Using Technology to Teach Reading

Mary Snow

University of New Mexico

May, 2010

Abstract

The question: “Does technology provide tools that teachers can customize and configure to their specific instruction goals, when teaching phonics and phonemic awareness in first grade?” led to an interesting exploration of current research on the use of technology in schools. While the need to integrate technology completely into the classroom and the curriculum continues to be recognized, it is not being widely implemented. Both the analysis of why technology is not being widely integrated, and specific examples of teachers successfully using technology can be found in the literature. This article provides an overview of this research, and a description of an attempt to use technology in a first grade class to improve pre-reading instruction.

Using Technology to Teach Reading

Experienced teachers have developed successful methods for teaching the basics of reading, phonemic awareness, and phonics to first grade students. Many school districts require teachers to use specific programs in their lessons such as Wilson Fundations. However, software programs and games are available that support teaching these skills. Software tools that support teachers easily incorporating technology into their program-based lessons have not been observed. The specific problem I observed in first grade was a daily routine where a student leading the class was expected to manipulate over 60 flashcards, while the whole class was reciting and making motions in response to each card shown. This starting question: "Does technology provide tools that teachers can customize and configure to their specific instruction goals, when teaching phonics and phonemic awareness in first grade?" led to an interesting exploration of current research on the use of technology in schools.

The integration of computer technology has been defined as "a reliance on computer technology for regular lesson delivery" (Bauer and Kenton, 2005). The term *integration* describes the third stage in a defined progression of the use of technology by in the classroom by teachers: (a) familiarization, (b) utilization, (c) integration, (d) reorientation, to (e) evolution.

Halverson and Smith (2009) separate technology into two perspectives or levels: technologies for *learners* and technologies for *learning*. Technologies for learners put the user in control. The user sets the goal and chooses the action or activity. Learner technologies include games, simulations, search engines, blogs, and wikis. These technologies encourage incidental learning, browsing, and active participation in a social context. There is no guarantee that learner technologies will produce the anticipated results. Learning technologies leave the product designer in control. The user is guided towards the learning goal by the software, which

usually can be configured or customized by the teacher. Learning technologies define a learning goal, have s structure that guides the user, tracks the user progress, and selects activities based on this progress. While technologies for learning have been accepted in schools, frequently technologies for learners have been banned from school.

Looking at the history of education in America, Collins and Halverson (2009, p. 91) propose that just as the Industrial Revolution led to the development of schools in America, the current Knowledge Revolution "is leading to a new era of lifelong learning" (p. 49). The progress of education can be divided into three phases:

- **Apprenticeship** – the era before the Industrial Revolution:
- **Universal schooling** – the education process that developed as a result of the Industrial Revolution
- **Lifelong learning** – the education process that will develop as a result of the Knowledge Revolution

Table 1 summarizes the impact of these changes across different dimensions.

Table 1

American Education Development

	Apprenticeship	Universal Schooling	Lifelong Learning
Responsibility	Parent	State	Individual and parent
Expectations	Social reproduction	Success for all	Individual choice
Content	Practical skills	Disciplinary knowledge	Learning how to learn
Pedagogy	Apprenticeship	Didacticism	Interaction
Assessment	Observation	Testing	Embedded assessment
Location	Home	School	Anywhere
Culture	Adult culture	Peer culture	Mixed-age culture
Relationships	Personal bonds	Authority figures	Computer-mediated interaction

The third column, Lifelong Learning, is the authors' visions of the changes the Knowledge Revolution will bring. This vision will continue to evolve as long as we continue to see significant changes in technology, such as the introduction of Cloud Computing and Apple's iPad (Boulton, 2010).

As any large, complex system evolves, change to that system becomes more difficult. Papert (1980) has been following the impact of technology on education since personal computer was first introduced. He predicted that computer technology in schools would change the relationship between the teacher and student. The teacher's role would move from information provider to interdisciplinary facilitator. Papert understood that this change would not come easy because K-12 schools are organized around a passive disciplinary instructional model that can be resistant to change. Schools have dealt with technologies in two ways, using the technology to enforce existing practices where possible, or banning technology to minimize the threat (Halverson and Smith, 2009).

