

## **Laptop Computers as a Tool for Authentic Instruction**

Kate Kemker

*Florida Center for Instructional Technology  
University of South Florida  
4202 E. Fowler Ave., EDU162  
Tampa, FL 33620  
(813) 974-1640  
katek@tempest.coedu.usf.edu*

Ann E. Barron

University of South Florida

Keywords: laptop, authentic instruction, Title I, classroom

Paper presented at the Annual Meeting of the National Educational Computing Conference, New Orleans, June 20–23, 2004.

## **Laptop Computers as a Tool for Authentic Instruction**

**Abstract:** Laptop computers can provide powerful tools for elementary classrooms, especially if they are combined with authentic instruction. The purpose of this study was to examine the use of the laptop computer as a tool in authentic instruction with students from low-socioeconomic backgrounds. The design for this study is a descriptive case study employing ethnographic methods, including student artifacts, videotapes, and interviews. Several themes, related to teacher/student interactions and classroom management emerged from the study. The study also resulted in a website (“No Strings Attached”) that provides lessons learned and sample lesson plans.

### **INTRODUCTION AND LITERATURE REVIEW**

The passage of the *No Child Left Behind (NCLB) Act of 2001* reinforced the belief that all children can learn if high standards are set. This landmark legislation reauthorized the Elementary and Secondary Education Act of 1965, through the appropriation of the largest funding in history for Title I schools, to pursue a standards-based reform agenda (Borman, 2003; U.S. Department of Education, 2002). In a speech to the Commonwealth Club of California, U.S. Secretary of Education Rod Paige emphasized the philosophy of NCLB -- all students can learn. However, he noted that there is a “soft bigotry of low expectations” for low socioeconomic students. He stated that educators must let go of the myths and perceptions about who can learn and who can’t to ensure that all students, despite their level of poverty, can reach high academic standards (Paige, 2003).

#### *Technology and Low Socioeconomic Status Schools*

As the standards movement in the field of education continues to gain momentum, state legislatures have placed an emphasis on the development of a rigorous curriculum for all students. This expectation requires a shift in the curriculum offered to low socioeconomic status (SES) students in Title I schools (Borman, 2003). A recent

analysis of Title I schools conducted for the Department of Education found that students performed better in reading when teachers spent less time on basic instruction, such as filling out worksheets, and more time in exploration activities, such as problem solving and simulations (U.S. Dept. of Education, 2001). However, educational researchers concur that the curriculum offered to low income students is often lacking in cognitively rich tasks that require critical thinking skills from students (Darling-Hammond, 1997; Haycock, 2001).

Studies have found stark differences in the use of computers between high and low socioeconomic schools (Means & Olson, 1995; Wenglinsky, 1998; Becker, 2000; Schrum & Bracey, 2003). Far too often, students in low SES schools, are expected to passively respond to instruction by simply watching or listening, rather than gain conceptual understanding through classroom discourse (Haberman, 1991; Padron & Waxman, 1999). While examining math achievement in schools, Wenglinsky (1998) determined that computers were being used for lower order skills, such as drill and practice, with students in low SES schools. However, students in high SES schools were using computers for higher order skills, such as simulations and problem solving tasks. He reported, "disadvantaged eighth-graders seem to be less likely to be exposed to higher order learning through computers" and that using "computers for drill and practice, the lower-order skills, is negatively related to academic achievement" (1998, paragraph 4). When the use of computers varies in relationship to the students' SES, it facilitates what Haberman (1991) calls the "pedagogy of poverty."

Students' work in the classroom should prepare them for complex, authentic tasks that will be demanded of them beyond the classroom and as adults (Means & Olson,

1995). Newmann (1995) developed a strategy (called authentic pedagogy) that requires students to construct meaning or knowledge, engage in disciplined inquiry, and work on products that have value beyond school. Students are given challenging academic lessons that involve the development of higher order cognitive skills rather than merely responding to lower order skills found in the pedagogy of poverty (Newmann, Wehlage, & Lamborn, 1992). Authentic instruction is meaningful instruction. Teachers are able to move students beyond memorization of facts by creating experiences which demand sustained, disciplined, and critical thinking on topics that have relevance to life beyond school. Research has shown positive outcomes when this curriculum has been implemented in the classroom (Avery, 1999; Newmann, 1996; Newman, Bryk, & Nagaoka, 2001).

