Blending Technology Use with the Basic School Philosophy: Tools to Support Learning in an Elementary School

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Overview

Students are gathered in a video studio at Harland Elementary School. The video conferencing system is being used to bring the expertise of a NASA scientist to these students who want to deepen their understanding of black holes. Students are seated in rows facing a large screen where they are able to see the scientist through a camera at his location in Florida. To the right of the screen is a smaller monitor for a second camera at the scientist s location. In the back of the room there is a third monitor

for an in-studio camera focused on the students. To the left of the large screen, the teacher stands to moderate the session, with a second in-studio camera focused on her. A parent volunteer is controlling what is displayed on each monitor. When the scientist begins to write on his flip chart, the chart appears on the large screen, and the scientist appears on the smaller monitor. The students ask questions that they have written, and each is eager to be called upon to pose a question. The scientist is clearly impressed by the level of complexity in many of the questions he is asked. His answers are clearly stated, but he does not oversimplify their content. He uses the flip chart to show equations and graphs that explain his points. He also shows the students some images and animations of black holes that he thinks the students will find exciting. At the end of the conference, everyone agrees that it has been a great learning experience.

The origin of this scene was the study of astronomy by students in a 5th-6th grade class of gifted students. When they started to ask their teacher questions that she could not answer, she discussed the problem with the school s Technology Specialist. This specialist had recently learned that it was possible to contact NASA scientists to work with students, so she suggested that they do a video conference using the facilities in the school s Distance Learning Lab. The Lab is just one, visually impressive, component of technology use at Harland. For both the teacher and the specialist, the video conference with NASA was a perfect example of the integrated use of technology to support learning: the decision to use video conferencing was made in service of learning goals, and because it was the appropriate form of technology to use for the purpose of speaking to a NASA scientist. When technology is not well integrated, it may be used for its own sake, or not at all.

The fact that the school has the opportunity to use such advanced technology represents several years of intense focus on the purpose and goals of both the school and the use of technology in education. Although the school s use of technology is exemplary, the staff still see themselves as learners. Every year there are new teachers to introduce to the use of technology, and there are new technologies whose uses in the classroom need to be explored. With all that they have pioneered, educators from Harland are frequently called upon to make presentations about the school, and they disseminate what they have learned in this and other ways. The staff, students, and parents are very proud of the school and its leadership role, and are also very appreciative of being a part of a school with a strong vision and a history of achievement.

Harland Elementary School is located in Crawford, Virginia. Crawford is a well-to-do community within commuting distance of Washington DC. The school building is attractive and clean. It is located on a cul-de-sac in a residential neighborhood with well-tended homes on large lots. The terrain is gently rolling and the area is dotted with many stands of mature trees. The school provides K-6 general education for neighborhood students (618 students), Harland Center for deaf students from across Crawford County and other counties as needed (73 students), and a Gifted and Talented program (126 students). Crawford County is a highly-regarded school district that can attract good teachers. The school staff consists of 3 administrators, 56 classroom/specialist teachers, 2 guidance counselors, 14 instructional assistants, 6.5 office support staff, and 6 custodians. The school building was renovated in the mid-1990s, including upgrading of the electrical system. Classrooms are grouped around shared open spaces; the open spaces are used for gathering students from all of the classrooms in the grouping, and also as an extension to the individual classrooms to accommodate students working in groups. Class groupings, called families at Harland, occur both by grade and across grades.

Harland calls itself A Basic School Powered by Technology. The Basic school philosophy was developed by the late Ernest Boyer and colleagues from the Carnegie Foundation for the Advancement of Teaching. The Basic School philosophy has 4 components: the school as community; a curriculum with coherence; a climate for learning; and a commitment to character. The Basic school curriculum attempts to achieve coherence through 8 themes: the life cycle, use of symbols, membership in groups, time and space, response to the aesthetic, connections to nature, producing and consuming, and living with purpose. (http://www.tc.columbia.edu/~ncrest/basic/)

The Basic school philosophy is central to the Harland vision for teaching and learning, and technology plays a secondary, support role. The Basic school philosophy and the school s focus on technology are ideas that emerged in the late 1990s. The staff were already engaged in an exploration of the Basic school philosophy when they were prompted to explore goals for the use of technology at Harland. This pivotal point stemmed from the receipt of settlement funds from Texaco in 1997 in compensation for an oil spill in the neighborhood. In order to receive these funds, the school had to provide a thorough, concrete technology plan. As a result of these two explorations occurring jointly, the use of technology is not an add-on or isolated concept at the school; the use of technology at Harland is thoroughly grounded in the overall vision of a Basic school.