During the 1990s the access to technology increased significantly, the ratio of students to computers went from 25:1 to 5:1, and the percentage of schools with public Internet access rose from 35% to 97%. There was a public mandate to remake schools as technology driven institutions. Additionally there was public funding for the development of high-quality scalable instruction technologies. If teachers gained experience with technology in classroom instruction, they would become more committed to integrating technology. This resulted in "progressive islands of innovation" and an increase in professional development focused on technology. However this did not result in a significant number of teachers integrating technology in their instruction on a daily basis. In the next decade, with the advent of high-stakes testing, the administrators became the advocates of technology. Technology was used to analyze assessment

data and provide teachers with information to target their instruction and monitor student progress (Halverson and Smith, 2009).

Computer Technology has not been successfully integrated into either the curriculum, or into daily instruction. Research has shown that computer technology can be effectively incorporated into classroom instruction, but this has not become a common practice. Technology must be integrated completely into the curriculum, rather than just added to the curriculum. Many students still need basic technology instruction, including keyboard, menu navigation, and overall system operation (Bauer and Kenton, 2005). In the study done by Bauer the two main obstacles that were identified were the extra planning time required by teachers, and limited access to the computers for students. Until teachers have gained a significant amount of experience with the technology they are trying to integrate, including the hardware, software environment, and specific applications, they will not see the return on the investment of their time. For students to use computers on a daily basis at school and achieve the goals of a truly integrated curriculum, the ratio of students to computers needs to be 1:1. Computers were introduced into the classroom in the 1980s when personal computers first became available. Most classrooms today have 4 to 5 computers available in the classroom as shown in Appendix A Figure 1. This configuration creates many opportunities for classroom management. As hardware became more available, the computer lab was added, containing about 30 desktop computers in a classroom like setting, see Appendix A Figure 2. For teachers the issues were scheduling including the frequency of lab availability, being out of the classroom, and skill level of the students. The mobile lab, a cart containing 30 wireless laptops, is the most significant recent advancement in hardware for schools, see Appendix A Figure 3. This cart can be moved

into the classroom, replacing the trip to the computer lab. Laptops are used at the student desks, and are returned to the cart for charging.

In the classroom, computers are most frequently used for drill, informative (web search) and expressive (word processing) purposes. (Wozney, Venkatesh, and Abramiet, 2006). While computers are incorporated into the writing process, teachers do not use computers for all aspects of the writing process, specifically the prewriting activities and in some cases preparing the first draft (Lovell and Phillips, 2009 page 13).

While much of the research deals with the lack of large-scale progress integrating technology, it does include some significant success stories. Anderson and Balajthy (2009) describe the use of technology to help struggling readers, including using electronic texts, creating discussion blogs, and using Accelerated Reader (www.renlearn.com/ar) in an inner city literacy program. May (2003) describes how, with the right attitude, she made use of all the technology available at the time, including digital cameras, word processors, computers, and printers, to create a reading program which supports the diverse levels of her students. She discovered motivational effect of technology on the students. Compton-Lilly (2009) recognized that she could not just teach the process, phonics, fluency, vocabulary, but must teach the person. She described her use of technology to successfully teach a six year old that was both struggling reader and video game expert.

In this research, I have not found a description of software that is easily configurable by the classroom teacher to support her ongoing first grade pre-reading instruction. The specific problem I observed was a daily routine where the student leading the class was expected to flip through over 60 flashcards, as part of phonics drill. I developed a simple application, minimizing dependence on specific hardware and software. This application basically automated

the display of the flashcards using the same phonemes, with the same background color. See Appendix A Figures 4, and 5. The application could be run on any computer with a web browser. Access to the Internet was not required. For whole class drill, a projector attached to the computer was required. If a Smart Board was available, the student at the Smart Board could control the drill, otherwise the drill was controlled at the computer using a mouse. Using the technology had a motivational effect, especially as each student had an opportunity to control the drill at the Smart Board. Many of the obstacles described in the research had to be overcome. There was the time to develop the program, the continued time to maintain, enhance, and distribute the program. There was also training time to ensure that the classroom teacher could set up and run the program. The physical logistics of using the technology in the classroom that I encountered were not specifically mentioned in the research. This included setting up the classroom so all students could see the Smart Board, while minimizing daily classroom reconfiguration. Electrical cord safety is a continual problem, as the projector required an electrical connection and there is a cord from the Smart Board to the laptop. Solutions to the last two problems (a wireless connection for the Smart Board, and a cord cover) are coming.

