Noah Lite English Dictionary* (see web site, <http://www.arslexis.com/>) with 140,000 words is available as freeware. As students use the handheld computer ---or another computer---for word processing, they can quickly access a dictionary and thesaurus on the handheld computer (Baumbach, et. al., 2004). Teachers and students in foreign language classes, can find free or inexpensive foreign language dictionaries online from several different Internet sites as well.

Collecting, Organizing, and Mining Data for Decision Making

Spreadsheets. Using a simple spreadsheet program, students can create simple electronic survey instruments or dataset that can then be stored on the handheld computer (Mark, 2003; Ravitz, & Mergendoller, 2002). Students can use these surveys to conduct field research, including interviews, by recording data and other findings in a handheld's spreadsheet (i.e., Microsoft Excel). Completed surveys can be beamed to a central computer so that results can be tallied and discussed in class (Ray, 2001; Starr, 2003).

Database Applications. Students can use databases to store, sort, and search through large amounts of information which can serve as the source of original research and analysis in the classroom or in a field setting

(Mark, 2003; Rose, 2002; Tinker, Staudt, & Walton, 2002). Students can merge individually collected data into a larger database simply by beaming or synching their databases.

Collaboration

Because handheld computers allow users to readily share files and other information by “beaming” files from one handheld to another, collaboration and sharing of information and software is enhanced (Mark, 2003; Marsh, et. al., 2002; Vahey & Crawford, 2002). This sharing and commenting on work leads to an increase in the quality of finished products, such as written drafts and reflective discourses (Soloway, 2000).

SUMMARY

Handhelds can be personal productivity tools as well as instructional tools for both social studies teacher and students at the K-12 level. Handhelds prompt exploratory and constructivist practices in the K-12 classroom and in the field (Bell, 2002; Hecht, 1997; Tinker, Staudt, & Walton, 2002; and Starr, 2003). In the hands of students, these computers can become critical and creative thinking tools. They also make the learning process fun for students by giving them a greater sense of responsibility for their learning. The range of software promoting the integration of handheld computers into the K-12 classroom continues to increase (Doe, 2004).

The empirical evidence suggests that the integration of handheld technology into the K-12 classrooms promotes 1) teacher productivity and 2) student-centered learning. However, despite a wealth of empirical and anecdotal evidence there is no research base to support these assertions. Further research supporting their effectiveness, however, remains to be done.

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