There are several components to the school s use of information technology.

One to One. The centerpiece of Harland s technology use is the One to One program in which each 5th and 6th grade student is assigned an eMate to use for the full school year, 24 hours a day, 7 days a week. The eMate is a rugged, portable computer designed for use at the elementary school level. The eMate has word processing, email, drawing, spreadsheet, and graphing applications. The display is not a full-size monitor but does allow viewing of several lines of text at one time. Input is by keyboard or stylus, allowing students to easily switch between typing notes and drawing illustrations. There is also an infrared port, allowing teachers to beam work to students, and students to beam work and messages to each other. Staff, students, and parents are great supporters of the eMate and cite only 2 drawbacks: the vintage of eMate at Harland cannot be used for Internet browsing, and student use of the keyboard may hamper the development of their cursive writing.

Wireless Laptop Computers. The school would like to extend the One to One program to the 4th grade, but this is difficult because the eMates were purchased using the one-time funds from Texaco and because this low-cost alternative to laptop computers is no longer manufactured by Apple. As a compromise, the school purchased 10 wireless laptop computers that are used by the 4th grade classes. Although this means that access is more limited, the wireless technology is helpful. The computers can be used all day, then recharged overnight for use again in the morning.

The 4th grade teachers are part of the One to One teaching team, even though their students do not have eMates. They meet with 5th and 6th grade teachers weekly to assist each other with effective integration of technology in classroom work.

AlphaSmart. The AlphaSmart, a simplified word processor, is used in K-4th grade classes. The AlphaSmarts are generally used while at school, and allow students to do drafts that can then be downloaded to a desktop computer for further editing or enhancement.

Technology Computer Lab. This lab is equipped with 30 Macintosh G3 computers connected to a central server and the Internet. One of the computers is connected to a television monitor so that it can be used for teaching. A scanner and digital printer are also available. The lab is run by a full-time staff member and is booked for use by entire classes, as well as for staff technology training.

Distance Learning Lab. The Distance Learning Lab provides video conferencing and closed-circuit television capabilities. Each day, 6th grade students produce an in-house news program called Harland Morning. Instead of listening to announcements through a public-address system, Harland students watch as their peers tell of the day s events, with an American Sign Language interpreter simultaneously translating the program for the deaf and hard-of-hearing students. Video conferences are arranged judiciously, as the cost of the telephone connection is often prohibitive.

Assistive Technology. The Harland Center makes use of a full-range of assistive technology for deaf and hard-of-hearing students. The school also assists the parents of these students with finding sources for assistive devices needed at home, such as TTY and captioning for television. These items are generally available free of charge through community support programs for assistive devices. There is currently no program for families of deaf students with limited finances to obtain home computers. Staff at Harland are actively trying to find new sources of funds for this purpose.

Classroom Computers. Each classroom is equipped with at least 6 Macintosh computers that are