The success of the first application let to the development of a second, even more useful program. This application displayed Dolch sight words, again replacing the use of flashcards. See Appendix A, Figures 6, 7, and 8. Students are required to read each sight word in 3 seconds or less. When the flashcards were used to test the students, a kitchen timer was used to track total time. Individual words were not timed. A timer was added to the framework for this application. The timer configured the interval at which the sight words are displayed in a range from .25 seconds to 5 seconds. The students were timed on each word. Because the time interval was configurable, students were also challenged to see how fast they could read the

words. The application can be used on any of the classroom computers for individual practice. It is used with the Smart Board by the whole class. This application was used for practice and testing of levels 7 and 8 of the Dolch Sight Words. Students appeared to learn the words faster using this application. This has not been validated by a controlled study. One side effect of this application is that the students are learning about decimal numbers and improving their sense of time.

As part of this research, I interviewed the classroom teacher who supported and assisted in the development of these applications. The complete interview can be found in Appendix B. To summarize, the classroom teacher thought that the application was a significant improvement over the flashcards. The cost of time and effort to develop the application was recovered as less instruction time was spent on these activities, and the student motivation was higher. The sight word application appeared to increase student fluency, and supported differentiated instruction.

Integrating technology into daily instruction has both rewards and challenges. It does cost time, but once in place it can actually save time. The students find it a great motivator. The physical obstacles to technology are often overlooked and need to be addressed. Teachers who use computer technology at home are more likely to incorporate this technology in their teaching practice. The rate of change in technology in the last 25 years has contributed to the difficulties of integrating technology in the school. Software, and hardware are outdated much faster than textbooks. It can be difficult to determine which technology to incorporate and which to bypass. Students in school today desperately need technology skills to become productive members of society. The future vision for the role of technology in education must include understanding the impact of technology on society, and the history of the incorporation of technology in education.

References

Anderson, R., & Balajthy, E. (2009). Stories about struggling readers and technology. The Reading Teacher, 62(6) 540-542.

Bauer, J., & Kenton, J. (2005). Toward technology integration in the schools: Why it isn't happening. Journel of Technology and Teacher Education, 13(4), 519-546.

Boulton, C. (2010). Apple iPad challenges Google's Chrome cloud computing designs. x eWeek.com, Retrieved from http://www.eweek.com/c/a/Cloud-Computing/Apple-iPad-Challenges-Googles-Chrome-Cloud-Computing-Designs-219397/.

Collins, A., & Halverson, R. (2009). *Rethinking education in the age of technology.* New York: Teachers College Press.

Compton-Lilly, C., (2009). What can new literacy studies offer to the teaching of struggling readers? The Reading Teacher, 63(1) 88-90.

Halverson, R. & Smith, A. (2009). How new technologies have (and have not) changed teaching and learning in schools. Journal of Computing in Teacher Education, 26(2), 49-54.

Lovell, M. , & Phillips, L. (2009). Commercial software programs approved for teaching reading and writing in the primary grades: antoher sobering reality. Journal of Research on Technology in Education, 42(2), 197-216.

May, S. W. (2003). Integrating technology into a reading program.(using hardware and software tools to teach). T H E Journal, 30(8) 34-38.

Papert, S. (1980). *Mindstorms: Children, computers and powerful ideas.* New York: Basic Books.

Papert, S., & Harel, I. (1991). *Constructionism,* New York: Ablex.

Wozney, L., Venkatesh, V., & Abrami, P. (2006). Implementing computer technologies: teachers' perceptions and practices. Journal of Technology and Teacher Education, 14, 1. p.173(35).

Appendix A Figures

Figure 1 Most Classrooms have 4 to 5 computers available for student use.

Figure 2 Most Schools have about 30 computers in a lab scheduled for use on a class basis.

Figure 3 A mobile lab can hold up to 30 laptops.

Figure 4 Screen shot of the phonics application.