### *Laptop Computers in the Classroom*

Generally, access to computers in low SES schools has been limited to two or three computers located in the classroom or an occasional visit to a computer lab (Becker, Ravitz, & Wong, 1999; Schrum & Bracey, 2003). However, researchers predict that when “true universal access” to portable technologies, such as laptops, is created, “the very ways in which we think about teaching, learning, and communicating may change” (p. 4, Hill, Reeves & Heidemeier, 2001). When all students have access to a laptop computer during the day for instruction, it levels the playing field for all students by providing vast amounts of resources, powerful tools for construction of knowledge, and global communication with experts, mentors, and peers (Solomon & Allen, 2003).

With decreasing computer prices and the advent of wireless networks, laptops are becoming feasible for schools. Several large-scale implementations, such as Microsoft’s

Anytime Anywhere Learning Program and Maine's Learning Technology Initiative are taking place across the country (Rockman, 2000; Cohen, 2002). In addition, smaller-scale implementations can be seen in schools and districts in several states (Stevenson, 1999; Ross, Lowther & Morrison, 2001, Apple Learning Interchange, 2004). Based on these initiatives, several research studies have been conducted to assess the educational benefits of laptops in the classroom. These studies have focused on motivation, writing skills, student achievement, absentee rates, perceptions, and other issues.

A study that included a focus on low income students took place in the Beaufort County School District in South Carolina. The laptop project began with 300 sixth graders in 1996 and expanded to sixth, seventh and eighth grade students by 1999. Achievement scores on a standardized test (1999 Metropolitan Achievement Test or MAT7) were analyzed to determine if students who used laptops scored significantly better or worse than students who did not participate in the laptop project. The findings indicate that students who were laptop participants for two years and who were on free and reduced lunch benefited most from the project.

Laptop users who were on free or reduced lunch had a statistically significant higher average NCERRR score (55.8) than did non-laptop users (42.2) who were on free or reduced lunch. While those students who qualified for free or reduced lunch and had been using the laptops for two years were scoring on the average at the 60<sup>th</sup> percentile overall of the MAT7, their counterparts, non-laptop users on free or reduced lunch, were scoring on average only at about the 36<sup>th</sup> percentile in terms of national norms (Stevenson, 1998, p. 5).

Overall, participation in the laptop project was associated with less absenteeism and fewer tardies. Students with laptops attended school more regularly and scored better on achievement tests (Stevenson, 1998).

## **METHOD**

As the laptop computer becomes a regular tool in the classroom, a new model for assessing the use of technology in the curriculum with low SES students must be developed. Ringstaff and Kelley (2002) proposed that research move beyond the question of whether or not computers are worth the cost to questions such as, “Under what conditions do computers have the most benefit for students?” There are significant gaps in research concerning the use of the laptop computer as a cognitive tool for instruction with low socioeconomic students.

### *Participants*

In the 2001–2002 school year, a pilot program was implemented in a Title I school in Florida. The goal of the study was to examine teachers and students who were engaged with laptop computers in core curriculum areas. The research documented the implementation of ubiquitous technology with video, student artifacts, and interviews.

Three key factors were involved in the selection of the elementary school for the study. The first factor was the reputation of the principal for integrating technology in the school and her understanding of its impact on the students and staff. As the instructional leader of the school, this principal believed that technology should be integrated into the classroom, not taught as a separate subject. Hence, there were no computer labs at the school. She believed the learning should not stop for students to “go to the lab,” but that learning should take place wherever the students are located.

The second factor influencing the selection of the school was the flexibility provided by the school environment, which allowed the researcher to access selected classrooms. A culture existed at the school in which visitors were welcome to visit classes and observe the students and teachers. The style of instruction in the classroom tended to be learner centered. Students could freely move among learning centers located throughout the classroom.

The final factor in the school selection was demographics. The school had Title I status -- 74% of the students qualified for free and reduced lunch. The composition of ethnic groups in the student population was 21% African American, 10% Asian/Pacific Islander, 10% Hispanic, 3% Multiracial, and 56% Caucasian (See Figure 1). There is a heavy population of ESE students at the school.