connected to a local network and to the Internet. Classes each have educational and multimedia software, and they share access to some technology such as printers, scanners, and digital cameras.
Teachers Computers. Teachers have desktop computers in the classroom for productivity and instructional uses. Most teachers at the school use email to communicate within the school and with parents.
Having all of this technology available puts Harland ahead of many schools in the nation in terms of access. However, the staff is quick to point out that the satisfaction in having all that technology comes from the school s success in integrating its use to support learning. The staff culture is remarkably collaborative and open, and teachers frequently turn to each other to learn how to use technology effectively in the classroom. Teachers experienced with using technology say that it is now hard to separate thinking about technology use from thinking about instruction; for them technology and instruction have become seamless, and use of technology occurs naturally as they plan instruction. They do not make use of technology for its own sake, but include it when it will support learning.
Teachers are well supported in their use of technology by two on-site staff. The Technology Specialist runs the Distance Learning Lab and provides training in technology use as needed. She also spearheaded the school s technology plan and coordinated the One to One program. Staff at the school see her as having provided outstanding leadership in technology use at Harland over the years. The Technology Computer Lab teacher runs that Lab and also provides training in the use of computers and software. Both of these staff members assist teachers with troubleshooting technical problems. For problems that they cannot solve, the district provides technology support specialists.
Parents are aware of the school s Basic school powered by technology vision and support it. The PTA is very active, as are individual parent volunteers. They estimate that 75% of families contribute volunteer time at some time during the school year, ranging from one-time assistance on a class trip, to a weekly commitment to assist in the Distance Learning Lab. There are newsletters from both the school and the PTA to keep parents informed, and many teachers are available by email. There were many parents volunteering in the school on each of the days of this case study.
Another reform at the school emphasizes the need for K-2 students to achieve learning goals by age 8, with some children reaching those goals earlier than others. In the Success by Eight program, students are assigned by learning needs into either K-1st, 1st-2nd, or 1st grade only classrooms. These groupings enable greater support from reading, learning disabilities, ESL, and Total Communication specialists, so that all students achieve the same learning goals before entering 3rd grade. The teachers of these classrooms meet weekly in order to plan curriculum and share strategies. These weekly meetings enable teachers to provide each other with a significant source of support and advice.
Harland is also working on an initiative called the Woodson pyramid. The pyramid includes Harland, four other elementary schools, and the middle and high schools the elementary students will attend. The goal of the pyramid is to take the model of technology use developed at Harland and implement it at each of the other schools in the pyramid. To date, Harland s use of technology has involved K-6 students, but by spreading the model to the other schools, the impact of the model through 12th grade could be observed. The Crawford school district is willing to provide some financial support to the Woodson pyramid because it will serve as a pilot for the district. Beyond funding from the district and from the schools themselves, Harland s principal says they are negotiating with a couple of companies to act as pilot sites for K-12 use of their computers and other technology.

The Past

The staff at Harland were exploring the Basic school concept when funds from the oil spill settlement with Texaco became available. The school was required to develop a technology plan in order to receive the funds, and found that it was far easier to buy hardware and software than it was to envision how these purchases could improve learning. After spending about half of the money on classroom

computers, wiring, and teacher training, the remainder was left to collect interest while a team of administrators, teachers, and community members continued to develop the vision for technology use. The school s Technology Specialist came to Harland at that time and joined the technology committee and a Basic school reading group. She is cited as the person who was instrumental in helping others determine what role they would like technology to play at Harland. At a meeting of the technology committee, she asked them to envision a school where money is no issue and what do we want teaching and learning to look like, what do we want our classrooms to be. [TC302] She says that as teachers envisioned what they wanted their students to be able to do more broadly, the specific technology needs were defined as part of that vision. She found that gradually, the same needs were being defined at Basic school reading group meetings in their discussions of what would happen in the ideal school. Ultimately, the staff felt that the two threads came together and the school s vision was clear: a Basic school with an emphasis on using technology to support learning.

The initial purchases made using the Texaco funds reflect typical school technology plans: the infrastructure to support a group of 4 computers in each classroom and training in their use. It is interesting that the vision developed at Harland extended to the concept of one-to-one student-computer access. In their blue-sky exercise, they were concerned that learning experiences could be limited by the extra organizational efforts required when students must share computer access. It is often suggested that a group of computers in each classroom is preferable to school computer labs, and many schools aim to equip all classrooms with at least a few computers, but most schools do not attempt to achieve one-to-one access. No doubt the one-time funding from Texaco made it possible for Harland to decide that one-to-one was the best strategy.

The Distance Learning Lab was built with funding from Bell Atlantic. It consists of closed-circuit television production equipment, housed in a studio and control room, and a Tanberg Educator 5000 system for video conferencing, housed in the studio. Use of the Lab is intended to support student collaboration and prepare them for mobile and remote workplaces in the future. Another important goal for the Lab is to provide visual access to the deaf and hard-of-hearing students. These students are able to share in the morning announcements through the visual medium of television. Not only is the news program signed as well as spoken, each day a new sign is highlighted in order to improve the communication between hearing students and deaf students.