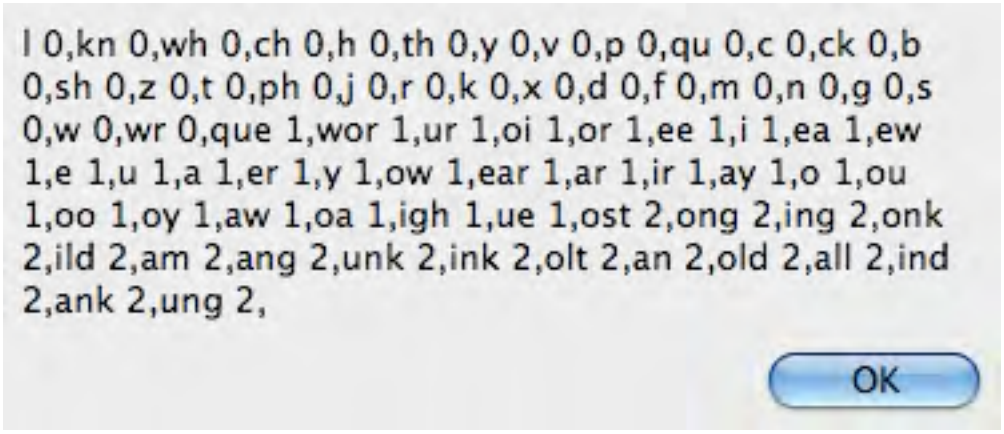

Figure 5 List of phonemes used in the phonics application.

Figure 6 Screen shot of the sight word application.

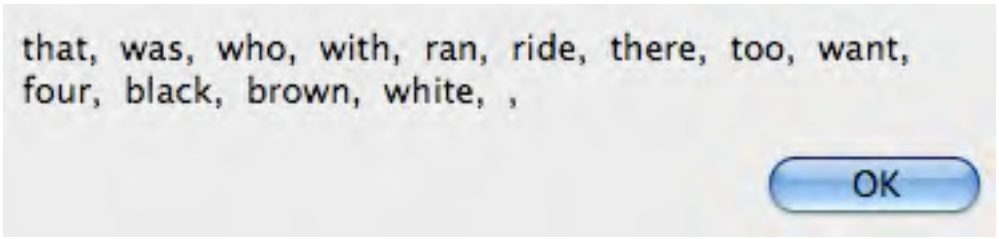

Figure 7 Level 8 word list.