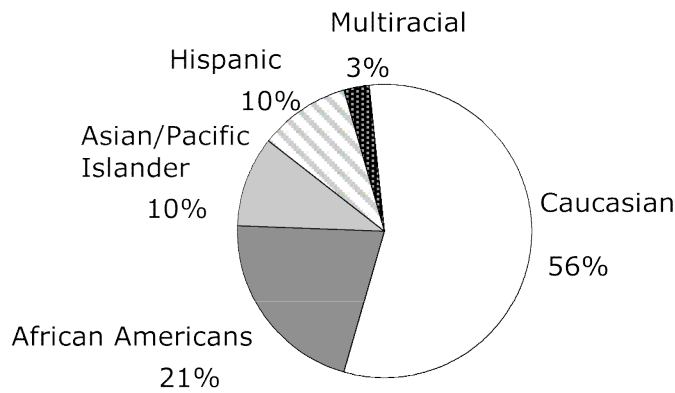


Figure 1

The teachers involved in the study were given their own laptop computer and training on various application programs. They were also provided with access to a set of laptop computers for their classroom, along with other peripherals, such as scanners and digital cameras, for student use. The project was implemented in two second-grade classrooms and two fourth-grade classrooms and was enthusiastically endorsed by the

principal. She encouraged the involvement of her teachers with the project by participating in training and offering ideas for integrating the technology in the curriculum. She also encouraged the two teachers at each grade level to meet as teams and plan similar lessons for their students.

### **DATA COLLECTION AND ANALYSES**

To effectively understand the instructional process and culture of the classroom in its natural setting, the researcher employed ethnographic methods to gather data (Patton, 1990). A technique often used in ethnographic methods (participant observation) involves the researcher becoming a full participant in the process to develop meanings, constructs, and ideas as events occur in the community. The utilization of participant observation allows the researcher to gain an in-depth understanding of the phenomena from the perspective of the participants (LeCompte & Schensul, 1999). Once the classrooms were equipped with the laptops, the researcher came to the school on regular basis to gather data on the process of the implementation of laptop computers in the classroom. Various sources of data were used for this study, such as classroom observations (which were videotaped), teacher interviews, student interviews, and student work.

#### *Classroom Observations*

The researcher for this study took on the role of participant observer in the classrooms, providing the teachers with input on lesson design and occasional assistance in troubleshooting technology problems. The study began in the fall of 2001, with occasional visits to the classroom allowing the researcher to examine the culture of the various classrooms. Throughout the study, classrooms were videotaped for future analyses.

At the end of the study, the videotapes were numbered and labeled according to teacher, lesson, and date. The researcher then examined each of the tapes while capturing them with the video editing software. Each tape was logged into smaller clips according to lesson, video shot, and conversation of the teacher. These clips were then edited to produce short two – three minute movies based on the lesson of the teacher.

As the videos were being examined, themes began to emerge. One theme was the instructional conversation between the teachers and students with the technology. In two classrooms (one at each level), the teachers emphasized a vocabulary of "techie" terms with the students. Both teachers felt it was very important that the students were taught the application before it was used in the curriculum. However, in the other two classrooms, the instructional conversation was about the lesson and not the technology. One teacher commented the "computer was not always the lesson, it was something that built upon the lesson."

Another theme that emerged was the classroom management of the teachers. In the two classrooms that emphasized the technology, the teachers posted the various rules of the classroom and instructions for using the computer on walls around the classroom. In the other two classrooms, student work was posted on the walls rather than rules.

A final theme that emerged was the observable behavior of the teacher during the use of the laptop computer in the classroom. In one of the technology-focused second grade classrooms, the teacher spent most of her time going from computer to computer touching the trackpad to solve problems for the students. By the end of the year, the students would be sitting with their laptops, raising their hand, and waiting for the teacher to come solve a problem. However, when the same computers were used in the

curriculum-focused second grade classroom, the teacher moved around the classroom observing student work. In many cases, the students took the initiative to solve their own computer problems and helped each other whenever possible.

### *Teacher Interviews*

At the end of the study, the researcher set up meetings with each of the teachers. Each teacher was shown sample lessons from their classroom and asked to reflect on the lesson. The interviews were done informally in the comfort of their homes or classrooms, with a semi-structured set of questions.

One teacher reflected on her expectations for the project by stating she “thought it was going to be a disaster.” She went on to explain that she was having problems with the laptop computer and she could not imagine how her students who can barely hold a pencil would be able to use the laptop computer. “Handing a student a thousand dollar laptop was just one of the stupidest things you could think of.” However, she was amazed to see the excitement of the students and how they all wanted to do well. In the end, she noted that the students did not have any problems with the laptop, and they were totally engaged in lessons.