The Present

The use of technology is well integrated with instruction at Harland. Beginning with the development of the school s technology plan and the early efforts at using eMates, the school has progressed in its understanding of the value that can come from using technology in the classroom. As new teachers join the staff, that process of developing an understanding is repeated. The process is sometimes easier with younger teachers because they are often already familiar with the technology and need only to learn how to use it effectively in the classroom.

Harland teachers have many ways to obtain the training that they need in order to use technology. The school district provides a summer boot camp to teach technology basics, and courses on using specific software such as ClarisWorks and PowerPoint. At the school level, the Technology Specialist provides training for staff who want to make use of the Distance Learning Lab. Computer use and software classes are offered at the school s Technology Computer Lab after school, on weekends, and during the summer. These courses are taught by the Lab s computer teacher, the school s Technology Specialist, and by staff members with expertise in using a particular piece of software or equipment. Staff members with specific expertise also work individually with teachers who want to learn a new skill. We have little mini-lessons that the computer teacher provides, and she puts the topics out there and if you re interested in going, you can go ¼ and I ve utilized that. Also, our distance-learning lab teacher has really supported me in learning how to do things like ¼Avid-Cinema¼ and that s just when ¼

when I m interested something, I can find the expert in the school and fortunately, there are so many people who are an expert in something, even general ed teachers who s main purpose is not technology, they ll be an expert in certain things. [T309]

Harland teachers can turn to the technology staff at the school, as well as other teachers, for assistance with technical problems. For technical problems that cannot be solved at the school level, the district provides technology support specialists who can repair computers, administer the network, and provide other technical assistance.

Teachers team meetings have been a critical source of support to the integrated use of technology. Teachers meet by grade level and they meet across grade levels. The One to One program team (4th, 5th, and 6th grade teachers) meets weekly, as does the Success by Eight team (K-2nd grade teachers). Teaching specialists, for example in reading and music, also meet with teaching teams many times during the year. These meetings provide a forum for teachers to plan and articulate the curriculum, discuss appropriate uses for technology in different subject areas, and give each other technical assistance with the use of specific pieces of equipment. The principal says the meetings also serve as the forum for dealing with the process of change, so that teachers do not feel isolated when they are trying to do something new in the classroom.

I think, that s probably been the most powerful and most useful tool, is that teachers every week get together and talk about how they re using it [technology], how they implement it, what do they see happening, what s working well, what are they having trouble with, what did somebody else initiate in the classroom that would be a good thing for them to try. So, initially it was a live brainstorming, you know, oh, how do you use it for language arts, how do you use it for social studies, how could you use it for math. And then people was going back and actually trying it out, and coming back and saying, that really bombed, you know, or that was great, I couldn t believe helpful it was. And then also it was...time for people come and just complain, you know, and just vent and get out their frustrations. [SP301]

From the beginning, there were indications that the One to One program at Harland could have an impact on how quickly and how well students understood some concepts. One teacher tells the story of trying to fulfill the district s mandate to do author conferences on student writing. Over the years, she had found that students were not able to critically evaluate writing samples, and therefore the conferences were not effective. The first time she tried doing a conference using the eMates, however, she found that they were a perfect tool for scaffolding the students ability to analyze each other s writing.

So, the first author beamed it to the other three kids in their cluster. So, now, when they read it, the kids were reading it on their screens.... Child finished reading it, and said, okay, so, what do you think? What are the good parts? Everybody said, that was a wonderful story, I loved it, but did you realize that what you read wasn t what you wrote? Wow, so, a REAL comment ... about something ... for the first time ever, and I d been trying to do these author conferences for years ... what do you mean ... everybody scroll up to the first paragraph, now you ve got everybody with a story, everybody s scrolling back to the first, and now the author, as children, did you see here, that you had a dialogue going here, and no paragraphs, there are no quotation marks, I don t know who s talking when I m reading this, when you read it, I knew who was talking. So, now I ve had the author typing in, putting in dialogue, change ... right in their story, so they knew where to go back. ... that was when I started to see that this could be a wonderful tool for improving writing, the kids are really wonderful at doing that, because they are very good at looking at those things. But, aurally, it s something totally different. [T305]