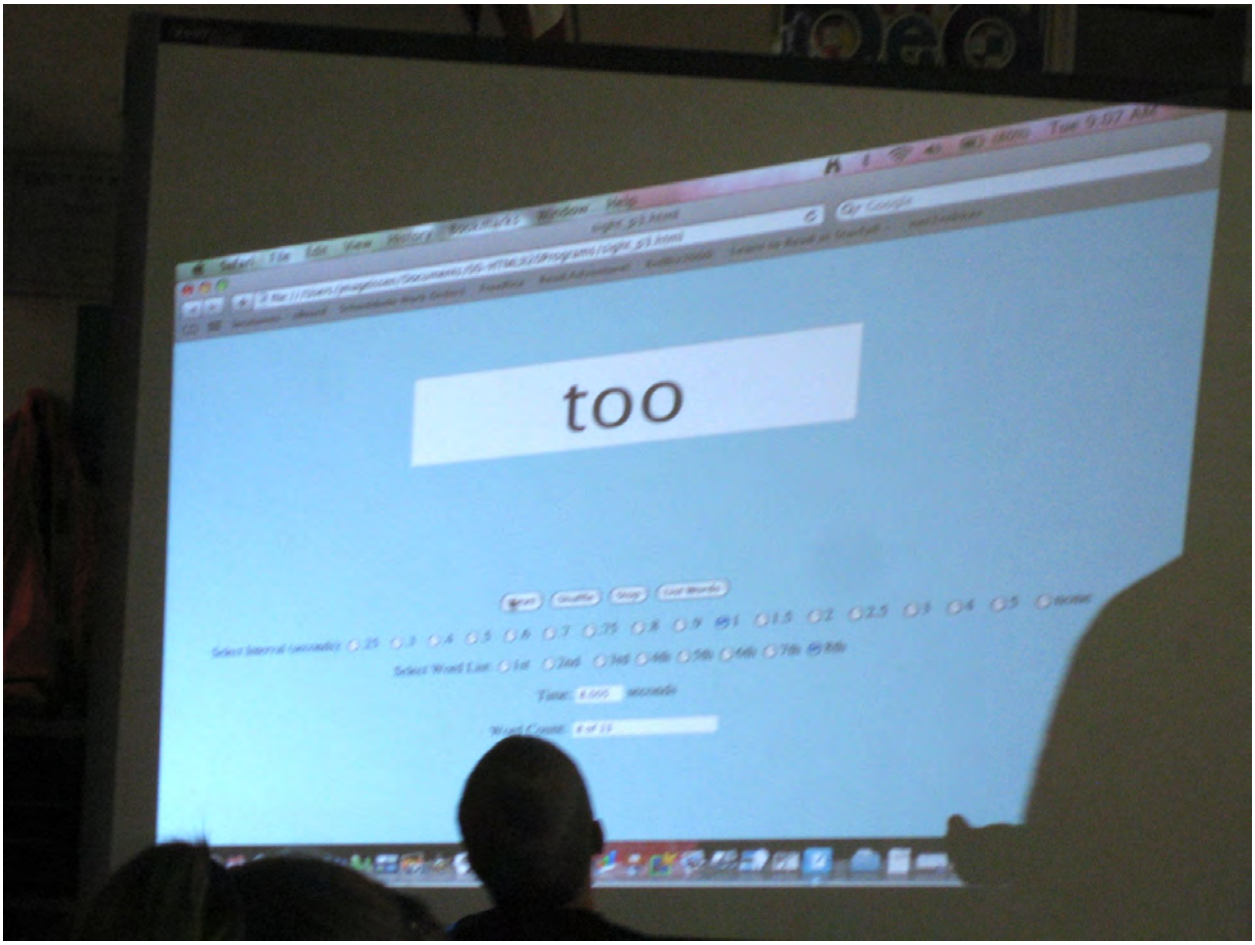

Figure 8 Practicing sight words on the Smart Board.

Appendix B. Classroom Teacher Interview

Phonics Application

1. What are the advantages of flash cards over the application?
    - The student leading the drill develops fine motor skills by manipulating the flash cards.
2. What are the advantages of the application over flash cards?
    - Every student wants to be leader because the leader gets to use technology.
    - The room is darker which makes the students quieter.
    - Re-sequencing the cards is much easier and gets done much more often.
    - Everybody can see the cards as they are displayed.
    - Frees the teacher to focus on students needing attention.
3. When would you start using the application next year?
    - On day 2, starting with the letters. In Kindergarten student learn all the motions and sounds for the letters.
4. How would you measure the differences between the flash cards and the application?
    - Select 2 groups of students of equal ability. Test the students individually, then after a period of using either the flashcards or the application, test the students again. The test would require the students to do the drill, sound, word, and motion individually in response to the flashcards or the application.
5. Now that the application is part of the daily routine, how much time does it save or cost?
    - The drill goes faster with the application. Setting up the Smart Board and projector take more time. If the classroom could be arranged so that the projector and Smart Board were always set up, this cost would be minimized.

6. What changes would you make to the application?
    - Make it easier to add letters (phonemes).
    - Make sets of letters selectable.
    - Change the font so students can easily differentiate between the letters L and I.
7. Other comments:
    - Build in accountability; have to think about exactly how to design this.
    - Create levels by grouping sounds, and make level combinations selectable.

Sight Word Application

1. What are the advantages of flash cards over the application?
    - Words that are missed can be set aside. The font better differentiates some letters, such as L and I.
2. What are the advantages of the application?
    - The time interval supports student accountability.
    - The application fits into the PDSA process better.
    - The words can be easily shuffled or re-sequenced.
3. Would you use this application next year? When would you start?
    - I would start using the application in week 2. Students are given two weeks to learn the first set of sight words.
4. What is your estimate of the differences in class time to test sight words with flashcards versus the application?
    - Flashcards take twice as long as the application.

5. What is your estimate of the time it takes to learn sight words with flashcards versus the application?
    - Learning sight words is a homework assignment, students are given flashcards to take home. With the application all students are equally motivated to learn the sight words, being able to control and vary the time challenges students that are already familiar with the words, improving fluency.
6. How much time does the application save or cost in teacher planning time and class instruction time?
    - Teacher planning time - There is minimal to no difference
    - Class lesson time - Testing sight words with the application takes less time.
    - Other time - Setup time takes more time.
7. Other comments:
    - Using the application increases fluency.
    - The application could be provided to the student who wanted to use it at home.
    - The application supports differentiating instruction. When a new student joined the class we were able to create a special level to challenge her. This made her feel like part of the class.
    - The students enjoy and respond positively to instructions that includes technology. It is similar to watching films in school when I was a student. Incorporating technology is critical for students and consistent with the goals of the Partnership for 21st Century Curriculum (http://www.p21.org).

Authors Note

I would not have been able to develop and implement the applications with out the support, interest and input of Judy Magelssen, the classroom teacher, referenced in the article. Judy provided support when I encountered technical problems, and significant user input on the requirements and design of the application.