Other teachers reflected about how their experience caused them to think differently about lessons and projects for the classroom. After learning something new, they began to think about how they could teach it differently to engage the students in the lesson. One teacher reflected on how easy it was to integrate the technology into a lesson; she had not realized it was so simple. It has now become a “habit” for her to think about using the technology in a lesson.

### *Student Interviews*

At the end of the year, the two fourth grade teachers interviewed their students about using the laptop computers. In one classroom (that had focused on the curriculum), the teacher specifically asked the students about using the laptop computer. The students acknowledged the question, then began to discuss their projects, never mentioning the technology. As the teacher went from student to student, asking them to reflect, she stopped for a moment and realized, “they are not mentioning the technology.”

In the technology-focused classroom, the teacher asked similar questions of the students and inquired about their frustrations with the technology. The students discussed specific software, such as iMovie and Inspiration. It was during this reflection process that the teacher realized the students were concentrating on the technology, and not the projects or curriculum.

### *Student Work*

The student work that was collected included both digital and written material. All of the teachers had created a “filing cabinet” on their computer for the students to store their work; this allowed the teacher the opportunity to grade the work and return it to the students. Digital work included, Inspiration, Kidspiration, and AppleWorks documents, in addition to videos the students had created. Written work included, reflections, letters, and “delta’s and plusses” on projects.

The laptop computer was used as an authentic tool for students to develop their schema with real-world connections for the use of technology. For example, to understand sensory details, the students took their laptop computers into the garden, and used Kidspiration to create visual representations of their five senses. As part of unit on fractions, the fourth grade students used spreadsheets to design a

luxury hotel for the Olympics. The final product was a colorful layout of a luxury hotel.

### **SUMMARY WEBSITE**

The data collected from the study was published in the form of CD-ROM/website for the state of Florida called "No Strings Attached! Wireless Technology in Education". The videos and student artifacts guided the design of the website that was designed to share methods and ideas for integrating technology in the classroom.

The "No Strings Attached! Wireless Technology in Education" website is divided into three main sections: Lesson Plans, Making it Work, and Reflections. The first section contains lesson plans used in the study or developed by the teachers in the study. Each lesson contains objectives, procedures, curriculum standards, technology standards, materials, and additional information. Some of the lessons contain videos of students implementing the lesson with the teacher providing a synopsis of the lesson.

The second section of the website is called "Making It Work." This section provides a variety of examples for how technology can be implemented in a district, a school, or a classroom. A subsection provides examples of students creating short videos on basic technology operations, such as opening an application or connecting a camera to a computer. Other subsections include district-wide methods for training teachers on technology, digital tools for the classroom, and examples of student-made movies and teacher-made movies.

The final section is "Reflections," in which teachers reflect on technology in the classroom. For example, one reflection deals with students importing pictures from the camera to the computer, and the time it saved the teacher. Another reflection is on making movies, in which the teacher realizes that in the future, the students should make

the movies.

For more information about this study and the culminating website, visit <http://etc.usf.edu/wireless/default.htm> or contact Kate Kemker at [katek@tempest.coedu.usf.edu](mailto:katek@tempest.coedu.usf.edu).

## REFERENCES

- Apple Learning Interchange. (2004). Building a 21st Century Learning Community: Manatee County, Florida. Retrieved January 21, 2004, from [http://ali.apple.com/ali\\_sites/ali/exhibits/1000884/](http://ali.apple.com/ali_sites/ali/exhibits/1000884/).
- Avery, P. G. (1999). Authentic assessment and instruction. *Social Education*, 63(6), 368-373
- Becker, H. (2000). Who's wired and who's not: Children's access to and use of computer technology. *The Future of Children*, 10 (2).  
[http://www.futureofchildren.org/usr\\_doc/vol10no2Art3.pdf](http://www.futureofchildren.org/usr_doc/vol10no2Art3.pdf)
- Becker, H. J., Ravitz, J. L., & Wong, Y. T. (1999, November). *Teacher and teacher-directed student use of computers and software*. Teaching, Learning, and Computing: 1998 National Survey Report #3.
- Borman, G.D. (2003). How can Title I improve achievement? *Educational Leadership*, 60, 4, 49-53.
- Bozeman W. C., & Baumbach, D. J. (1995). *Educational technology: Best practices from America's schools*. New York: Eye on Education, Inc. pp.174-176.
- Cohen, R. (2002, June 15). Laptops in Bar Harbor get high marks. Bangor Daily News. Retrieved on January 19, 2004, from <http://www.state.me.us/mlte/pressroom/articles/061502BDNCONNERS-EMERSON.htm>.