She had a similar experience teaching graphing and the meaning of the slope and intercept. Each

student opened the graphing calculator on their eMates and entered an equation for a line on the graph. After that line was constructed, the teacher asked the students to enter another equation that would create a second, parallel line on the graph. Then they created a line below the first line, with its equation generated by the students themselves. From there, they experimented with the slope of the lines, and by the end of the class, they understood not only how to construct a graph, but also the significance of the slope and the intercept. The teacher was again surprised months later when she was preparing students for the district tests and found that they had retained that understanding of graphs.
She also is enthusiastic about what the Internet can add to learning experiences. Students have access to many more sources of information sources on the Internet than they have in their school and local libraries, and this access has changed the way that she teaches topics in history such as the Civil War. She now uses primary sources, and asks the students to interpret what people at the time were thinking as events were unfolding.
So, I found out, all of sudden, that it [the Internet] had added a depth to my instruction, and a validity to the information, that they re reading, rather than something somebody s already taken and put into words that kids can understand, so they have to be better readers, they have to be better writers. [T305]

Parents also say that technology use has benefited their children. One parent with a dyslexic son says that the eMate has helped him to keep his train of thought when he is writing, and consequently, to write more. The eMate helps him to do this because he knows he can review his work using the spell check tool, so he finishes writing the content before correcting his spelling errors.
Another parent says that the eMate helped her daughter to manage her homework without help from her parents. A 5th grade student, her teacher uses email to remind students of their homework assignments. Because the students have their eMates with them at home, they can easily review the assignment, and begin working using a familiar tool, the eMate.
The thing I found the most beneficial for her, I think, was it made more independent in her schoolwork when she got home. Because she could come home and she knew how to use that email, and she knew what she had to do and she would sit down and do it. And before, she didn t use the computer all that often, or when she did, she needed a lot of help, so it really did make her independent and made the homework so much easier on the family. [P303]

Harland students perform well on standardized tests. Scores on the Stanford Achievement Test in all subject areas tested in 1999-2000 are above the 70th national percentile equivalent. For example, 6th grade students scored at the 79th percentile for language, the 84th percentile for science, and the 88th percentile for reading. These scores show that the educational achievement of Harland students compares favorably to the achievement of students across the country, but it does not show that the use of technology improves student achievement. Although there have been attempts, the school has not yet been able to gather data that shows technology is helping students learn. The principal notes that from the beginning of technology use, they knew that they needed to measure outcomes, but they could not identify a way to separate the impact of technology from other factors.
We started trying to work on an evaluation. And, very quickly, in that first year we realized, well we spent a lot of time in that first year trying to prove that technology made a difference. We made surveys, we gathered data, we thought we had it handled, we thought by the end of the year this is going to be great. Well, by the end of first year, we realized that you can t separate the technology from the curriculum, and that the only thing that we really proved, in quantifiable ways was that our children improved their typing speed; we re very good at doing that. [SP301]

Regardless of the lack of quantitative verification that technology is helping students learn, students themselves think it is having a positive impact. One student describes the difference between another school without advanced technology and Harland as the difference between students covering topics in

a rote fashion and covering topics in a way that spurs them to become lifelong learners.
They re [students at the other school] covering the same stuff, but they re probably not enjoying it as much, it s just kind of, it s memorization of facts and it s ... learning can much more interesting when ... it s just a matter of ... are kids wanting to learning, is this going to form a habit of lifelong learning .... [S307]

Another student says the use of technology prompts teachers to have higher standards for student work because of access to additional resources. When students use school libraries, they typically use secondary sources such as textbooks and encyclopedias. In addition, there may be a limited number of books on a given topic, and so each student may not have equal access to the best resources.
I mean, if you have to go to the library and get a bunch of books ... the standards, the teachers can t set very high. But, now, I mean, you have all this information [on the Internet] that you can access, so, the standards are higher. [S307]

One student comments on the differences between writing a paper and doing a slide presentation in a program such as PowerPoint. He says the slide show format requires students to go beyond presenting facts to thinking about audience and the effectiveness for communicating of different media, such as text and photographs.
I think it s a little tougher to do a slide show, because with a paper, you ve got the facts, you can kind of get them down, but when you re making a slide show, people don t just want to see text. You want to have effects, you can insert pictures, and the teachers expect when you choose something like to use a computer, they expect above and beyond what you d do by hand, because they do expect you to take full advantage of the technology that you have. And, it s kind of difficult to do a really good slide show, because you have to consider ... am I getting information across? Can people read this? Are people interested? You know, are there good pictures, there s a number of different things to consider, and if you are good at that, and you get it done, it can be spectacular and a hundred times better than a ... than just a written paper, but it is more difficult and there s a number of different things you have to consider. [S307]

Like the eMate, the video conferencing system in the Distance Learning Lab has provided benefits to students. The general student population has been involved in conferences with their peers from around the world, and with experts, such as the conference with the NASA scientist described in question 1. The deaf students have also participated in conferences with other schools for the deaf from around the country. Because the incidence rate of deafness is low for young students, this connection is important for expanding the population of peers of Harland s deaf students.
Another use of the video conference system is for teacher training and development. In a recent grant proposal, Harland aimed to establish a program with a school of education in which pre-service teachers could be recorded working with Harland teachers, and their performance could be viewed by other pre-service teachers while sitting in their class at their school of education. This real-time interaction during teacher practicums would combine the experience of practice teaching and the discussion of that experience. Although this teacher training initiative has not yet been funded, the principal at Harland plans to keep trying to find partners for it.
Although technology use at Harland has reached a stable level, there are concerns about how the school will maintain and expand its One to One program. Nonetheless, there are no plans to abandon the vision of one-to-one computer access for at least the higher grades at the school.

Hypotheses

Hypothesis 1.

Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.

Evidence in favour of the rival hypothesis.

The Basic school reform initiative was the driving force in creating a vision for Harland. The Basic school philosophy was introduced at the school at the same time that the school was exploring the use of technology in instruction. As a result, use of technology is integrated with the school s vision and goals.

Hypothesis 2.

The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.

Evidence in favour of the hypothesis.

The diffusion of the Basic school powered by technology vision followed the traditional diffusion theory pattern. The study of the Basic school philosophy began when a few highly active teachers began a reading group to study the Basic school approach. Other teachers joined them as their interest was piqued, and the decision to become a Basic school evolved from reading group discussions that eventually included most of the teachers at the school, as well as some parents. The teachers were motivated to study the Basic school approach because they wanted to improve their teaching. The teachers who initiated the reading group were initially more committed to improvement, but the commitment of other teachers increased as they learned from their peers how a Basic school would work.

The decision to have a technology focus at Harland evolved from discussions about the technology plan the school needed to write in order to obtain settlement funds from Texaco to be used for technology. But even though the school became committed to using technology in specified ways, individual teachers differed in how prepared they felt to use technology in their own classrooms. As a result, the use of technology ranges from those teachers who feel extremely comfortable with technology and use it whenever suitable, to those who tend to use traditional instructional approaches more often.

The people who are really on the fast end of technology have had to be patient, myself included, with people who are on the low end of the learning curve. People on the low end of the learning curve have had to say, I m not there yet, but I m working on it. [TC302]

The earliest users of technology were those staff members who had already been using computers at home. They were willing to try using technology in the classroom as soon as the school was able to provide it. The teachers who remain hesitant to use technology are those with little or no computer experience. For example, new teachers at Harland this year are young enough that computers have always been a part of their lives. These teachers say that they are experienced in using computers for

their own personal and professional productivity needs, but that they are not experienced in integrating technology into classroom instruction. They are willing to learn to integrate technology because they are already familiar with it. Those teachers who have been teaching for many years and who have not been using computers for personal or professional productivity needs are least willing to use it in the classroom.

Hypothesis 3.

Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT s academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.

Evidence in favour of the hypothesis.