- Darling-Hammond, Linda. (1997) *The right to learn: A blueprint for creating schools that work*. Jossey-Bass: San Francisco.
- Haberman, M. (1991). Pedagogy of poverty versus good teaching. *Phi Delta Kappan*, 73, 290-294.
- Haycock, K. (2001). Closing the achievement gap. *Educational Leadership* (March), 6-11.
- Hill, J., Reeves, T. C., & Heidemeier, H. (2000). *Ubiquitous Computing for Teaching, Learning, and Communicating: Trends, Issues & Recommendations*. Athens, GA: Department of Instructional Technology, College of Education, The University of Georgia.
- LeCompte, M. & Schensul, J. (1999). *Designing and conducting ethnographic research*. California: Altamira Press.
- Means, B., & Olson, K. (1995). Technology and education reform: Technical research report. Volume 1: Findings and conclusions . Menlo Park, CA: SRI International.
- Newmann, F. M., G.G. Wehlage, & S.D. Lamborn. (1992). The Significance and Sources of Student Engagement. *In Student Engagement and Achievement in American Secondary Schools*, edited by F.M. Newmann, pp. 11–30. New York: Teachers College Press.
- Newmann, F. M., & Wehlage, G.G. (1995). *Successful school restructuring: a report to the public and educators*. Madison, WI: University of Wisconsin, Education Center.
- Newmann, F.M. (1996). *Authentic Achievement: Restructuring schools for intellectual quality*. San Francisco, CA: Jossey-Bass

- Newmann, F.M., Bryk, A.S. & Nagaoka, J.K. (2001, January). *Authentic intellectual work and standardized tests: conflict or coexistence?* Chicago: Consortium on Chicago School Research.
- Padron, Y.N., & Waxmn, H.C. (1999). Classroom observations of the five standards of effective teaching in urban classrooms with English language learners. *Teaching and change*, 7(1), 79-100.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newbury Park, CA: Sage Publications.
- Penuel , W. R., Means , B., Golan , S., & Korbak , C. (2000). *Challenge 2000 Year 4 Evaluation Report*. Menlo Park: SRI International
- Ringstaff, C. & Kelley, L. (2002). *The learning return on our educational technology investment: A review of findings from research*. WestEd Regional Technology in Education Consortium in the Southwest.
- Rockman, S. (2000). A more complex picture: Laptop use and impact in the context of changing home and school access. San Francisco: Rockman et al. [Online]  
Available: <http://rockman.com/projects/laptop/>
- Ross, S. M., Lowther, D. L., & Morrison, G. R. (2001, December). Anytime, anywhere learning: Final evaluation report of the laptop program: Year 2. Center for Research in Educational Policy. Retrieved January 19, 2001, from <http://www.nteq.com/Research/Laptop%20Yr2%20Final%2012-10-01.pdf>.
- Sandholtz, J., Ringstaff, C., & Dwyer, D. (1997). *Teaching with technology: Creating student-centered classrooms*. New York: Teachers College Press.
- Schrum, L., & Bracey, B. (2003). Empowering all learners: Creating technology rich,

- student centered curriculum. In G. Solomon & P. E. Resta (Eds.), *Toward digital equity: Bridging the divide in education*. Boston: Pearson Group
- Solomon, G., Allen, N., & Resta, P., (Eds.). (2003). *Toward digital equity: Bridging the divide in education*. Boston: Pearson Group.
- Stevenson, K. R. (1998). Evaluation report - year 2: Schoolbook *laptop* project (No. 2). Beaufort: University of South Carolina Department of Educational Leadership and Policies. [Online] Available:  
<http://www.beaufort.k12.sc.us/district/ltopeval.html>
- U.S. Department of Education. (January 2001). *High Standards for All Students: A Report from the National Assessment of Title I on Progress and Challenges Since the 1994 Reauthorization*. Prepared for the Planning and Evaluation Service, Office of the Under Secretary, U.S. Department of Education
- U.S. Department of Education. (2002). *No Child Left Behind Act*. Washington, D.C.: U.S. Government Printing Office.
- Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics* (Educational Testing Policy Information Report). Retrieved from <ftp://ftp.ets.org/pub/res/technolog.pdf>