Teachers at Harland have a clear mission to use technology when and if it will enhance learning. Therefore, teachers are not motivated to use technology if will not meet teaching needs. Teachers at Harland are given opportunities to attend training in technology use within the school, within the district, and elsewhere. Most of this training assists teachers with knowing how to use of various pieces of hardware and software, but resources listing steps for effective integration of technology into instruction do not yet exist. Teachers at Harland had to learn much of what they know about its integration by trial and error and by sharing their experiences with each other. Support from the school s administrators in the form of scheduled meetings of different teams of teachers provides a critical forum for teachers to build and share their knowledge of technology use.
There are teachers at Harland who make minimal use of technology because of their lack of comfort with it, and one would expect that there are teachers who use technology without tying its use to instructional goals, but there were no instances of this observed at Harland. During interviews, the principal, Technology Specialist, teachers, and parents all expressed the view that technology use at Harland is guided by learning goals, and there was agreement that all teachers are either using or learning to use technology effectively. The school does not actively recruit teachers who are technology experts, but instead looks for teachers who are interested in technology use and willing to learn to use it well.

Hypothesis 4.

Gaps in academic performance between high and low poverty students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to more advantaged students increasing the performance gap with disadvantaged (high poverty) students..
There are few high poverty students in Harland s general population and almost all of these students have access to technology at home. Harland students also have access to technology in their classrooms, in the Technology Computer Lab, and in the Distance Learning Lab. In addition, each student in the 5th and 6th grades receives an eMate to use continuously through the school year. Consequently, it is possible to conclude that Harland s general student population has equal access to technology, but conclusions about closing the achievement gap are not warranted here.
The Harland Center for deaf students gives some indication that technology will help close the gap between high and low poverty students. Students at the Center come from all over Crawford County, as well as from other counties, and they reflect the economic and cultural diversity of Crawford and surrounding counties. The school not only makes extensive use of technology in the Harland Center,

staff at the school also assist parents with obtaining technology for use at home, thereby increasing equality of access. There is evidence that use of technology in the classroom has had a significant impact on the progress of deaf students. Harland s principal, formerly a teacher in the center, recounts the first two years of technology use in the classrooms of deaf students.

The visual accessibility that was set up by having the technology in a room where deaf students are, so you can have the constant comparison between English print and American Sign Language, that was phenomenal in terms of literacy improvement that we saw in the first two years [of technology use], as compared to anywhere else, when you look at literacy research with deaf children. [SP301]

To the extent that technology can be a tool to address a need, such as deaf students need to connect the signs they use to communicate with English words, technology may help to close gaps. In the case of deaf students in Harland Center, technology is helping them to understand language. For other areas where there is an achievement gap, technology should also prove effective for improving performance.

Hypothesis 5.

Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like. The alternative hypothesis is that ICT use will lead to a lowering of academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.

Evidence in favour of the hypothesis.

Teachers at Harland have access to many pieces of educational software. They ensure that academic standards are not lowered by poor quality materials in two ways: first by selecting the best software available, and then by using it as a tool to support learning and not as a means in itself. Teachers are free to choose technology tools that fit with learning goals and to exclude it from their plans when it does not serve learning goals.

There is evidence that teachers are raising their standards for student work because of the use of technology at Harland. For example, students are expected to make use of primary sources available on the Internet in addition to traditional secondary sources such as library books and encyclopedias. Use of primary sources raises standards because students using them must interpret and synthesize information, rather than simply restate it.

Harland students say that the standards for their work are higher when technology is used. For example, because students can find many sources of information on the Internet compared to just one book on a given topic in the library they are expected to learn more about topics they study.

Projection to the Future

There is a full range of technology use at Harland that does not exist at most other schools. Other schools will need extensive funding and professional development if they are to achieve Harland s model use of technology. Other schools are indeed obtaining more computers and Internet access, and there is growing emphasis on providing teachers with training in the effective use of technology. But it seems unlikely that many schools will have the level of funding needed to install distance learning labs and provide one-to-one student-computer access, at least given today s costs for these technologies.

It will also be difficult for Harland to maintain its model use of technology. The school s commitment to one-to-one access remains strong, despite the immense challenge of funding the replacement of the eMates and of extending one-to-one computer access to more students. The district does provide

financial support for the use of technology, and Harland s PTA is able to raise large sums of money, but continued funding for the One to One program will not be achieved without the input of business partners. The technology committee is currently meeting with prospective business partners in order to ensure the continuation of the One to One program.
The Woodson pyramid initiative seeks to replicate Harland s technology use in the other schools in the pyramid. The financial difficulties that Harland faces despite all of the resources it has at hand point to the unlikelihood of the transferring the One to One program to the rest of the Pyramid s schools. To date, each of the four other elementary schools in the pyramid have installed video conference systems, but the high school still needs to upgrade its electrical system before it can make extensive use of technology. Besides the financial issues that affect the viability of scaling Harland s technology use to the rest of the schools in the pyramid, there is the need to gain high levels of commitment within each of the schools. That commitment has been lacking in the past because the principals did not agree that the use of technology was the highest priority in addressing the needs of their schools. Teachers at other schools in the pyramid will also have to go through a process of learning how to integrate technology with instruction in ways that support learning. All of this suggests that the Woodson pyramid initiative will take several years to unfold, with the purchase of the technology itself not necessarily being the most difficult part of the transfer of Harland s model of technology use.

Appendix A: Methods

Research Team: 2 researchers

Time Frame: 5 consecutive school days

Data Collected:
Interviews (30-90 minutes):
School principal
School Technology Specialist
District superintendent for technology
2nd grade teacher
5th-6th grade teacher

Focus Groups (30-60 minutes):
5 teachers
2 2nd-grade students
4 6th-grade students
3 parents

Observations (approximately 30 minutes)
Distance Learning Lab re: Harland Morning
2nd grade class in computer lab
2nd grade class in classroom

Appendix B: Teacher ICT Practices Survey Results

(Site 300, 51 teachers)

For work you assigned last year, how often did your students:

	1+ times weekly	1+ times monthly	a few times	never
	%	%	%	%
Use WWW	19%	28%	32%	21%
Create web pages	2%	2%	4%	91%
Send & receive e-mail	13%	2%	13%	72%
Use word processing	52%	15%	17%	15%
Use computer for games	40%	27%	18%	16%
Use a graphics program	20%	9%	39%	33%
Join on-line forum or chat	2%	0%	11%	87%
Use presentation program	6%	9%	26%	60%
Use instructional program	17%	17%	26%	40%

Experiences last year

	yes	no
	%	%
Graded student computer use	35%	65%
Made Web site for my classes	5%	95%
Involved in virtual, online course	18%	82%
Students collaborated via Web	18%	82%

Rate your ability to use a computer

	good	fair	poor
	%	%	%
Ability to use computer	78%	20%	2%

How much freedom did you allow students in locating WWW sites to visit?

		no restrictions	some restriction	Only certain sites
Students web restrictions	Count	2	16	12
	%	7%	53%	40%

Computer use in classes last year

	All	Most	Some	Very little	None
	%	%	%	%	%
% of classes devoted to computer use	37%	35%	21%	5%	2%
% of computer use done individually	8%	42%	39%	5%	5%

Computer use at home

	1+times weekly	1+times monthly	a few times	never
	%	%	%	%
Amount of computer use at home	50%	33%	15%	2%

Collaboration with other teachers via WWW

	yes	no
	%	%
Using ICT for collaboration	55%	45%

E-mail messages sent daily

	12+	6-11	1-5
	%	%	%
Daily e-mail messages sent	16%	37%	47%

Computer Expertise Index

	none	1	2	3	4	5
	%	%	%	%	%	%
Number of computer activities done	20%	12%	24%	22%	10%	10%

Appendix C: Supporting Evidence

List of appended documents:
Pages 16-18: Presentation Materials prepared for the American Association of School Administrators conference, February 19-22, 1999.
Page 19: MentorWorks Recruitment Flyer

Page 20: Volunteer sign up form for Harland Elementary

Page 21: The Harland PTA Alert News (November 28, 2000)

Page 22-25: Harland PTA News (November 2000)